Marine letter and it's effects on the nesting population of Turtles, Chelones bay, northern Cyprus.

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MARINE LITTER AND IT'S EFFECTS ON THE NESTING POPULATION OF TURTLES, CHELONES BAY, NORTHERN CYPRUS.

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CONTENTS

	Page no.
Contents	2-3
Summary	4
Acknowledgments	5
Introduction	6-17
1.1. General Introduction.	6
1.2. Marine Turtle Life History.	6-8
1.3. Threats.	
1.3.1. Impact of tourism.	8-9
1.3.2. Sand extraction.	10
1.3.3. Incidental catch.	10
1.3.4. Disease.	10-11
1.3.5. Pollution.	11-12
1.3.6. Predation.	12
1.4. Distribution and status.	13-14
1.5. Previous surveys in Northern Cyprus.	15
1.6. Legislation for the control of marine pollution.	16
1.7. Marine Litter.	16-17
Methodology	**18-28**
2.1. Study site.	18-23
2.2. Litter surveys.	23-24
2.3. Turtle activity.	25-28
2.3.1. Nesting data.	25-26
2.3.2. Hatching data.	26-28
Results	**29-48**
3.1. Comparison of beaches.	29
3.2. Comparison of relative frequencies of items.	29-34

	Page no
3.3. Comparison of weights of litter types.	34-40
3.4. Comparison of mean weight per quadrat.	40-41
3.5. Comparing the distribution of litter up the beach.	41-42
3.6. Comparing the distribution of litter along the beach.	43
3.7. Turtle nesting activity.	44-45
3.8. Turtle hatching activity.	45-47
3.9. Comparison of the distribution of litter and turtle activity.	47-48
Discussion of results	**49-59**
4.1. Litter composition.	49-50
4.2. Distribution of litter on the beaches.	50
4.3. Turtle nesting activity.	50-53
4.4. Turtle hatching activity.	53-55
4.5. Comparison of litter and turtle activity.	55-56
4.6. Recommendations.	57-59
References	**60-64**
Appendices	**65-109**
Appendix I.	65-68
Appendix II.	69-72
Appendix III.	73-79
Appendix IV.	80-82
Appendix V.	83-87
Appendix VI.	88-91
Appendix VII.	92-99
Appendix VIII	100-102
Appendix IX	103-107
Appendix X	108-109

SUMMARY

Due to its position in the Mediterranean, Northern Cyprus receives much marine litter deposited on it's shores. To examine the effects of this litter on the nesting populations of the endangered green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles, surveys of both litter and turtle activity were carried out on the five beaches in Chelones Bay on the north coast of the Karpaz peninsular. Litter surveys were carried out prior to the nesting season (mid May-mid June) using one metre wide belt transects. When comparing the mean litter weight per quadrat there was a significant difference in the spread of litter with less in the bottom two thirds and more in the top third of the beach. As the majority of litter weight recorded was plastic (60%), it was expected that this would be blown or washed to the back of the beach. There was no significant difference between the litter loads on the five beaches or the spread of litter along the beaches.

Surveys of turtle nesting and hatching activities were carried out at three day intervals. A total of 197 nesting activities were recorded, 90 being successful nestings. These were 73 *Chelonia mydas* and 17 *Caretta caretta.* Only 13 nests were recorded as hatched. This number is very low compared to the hatching success of nests on other beaches in Northern Cyprus. It is suggested that the effect of high tides in August this year, predation and marine litter are all contributing factors to this low success. There are estimated at being between 300-700 annually nesting green turtles (Chelonia mydas) in the Mediterranean. Chelones Bay is thus an important nesting site of the green turtle and it is recommended that it be protected by local authorities and a cleaning regime be introduced.

ACKNOWLEDGEMENTS

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INTRODUCTION

1.1. General Introduction.

Marine turtles need sandy beaches to nest on. There are many obstacles which now stand in their way with respect to nesting, for example an increase in tourism brings with it development and heavy use of beaches. Litter deposited on beaches may also obstruct their nesting and hatching efforts. This project was designed to investigate both the types and quantities of litter on known turtle nesting beaches in the Mediterranean which might affect the nesting success of marine turtles.

Of the seven species of marine turtles found worldwide today, three are found in the Mediterranean. These are the loggerhead (*Caretta caretta*), green (*Chelonia mydas*) and the leatherback turtle (*Dermochelys coriacea*) (Groombridge 1990). Only the loggerhead and green turtle are known to nest in the Mediterranean and both of these are found nesting on the beaches of N. Cyprus (Groombridge & Whitmore 1989, Godley & Broderick 1992).

1.2. Marine Turtle Life History

Marine turtles begin their lives on land where they emerge after 45-60 days incubation in the sand (Erhart 1982). On emergence they are very active and head towards the sea. On reaching the sea, they swim frantically out towards offshore waters. This swimming 'frenzy' continues for the next 3-4 days with all energy requirements coming from the reabsorbed yolk (Lohman 1992). Once they reach the offshore waters, the hatchlings slow down and begin to feed on pelagic invertebrates and algae associated with drifting flotsam. It is thought that they stay here for the next 3-5 years before moving inshore to feed in shallower waters (Lohman 1992). It is estimated that only one hatchling in two thousand will survive to maturity (Lohman 1992).

Some turtles, such as the green are predominantly herbivores feeding on algae such as sea grass (*Posodonia*) whilst most others, including the loggerhead are carnivores feeding on fish and crustaceans.

After a long maturation, estimated at between 25-30 years (Lohman 1992), depending on the species, adult males and females migrate to waters off nesting beaches. Here they feed and mate. During a nesting season females lay 3-4 nests at intervals of 9-14 days (Carr 1987). They may nest every 1-3 years, again a variation amongst individuals and species exists. Females have been documented as being site philopatric both within and between nesting seasons (Mortimer & Porter 1989). Estimates of the life span of marine turtles range from 60-120 years (Lohman 1992). Owing to this length of time few studies are able to conclude such predictions. Neither is it known at what stage individuals are no longer able to reproduce. Studies of carapace growth rings have proved inconclusive at aging turtles, however, other studies such as those by Zug et al. (1986) have shown that growth lines in the humerus are good estimators of age in *C.caretta*. However, large amounts of data are required to further such estimates and must rely on mortality strandings which can be hard to obtain.

When choosing her nest site many factors may be selected for, including slope of the beach, sand type and depth, moisture levels, temperature and covering debris. A gradual slope is thought to be preferred for ease of nesting and to reduce possible wash-over from high waters. McGehee (1990) showed that hatching success was highest in nests of moisture levels of 25% and lowest at 100%. Incubation periods also increased with an increase in moisture. Total flooding of a nest can suffocate developing embryos. Mortimer (1990) analysed sand particle size on green turtle nesting beaches and showed that most of these beaches around the world had sand particle diameters of between 0.2-1.0 mm. The temperature of a nest is critical in both development and sex determination. If incubated at 26°C a nest will be all males, at 32°C they will be all female (Harry & Limpus 1989). Normally most nests have a temperature intermediate to this.

The nesting activities of the two species are markedly different. In *Chelonia mydas*, the female digs herself a body pit with all four flippers. Upon reaching a depth below the level of the beach surface she then digs her egg chamber using only her hind flippers (50-80cm). At this stage she may find the sand unsuitable and abort her attempt, either going on to attempt to nest elsewhere on the beach or return to the water. If she builds the egg chamber successfully she will lay between 50-150 eggs per clutch. She then covers the egg chamber, packing sand down with her hind flippers and proceeds to cover the body pit with all four flippers as she moves forward a whole body length. This disguises her actual nesting position. Thus a pit is visible 1-2m from the original pit which is now covered by a large mound of sand.

Caretta caretta follows a similar nesting pattern although females dig a much shallower body pit and hence the egg chamber also tends to be shallower. In *Caretta caretta* there is a much smaller effort in covering the nest. The female only covers the original body pit moving slightly forward as she does this.
A nesting female may be on the beach from anything between 30 minutes to 8 hours (personal observations).

1.3.Threats

1.3.1. Impact of tourism

Over the last decade tourism in hot climates has escalated. With this comes an increase in beach development and use. Many factors associated with tourism cause detrimental effects on nesting turtle populations.

Tourists may directly disturb turtles by coming at night to observe their nesting activities. Torches, noise, and tourists getting too close to the nesting female may disturb adults and lead to the abandoning of nesting attempts (Arianoutsou 1988; personal observations). With beach development comes an increase in sewage output, this may affect benthic flora and fauna, crucial for the turtles diet.

Turtles are believed to be guided by phototaxis and photokinesis, thus they are attracted towards light and move faster under brighter conditions. This aids them in reaching the bright surf and being repelled by a broken horizon, such as vegetation or rocks at the back of the beach. Lights from beach developments may disorientate both adult and hatchling turtles, especially on cloudy nights. In Florida, an example of this was recorded by McFarlane (1963) where 90 out of 115 hatchlings were run over by vehicles as a result of being attracted to lights at the back of the beach. There are now several methods of screening lights or using certain types such as sodium vapour lamps to reduce the effect of artificial lighting on turtles.

Witherington (1992) showed that lighting beaches with low pressure sodium vapour lamps had little effect on nesting turtles whereas mercury vapour (MV) lamps significantly reduced the number of green and loggerhead turtles emerging and nesting within lighted study areas. Similarly hatchling turtles were attracted less to LPS luminaries, especially those which emitted only yellow light (Witherington & Bjorndal 1991). It is suggested that such LPS lamps should be used where artificial lighting cannot be completely eliminated.

On popular beaches excessive tourist use brings with it a number of problems. Traffic on the beach, both by trampling and vehicles causes compaction of the sand making emergence for hatchlings difficult or actually crushing them as they near the surface. Ruts left from tyre tracks act as trenches which hatchlings have problems negotiating and may overturn and dessicate (Witham 1982) or be delayed by having to transverse the beach, increasing the chances of predation.

The use of umbrellas and sun beds on turtle nesting beaches can cause piercing of eggs or critical cooling of nests through shading, altering the development and sex ratio of the nest if not arresting development completely. If left on the beaches overnight they may also cause obstructions to nesting adults (Warren & Antonopoulou 1990).

With the increase of usage of a beach comes the increase in litter left behind. As well as being hazardous to the turtles, organic debris may increase~~s~~ the number of animals visiting the beach and hence increase predation levels on eggs and hatchlings.

The use of propeller powered speed boats has in recent years caused the deaths of many turtles (Arianoutsou 1988). On the Greek island of Zakynthos, the most important loggerhead nesting site in the Mediterranean, at least nine turtles were recorded as having been killed by speed boats during the 1993 nesting season (Venizelos 1993).

In Northern Cyprus many of the above problems are not yet as serious as in other areas of the Mediterranean as tourism is restricted here, although continually increasing.

1.3.2. Sand Extraction

The removal of sand from a nesting beach can have many detrimental effects on dune/beach ecology and thus both turtles and tourist. As sand is taken away from the dune, beach sand blows back off the beach, now having no barrier to prevent its displacement by onshore winds. This results in an overall loss of sand from the beach, leaving it stony and too shallow for turtles to nest. Once this situation occurs it is very hard to reverse the effects. Coastlines themselves can be altered as a result such activities (Shabica 1982). Sand extraction is a major problem at many turtle nesting beaches (Godley & Broderick 1992).

1.3.3. Incidental catch

Incidental catch is the cause of many marine turtle fatalities around the world. In many cases live turtles are released after capture, however if longlines have been used hooks may be embedded in the turtles mouths and survival may be low. In the U.S. TED's (Turtle Excluder Devices) are now used by law on shrimp trawlers resulting in the reduction of incidental catches (Henwood & Stuntz 1987). Such equipment and control would be difficult in the Mediterranean where so many countries are involved, many too poor to consider such advanced machinery.

In the Mediterranean, an estimated 50,000-100,000 mature and young turtles are caught each year on longline hooks and in nets destined for fish (Groombridge 1990; Venizelos 1991). These turtles may be released if they have not drowned or died from injuries. However carapaces are sometimes sold complete or in part as tourist souvenirs and in parts of the Mediterranean, such as Tunisia, turtle meat is used for domestic consumption. It must be noted that many of these turtles may not be of the Mediterranean population. They may only be passing by or feeding around the around the Balearic Island at the opening of the Mediterranean where incidental catch is high.

Very little is known of the trade in turtle parts in Northern Cyprus. There have been however incidences of turtles being killed by angry fishermen finding a turtle in their nets which has not only damaged their net but caused their catch to have escaped. There are however no records of turtle shell being sold (Godley & Broderick 1992).

1.3.4. Disease

Among these new threats to turtles is the increasing incidence of fibropapilloma disease. Affected turtles exhibit large external tumours which may impair movement or grow across the eyes or mouth inhibiting feeding breathing and vision. There is some evidence that the presence of these tumours is indicative or causes internal problems (Hutchinson & Simmonds 1992). This disease is documented mainly in the green turtle in which it is most common and is thus commonly known as 'green turtle fibropapilloma disease' (GTFP). Having originally been documented in 1938 as a very rare condition GTFP has now reached epidemic proportions in Florida.

Possible causes of this disease have been postulated however no conclusions have yet been made. Suggestions range from viruses, parasites and algae to pollution, either directly or by causing stresses weakening the immune system (Balazs & Pooley 1991). Since this is a relatively recently recorded disease in marine turtles this seems to indicate that there may be new harmful factors affecting survival, one of which must certainly be considered is the presence of persistent pollutants. In the Mediterranean the occurrence of GTFP has not as yet been documented.

1.3.5. Pollution

Marine predators are the ultimate destination for much of the persistent pollution such as PCB's passed on to them by accumulative steps in the food chain. However, few investigations have been made into the concentrations of such compounds in marine turtles. Davenport *et al*. (1990) showed that tissue taken from a male leatherback stranded in Wales had fairly high concentrations of PCB's in the fat when compared to fish although not in as high concentrations as are found in marine mammals and birds. Still, such studies show that at least some species of marine turtles have the ability to accumulate these pollutants and may be detrimentally affected by them.

Some of the PCB's in marine ecosystems may be coming from the breakdown of ever increasing amounts of plastic debris to be found in the world's oceans and seas. Litter or marine debris not only has an aesthetic detriment in the marine environment but an ecological one also. Synthetic fishing nets discarded by fishermen, plastic bottles, bags and packing bands can entangle or be ingested by many marine animals such as seabirds, mammals, fish and turtles.

It has been suggested that turtles may mistake marine debris for edible items, plastic bags appear like jellyfish in the water, the diet of many marine turtles (Gramentz 1988). Turtle hatchlings spend 3-5 years during the juvenile pelagic stage drifting on flotsam. It is here that they will come into contact with buoyant debris. Hatchlings have been documented washed ashore containing tar pellets and plastic beads similar in size and shape to the floating vesicles that fragment from *Sargassum* plants (Carl 1987).

Balazs (1985) reported on 79 cases on which turtles had ingested materials such as plastic, metal and tar balls and 60 instances of entanglement. Ninety-five per cent of these cases occurred since 1970. Allen (1992) reports a loggerhead sea turtle washed ashore on Huntington City Beach, California whose cause of death was diagnosed as the ingestion of several plastic and wood pieces possibly causing faecal impaction.

Because the Mediterranean is an enclosed sea, it gets rapidly affected by toxic effluents and dumped waste. The extent to which debris on the beach affects nesting and hatching turtles is not known. However it must have some effect on both adults and hatchlings as they move and dig on the beach. Marine litter is discussed further below.

1.3.6. Predation

Although adult turtles face little threat from predation, except possibly shark attack, many animals prey upon turtle hatchlings. They face threats whilst still in the nest, on the way to the sea, and in the water from feral dogs, foxes, ghost crabs (*Ocypode cursor*), birds and fish (Stancyk 1982;Witherington & Salmon 1992). In the Mediterranean all of the above predate turtle hatchlings and in Northern Cyprus in particular the main predators on land were found to be dogs, foxes and ghost crabs (Godley & Broderick 1992).

1.4. Distribution and status.

Marine turtles are found world wide nesting in tropical waters. All species of marine turtle are listed on Appendix 1 of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). The green turtle is classified by the IUCN (International Union for the Conservation of Nature and Natural Resources) as 'endangered', and the loggerhead as 'vulnerable' (Groombridge 1990).

Within the Mediterranean, *Caretta caretta* and *Chelonia mydas* both nest regularly. *C.Caretta* is present in larger numbers with an estimated 2000 females nesting annually (Groombridge 1990). Most of these nestings occur on the coast of Greece, Turkey Cyprus and Libya with some nesting in Tunisia, Egypt (Venizelos 1993) and the occasional clutch being recorded in Israel, Italy. The largest population of nesting *C. caretta* can be found on the Greek island of Zakynthos where an average of some 300-700 females nests per season (Groombridge 1990) (see Figure 1.1).

Chelonia mydas nests slightly deeper than *C.caretta* and this is one of the reasons it is thought to prefer the slightly warmer temperatures of the S.E. Mediterranean. It is now only found nesting in S.E. Turkey, Cyprus and occasionally in Israel. Recent surveys by MEDASSET (Mediterranean Association to Save the Sea Turtle) of the Egyptian coast found only *C. caretta* nesting here. The estimated Mediterranean population of *C.mydas* is between 300-500 nesting females per annum (see Figure 1.1).

Although these population levels are low, it is not known how low they are in comparison to past population levels, as in many cases long term studies were not started until the populations appeared to be in decline. However, in the 1950's there were reports of passengers on ferries crossing the Mediterranean witnessing what appeared to be 'shoals' of turtles in their hundreds (Groombridge 1990).

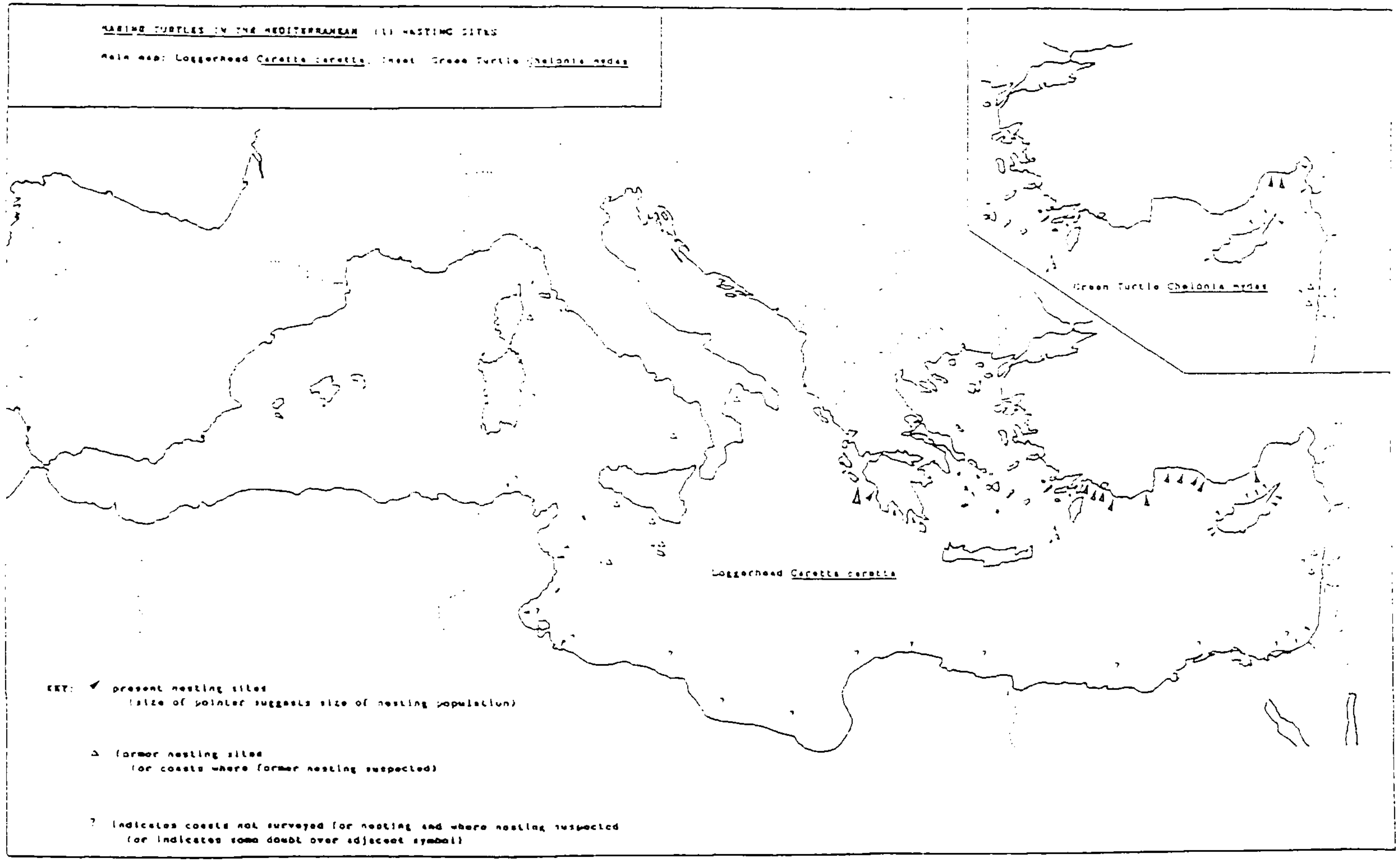


Figure 1.1. Map showing the distribution of green (*Chelonia mydas*) (inset) and loggerhead (*Caretta caretta*) turtles in the Mediterranean. Taken from Groombridge 1990.

1.5. Previous surveys in Northern Cyprus.

Between 18th June and 15th July 1988, Whitmore and Groombridge conducted a survey of many of the nesting beaches in Northern Cyprus (Groombridge 1988; Groombridge & Whitmore 1989). They counted recent tracks and nest pits during day time surveys of the beaches and estimated there to have been 96 *C.mydas* and 122 *C.caretta* nests during the period of study. They highlighted two stretches of beaches of significant importance to nesting turtles and recommended their protection by local authorities. These were the Chelones beaches, situated on the north coast of the Karpaz Peninsular three miles west of Dipkarpaz village, and the Alagadi beaches on the north coast, ten miles east of Girne. It is on the Chelones beaches that the present study has been conducted.

In Southern Cyprus the annual turtle nesting population is estimated at some 75 *Caretta* and 25 *Chelonia* nesting around the Akamas Peninsula (Demetropoulos & Hadjichristophorou 1989). Most other areas in Southern Cyprus which held nesting populations in the past are now so developed that turtles are no longer known to nest in areas others than those around the south west coast.

In 1992 Kuzey Kibris Kaplumbagalari Koruma Dernegi or the Society for the Protection Of Turtles in Northern Cyprus (**KKKKD/SPOT**) invited Glasgow University to conduct a survey of the nesting beaches in Northern Cyprus. This took place in the form of an undergraduate expedition lasting for 3 months. In that study 84 beaches were surveyed with 65 recorded having turtle activity and a minimum of 219 nests were laid (Godley & Broderick 1992). In 1993 a group from Glasgow returned to Northern Cyprus and the season has been even more successful with at least 571 nests being recorded (personal communication, report in preparation).

Sea turtles in the Mediterranean are protected by many international agreements, such as CITES, the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), and the Convention on the Conservation of Migratory species of Wild Animals (Bonn Convention). However, as the Turkish Republic of Northern Cyprus (TRNC) is not a recognised country they are not a party to the above conventions. They do however have their own laws protecting marine turtles.

1.6. Legislation for the control of marine pollution

The quality of marine coastal waters is generally controlled by those countries with coastal boundaries. In some cases however international treaties have been developed to control marine pollution both locally and globally. For example, the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 1972 (commonly known as the London Dumping Convention) was brought into force in 1975. It controls the dumping of wastes at sea mainly through the national legislation and regulations of states which are Contracting Parties to the Convention. In the Mediterranean the Convention for the Protection of the Mediterranean sea against Pollution (Barcelona Convention) stipulates that all Contracting Parties undertake to eliminate pollution of, among others, persistent synthetic materials. All surrounding countries are parties except Albania and TRNC.

Another global treaty is the International Convention for the Prevention of Pollution from ships (MARPOL) of 1973 which was amended by a protocol in 1978 and the main part of which entered into force in 1983. The Convention was mainly designed to deal with oil pollution but has more recently (1988) concerned disposal of garbage (Waldichuk 1989).

However, as not all countries are members of these treaties it can be very hard to control such marine pollutants. With garbage being dumped in huge quantities by such countries as the Lebanon and Syria the effects are often seen elsewhere. The TRNC being unrecognised as a country can do nothing about the amount of debris being washed up on its shores. It is not a member of any Conventions and has no political lobbying force outside of Turkey.

1.7. Marine Litter

The first to report litter in the marine environment was Heyerdahl (1971) who reported observing significant quantities of tar and solid litter floating in the ocean. Since then many reports have been made from around the world (McCoy 1988; Golik *et al.* 1988; Conner & O'Dell 1990; Morris 1980.). However, few deal with the deposition of litter on the coasts.

Plastics are now the most common contaminants of the marine system (Morris 1980). The Mediterranean is surrounded by industrialised countries and has very busy shipping waters as well as having a water circulation pattern which collects, retains and accumulates floating material. Water exchange between the land locked sea and oceans is slow and limited, stratification concentrates pollutants in particular areas as currents mass litter in 'whirlpools'. Thus floating litter accumulates in these areas and storms at sea break up the litter masses and deposit them on coastlines (Stansell 1990). The increase in pollutants also results from the increase in tourism, bringing with it a heavier burden of waste.

In a study by Gabrielides *et al* (1991) surveys of persistent litter on 13 beaches in the Mediterranean were made. They showed that plastic was the commonest form of litter recorded followed by wood, metal and glass items. They attributed much of the waste to land-based as opposed to marine-based litter. However, it should be noted that their studies were conducted on heavily used tourist beaches.

Similarly, Golik & Gertner (1992) conducted a study of littering on the Israeli coastline. Again the majority of litter was plastic. Their results were related to the distance of a beach from a population centre.

Due to it's position in the Mediterranean, Cyprus receives marine debris on its shores as currents are deflected from the Turkish coast, turning to deposit their load on the shores (personal communication. Prof. Ilkay Salihoglu.)

Very little is known about coastal and marine litter in the Mediterranean, especially with regard to its effects on marine life. It was for this reason, after visiting Northern Cyprus to study the nesting populations of turtles in 1992 and seeing the large amounts of litter on the coast that I was keen to undertake this project.

METHODOLOGY

2.1. Study site

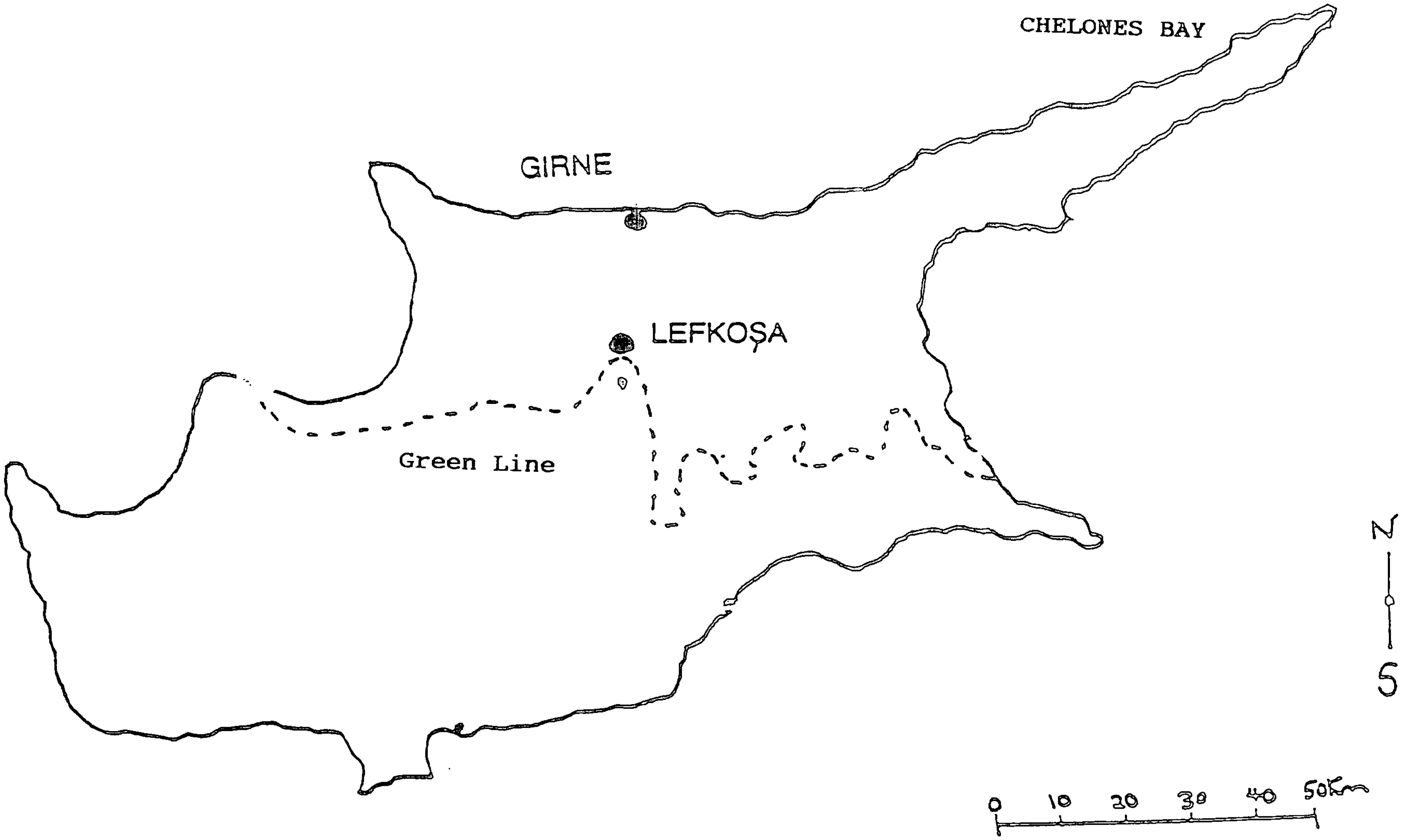
Cyprus is situated in the S.E. of the Mediterranean (see Figure 1.1.), close to the coast of Turkey. It is now split into two halves, the North being inhabited by Turkish Cypriots, the South by Greeks (Figure 2.1.1). The population in Northern Cyprus presently stands at over 170,000 and is steadily increasing. Temperatures during the summer months, of May to September climb as high as 40°C, with a mean temperature of approximately 30°C. Over the last two years the tourist industry has risen by more than 100%. Northern Cyprus now has over 100,000 visitors every year.

The study site was a bay situated on the north coast of the Karpaz Peninsula, Northern Cyprus, 3 miles west of the village of Dipkarpaz (Figure 2.1.2). Locally these beaches are known as Chelones Bay, signifying the historical importance of this area to nesting turtles.

The bay is made up of five small beaches: "Chelones 1, 2, 3, 4 & 5." (see Figures 2.1.3.-2.1.7.) All are north facing beaches of gradual slope and medium sand grain type. Chelones 1 is the most westerly of the beaches in the bay.

This group of beaches were chosen as previous reports have documented them as important green turtle nesting beaches (Groombridge 1990;Godley & Broderick 1992), and they are renowned, locally, for their high densities of litter pollution. All are relatively inaccessible and thus have very little human usage (no tourists and only a few locals). The litter levels therefore remain fairly constant throughout the summer season as the majority of litter comes in from the sea during the winter storms.

Figure 2.1.1. Map of Cyprus showing the 'Green Line' dividing North from South. Chelones Bay is situated on the north coast of the Karpaz peninsular.



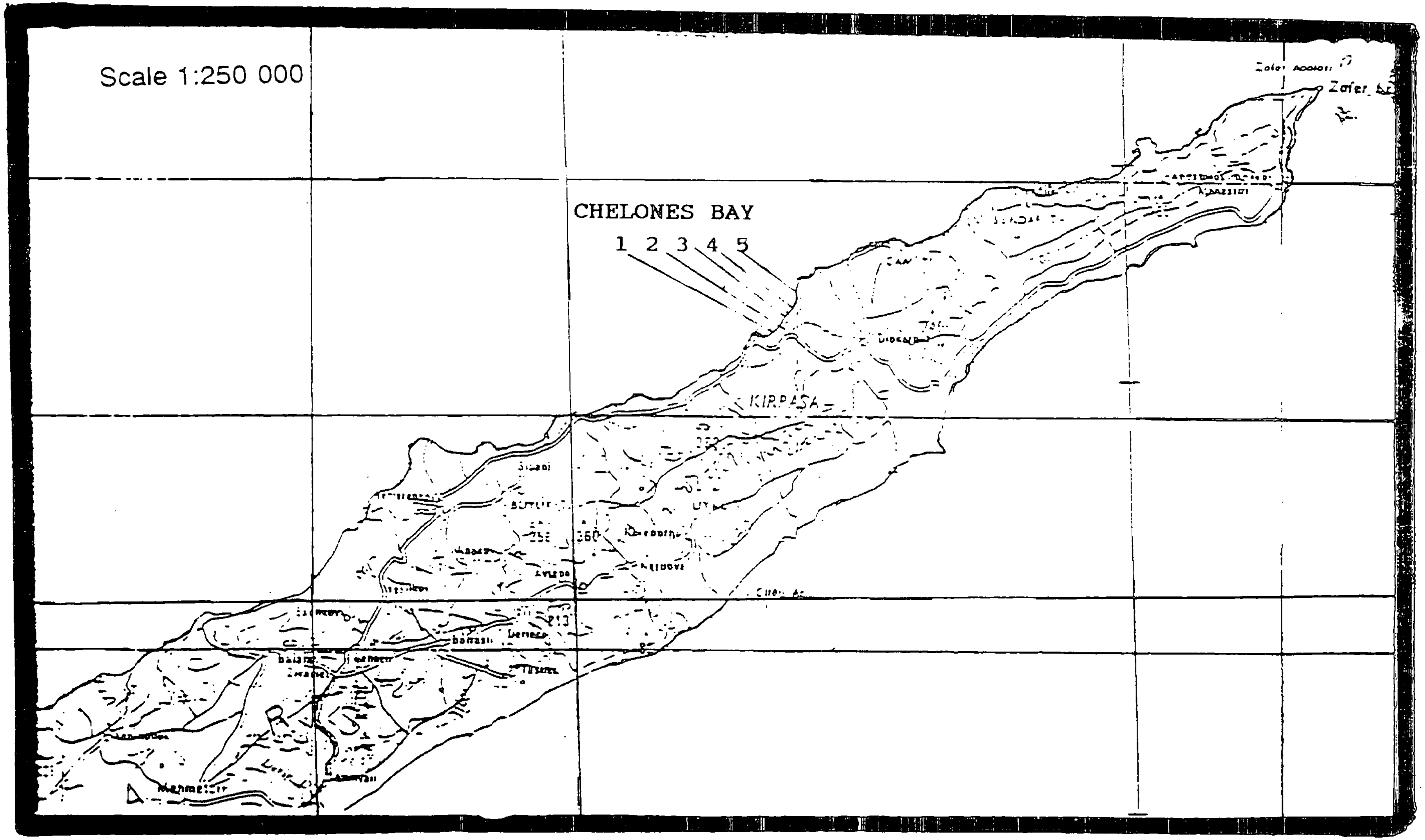


Figure 2.1.2. Map of the north coast of the Karpaz peninsular showing Chelones Bay and the surrounding area.

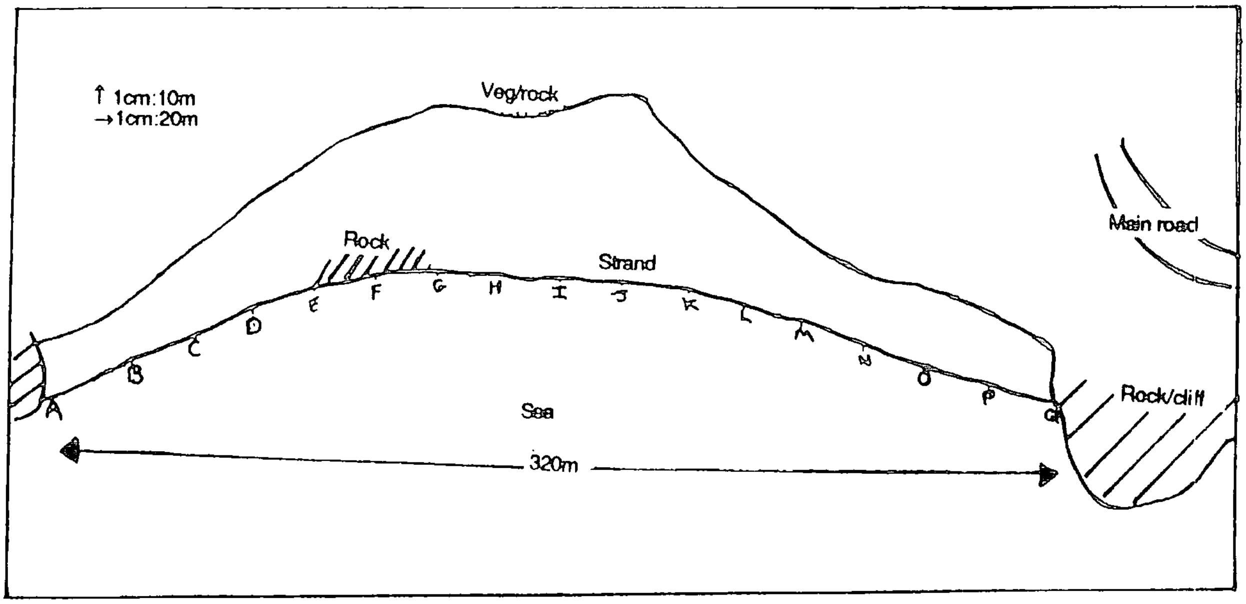


Figure 2.1.3. Sketch map of Chelones 1 showing stations A-Q at 20m intervals. Beach length of 320m.

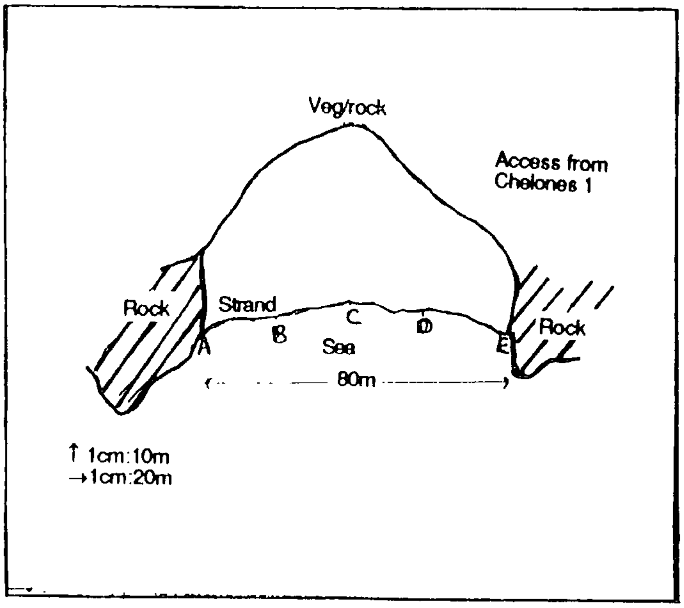


Figure 2.1.4. Sketch map of Chelones 2 showing stations A-E at 20m intervals. Beach length 80m.

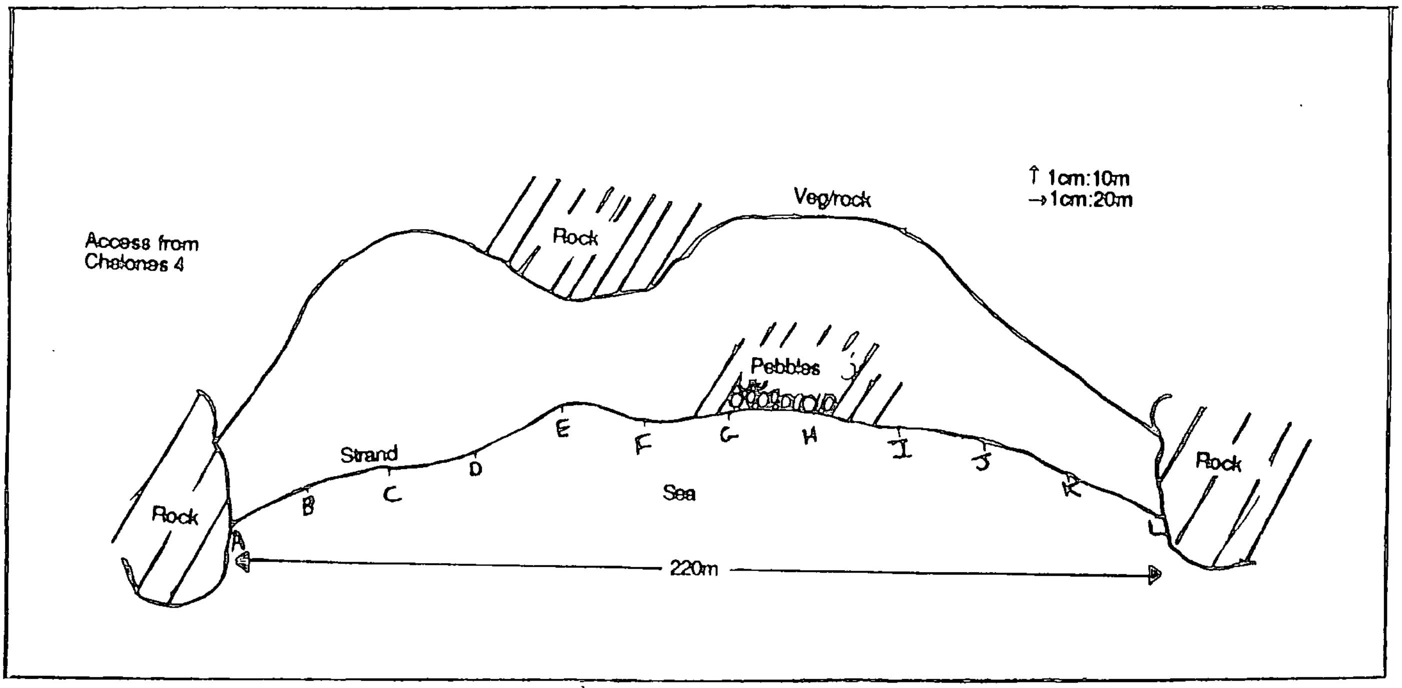


Figure 2.1.5. Sketch map of Chelones 3 showing stations A-L at 20m intervals. Beach Length 220m.

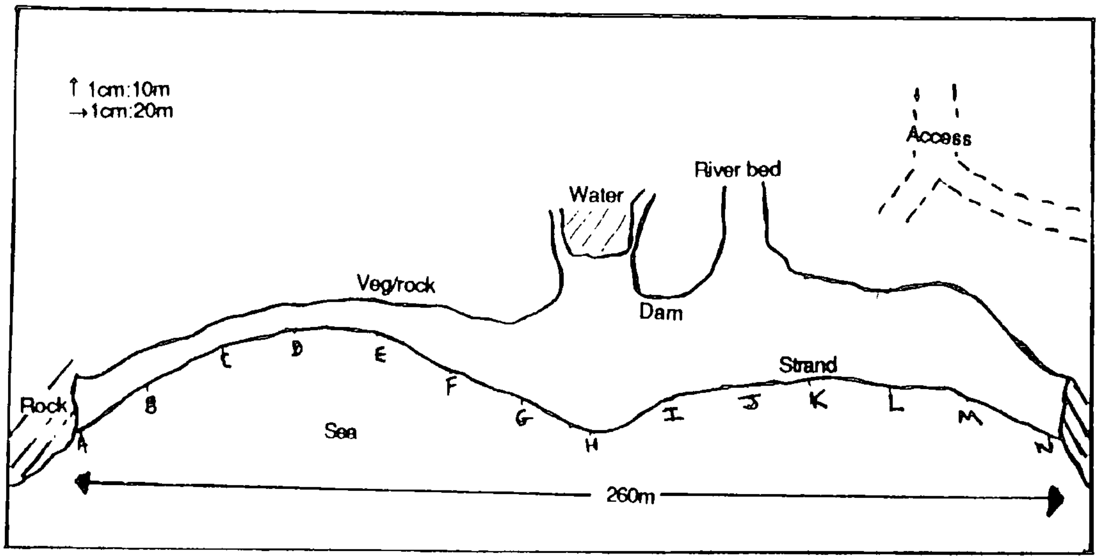


Figure 2.1.6. Sketch map of Chelones 4 showing stations A-N at 20m intervals. Beach length 260m.

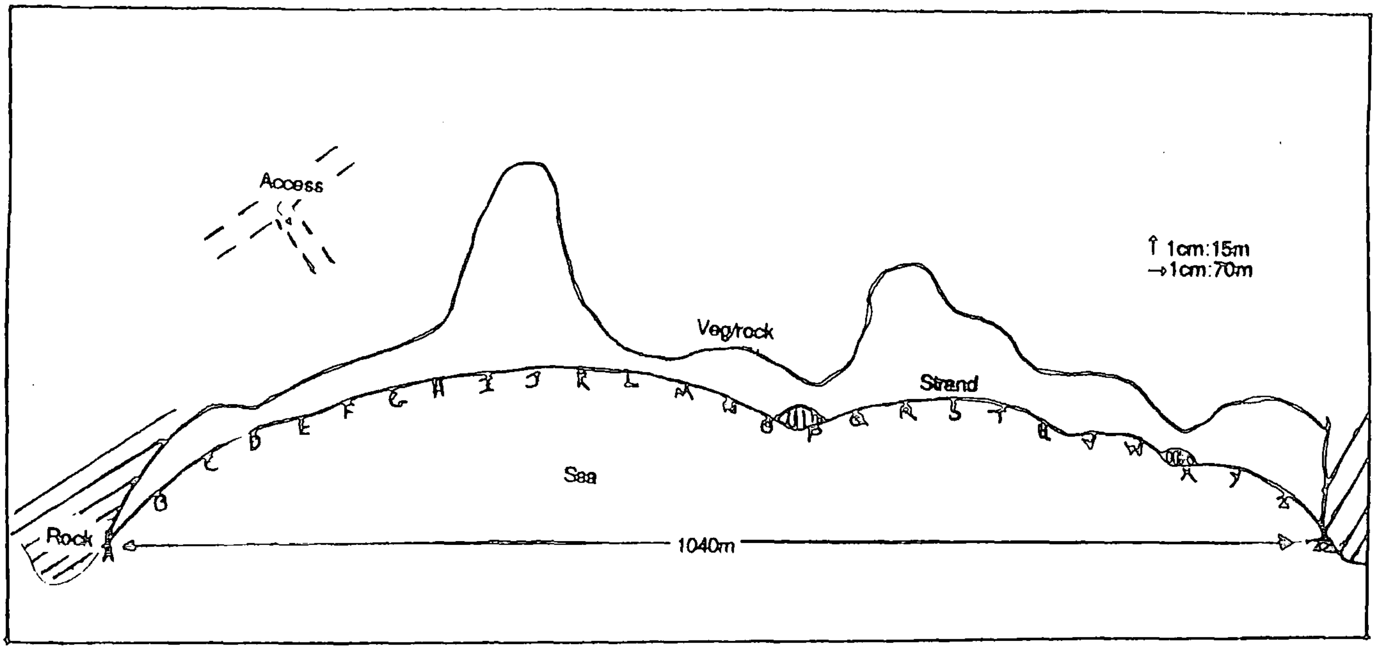


Figure 2.1.7. Sketch map of Chelones 5 showing stations A-ZZ at 40m intervals. Beach length 1040m.

2.2. Litter surveys

During the period from mid May to mid June, at the start of the turtle nesting season, litter surveys were carried out on all of these five beaches. It had been planned to also carry out surveys at the start of the hatching season; however, this was not possible due to the amount of work involved and there was very little change noted on the beaches during this period. Metre-wide belt-transects were marked out running from the strand line to the top of the beach (see, Golik & Gertner 1992). These transects were divided into 1m^2 quadrats. Transects were carried out at 20m (Chelones 1, 2, 3 & 4) or 40m (Chelones 5) interval stations along the length of the beach, with the transect being taken as the first metre between stations (i.e. 1 of 20 or 40). Quadrat 1 within any transect lay on the strand line with the highest numbered quadrat being at the top of the beach. The back or top of the beach was determined as the start of the rocks, dunes or vegetation which would make it impossible for nesting or nesting attempts to occur (Figure 2.2.1.).

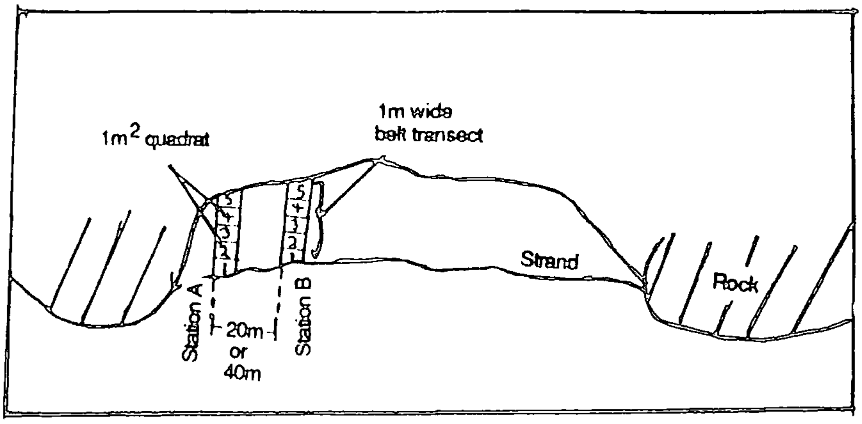


FIG.2.2.1. Diagram to illustrate the position of stations, belt transects and quadrats in relation to the strand and top of the beach.

Within each quadrat all items of litter larger than 2cm in length were examined. The following information was recorded:

1)Composition - the nature of the item, for the following categories; plastic, glass, wood, tar, miscellaneous (this included rubber, cloth, polystyrene, metal, rope, which were all present in such low quantities not to warrant their own category).

2)Type - the form of the item such as a bottle, bag, lid, syringe or just a piece.

3)Weight - The weight of the item was recorded to the nearest 10g.

4) Origin/notes - if apparent, the origin of the litter was recorded from information written on the item. Other notes such as colour were recorded.

All this information was noted on data sheets (see Appendix Ia). All litter was replaced in its original quadrat after examination.

These data were used to illustrate the types of litter on these beaches, highlighting the quantities and if possible the origin. A comparison of the distribution of litter on the beaches was also possible. It was predicted that the quantity of litter would vary along the shore and up the beach from the strand to the top of the beach.

2.3. Turtle activity

Throughout the whole turtle season, from June to October, the beaches were walked to record all turtle activity at three day intervals. Both nesting and hatching data were collected in this way.

2.3.1. Nesting data

It is very apparent if an adult turtle has been on a beach from the sand disturbance and tracks left. Species identification was possible using the criteria of track and nest pit morphology. *Chelonia mydas* makes a symmetrical crawl track and nesting attempts are usually associated with a large deep pit and a large amount of sand disturbance. With actual nesting, a great deal of covering up activity is evident. *Caretta caretta* makes a markedly asymmetrical crawl track and a shallow nest pit with only a small degree of associated disturbance (Figure 2.3.1.).

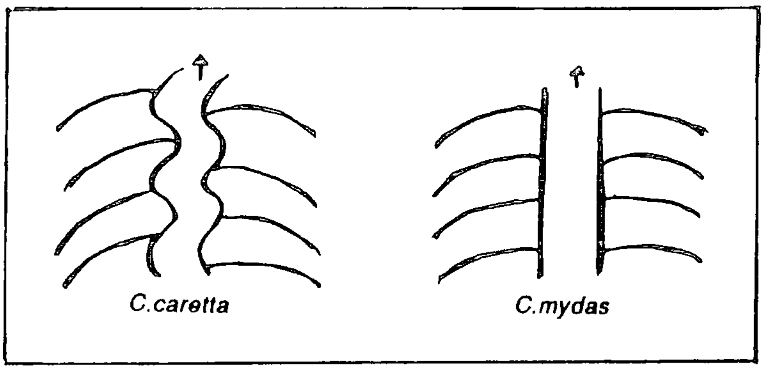


FIG. 2.3.1. Diagram to illustrate the asymmetrical crawl track of *Caretta caretta* and the symmetrical crawl track of *Chelonia mydas.*

Each activity was assessed and classified into the following behaviours:

a)Successful Nesting (N) - was recorded when a crawl track was visible leading to an area of disturbed sand where digging and covering have occurred. The nest is described above for each species.

b)False crawl attempted nesting (FCA) - was recorded when some disturbance, if only slight, occurred but no covering up was apparent.

c)False crawls U-turn (FCU) - was recorded when a turtle made no nesting or digging attempts simply a crawl on the beach and back to the sea.

If tracks were considered to be fresh enough, the track width was measured using a 1m tape measure, to give an indication of the size of nesting females using these beaches. The width was taken from 'elbow' to 'elbow' as a full sweep of the flippers does not always show up on the sand. Thus accuracy of measuring the full flipper span is not consistent, although it is thought the 'elbow' width is a useful indicator of this.

Location of an activity was noted using 30m tape measures in accordance to designated landmarks, strand line and vegetation. Positions could then be calculated either from the left or right hand side of the beach since designated landmarks had been previously measured and mapped. Tracks were raked over to avoid double counting on subsequent surveys. These data were recorded during day time survey nesting sheets (see Appendix Ib).

2.3.2. Hatching data

Study sites were surveyed during the day for evidence of hatched nests. This is apparent by the numerous small tracks creating a mottled effect over the dry sand. Hatchling tracks on the sand were traced back to an epicentre which was usually a slight depression in the sand which occurs as the sand percolates down the nest column to fill the space previously taken up by the eggs/hatchlings.

The activity was recorded under the following headings:

a)hatched nest (H) - described as above with no apparent disturbance.

b)predated nest (P) - no hatchling tracks are apparent but egg shells are visible and often scattered over the surrounding area. Dog and/or fox tracks tracks can frequently be found around the nest. Dog tracks are much larger than the small almost cat-like fox tracks and thus the type of predator is sometimes distinguishable.

c)hatched and predated (HP) - as with a predated nest although hatchling tracks are apparent.

Position of the activity on the beach was noted and the nest was then excavated by hand. Care was needed at this point as live hatchlings are frequently found in the nest column. It is often very hard to find the egg chamber as the hatchlings may come up at an angle if there is an obstruction blocking their path. Predation of nests also makes location of the egg chamber difficult. Thus nests were sometimes noted as having hatched, although their excavation was not possible.

If the eggs were discovered, the depth from the surface of the sand to the top of the egg chamber was recorded and the nest contents removed. The depth to the bottom of the egg chamber was then recorded. Any live hatchlings found in the nest column or chamber were counted. They were then released and allowed to crawl from the nest site to the sea unaided, whilst being carefully monitored as predation from ghost crabs and birds is a threat, as is the risk of overturning whilst manoeuvring around litter on the beach.

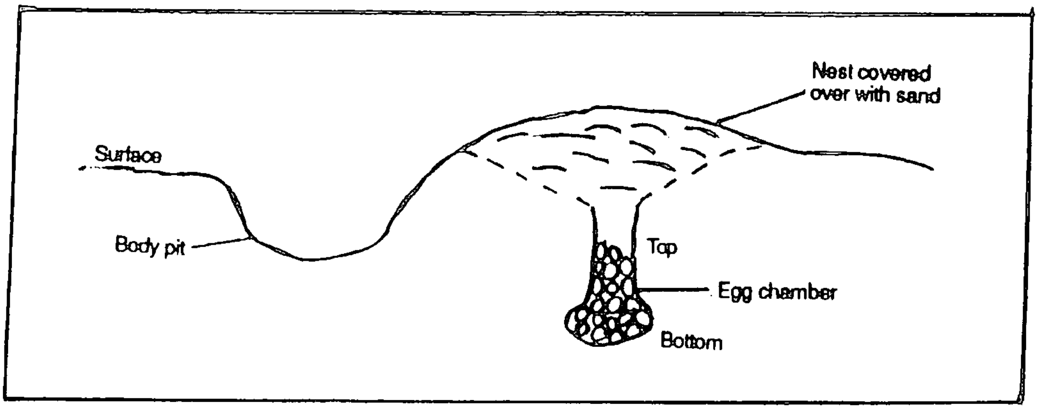


FIG.2.3.2. A section through a nest showing the position of the egg chamber in relation to the covered sand and body pit which are visible from the surface. This is characteristic of a *Chelonia mydas* nest. A *Caretta caretta* nest involves a much shallower body pit which is much closer to the egg chamber with a smaller mound of sand covering the egg chamber.

A count of the eggs removed from the nest was made recording the number hatched and unhatched. Unhatched eggs were incised and categorised into the following;

a)**'yolked unfertilised'** - containing no evidence of fertility i.e. no embryo or blood spot.

b)**'nonviable'** - non-yolked and unfertilised, these are often much smaller and contain only albumen. They are thought to occur at the start or end of the lay possibly due to developmental abnormalities or to act as packaging to protect the viable eggs of the clutch.

c)**'dead in shell'** - eggs containing a dead embryo which were recorded as less than or greater than half way to full term development.

Those which had died post hatching in the sand column or on the beach were also recorded. From hatchlings or dead in shells the species of the nest could be identified. This was not always the case due to high hatching rates or predation.
All nest materials were removed from the beach to avoid confusion or an increase in predation. Data was recorded on a hatching data sheet (see Appendix Ic). Hatchling tracks were raked over to avoid double counting.

RESULTS

3.1. Comparison of beaches.

An example of the individual items of liuer recorded at one station (Chelones 4, Station A) is given in Appendix II. Owing to the large amount of data collected, the litter items were totalled and a summary of each beach can be found in Appendices III-VII. Table 3.1.1. illustrates the varying lengths and relative number of stations and quadrats surveyed for each of the five beaches sampled.

Beach name	Length	No. stations	Total no. of quadrats	Mean quads./ station ± SE
Chelones 1	320	17	292	14.7±2.15
Chelones 2	80	5	77	15.4±2.38
Chelones 3	220	12	225	18.75±1.87
Chelones 4	260	14	151	10.79±1.60
Chelones 5	1040	27*	377	13.96±1.88
TOTAL	**1920**	**48**	**1122**	**14.92+1.28**
* Stations are at 20m intervals except for Chelones 5 which are at 40m.				

Table 3.1.1. A summary of the beaches surveyed to show for each beach, the lengths , number of stations, total number of quadrats and mean number of quadrats per station.

3.2 Comparison of relative frequencies of items.

Where possible notes were made as to the origin of litter items. Of all plastic items recorded 22.3% had Arabic writing on them, mainly detergent bottles. Of all litter recorded 1.8% were of medical type such as blood bags, drip bags, syringes and glass drug bottles. Examples of the types and quantities of litter examined are shown in Figures 3.2.1.-3.2.4.

For each beach, the frequency items of each litter type recorded in each quadrat was totalled, as was the total weight of each litter type. These values could then be totalled for each station and hence each beach, allowing a comparison of the litter types on the beaches both individually and collectively.

Figure 3.2.1. Photograph of a green turtle body pit surrounded by natural and man-made debris taken on Chelones 4 (June 1993).

Figure 3.2.2. Photograph of the litter types found of Arabic origin on Chelones 4 (June 1993).

Figure 3.2.3. An example of the marine litter deposited on Chelones 5 (June 1993).

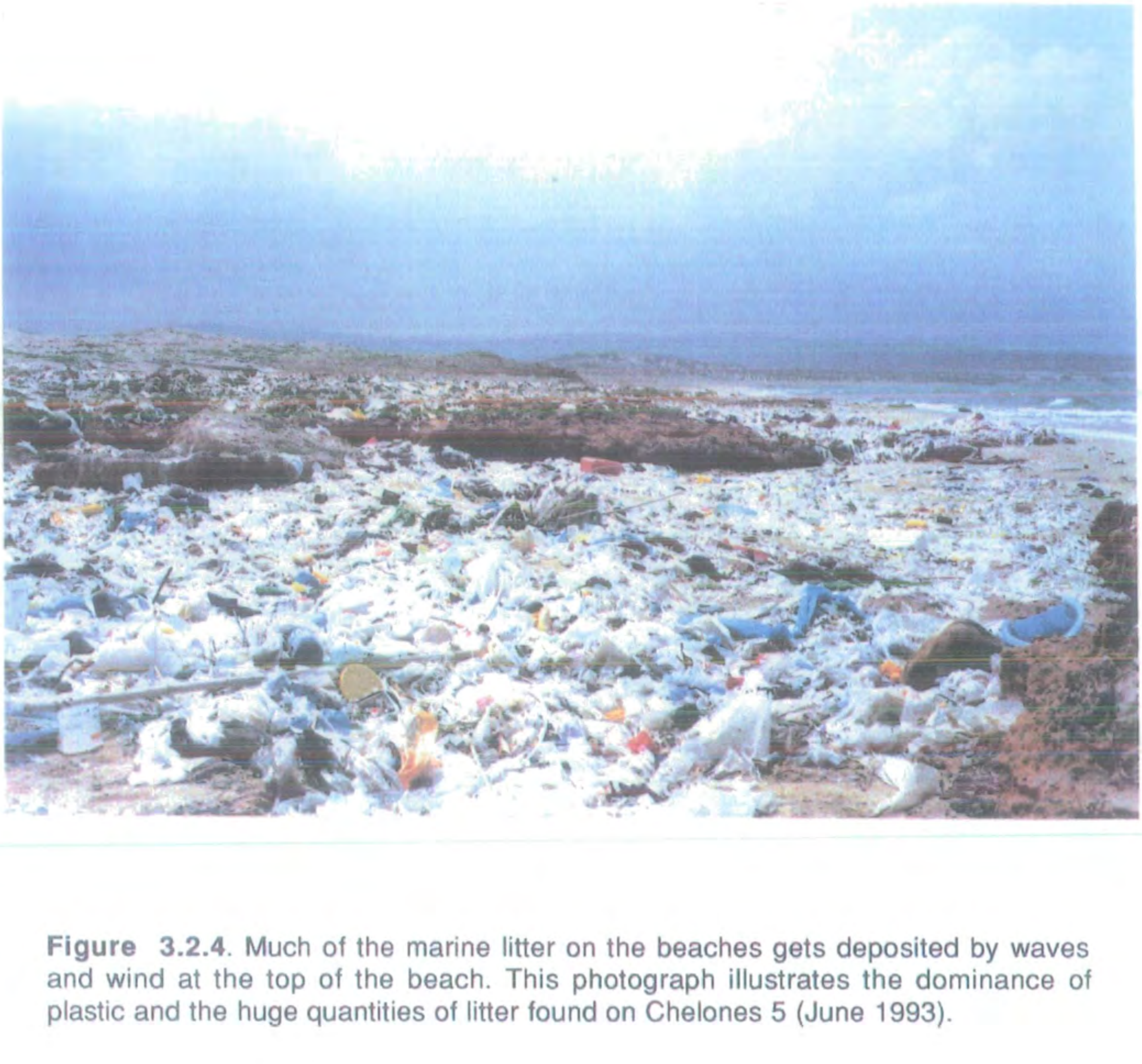


Figure 3.2.4. Much of the marine litter on the beaches gets deposited by waves and wind at the top of the beach. This photograph illustrates the dominance of plastic and the huge quantities of litter found on Chelones 5 (June 1993).

Figure 3.2.5. illustrates the relative frequency of litter types amongst the total number of items recorded. The dominance of plastic is clear with 85.1% of all items being recorded as such. Glass is the second most frequent litter type but representing only 6.5% of items that were recorded.

Figures 3.2.6 - 3.2.10. illustrate how this overall picture is similar when each beach is examined individually.

3.3. Comparison of weights of litter types recorded

As all items greater than 2cm were recorded there was obviously great variation in the weights of the items overall. It was for this reason that litter weight was recorded allowing the total weights of each litter types to be examined for each beach and collectively for all beaches together. Total weight of all items recorded are illustrated according to litter types as a proportion of the overall weight recorded.

These data are shown in Figure 3.3.1 for all five beaches collectively, and for each beach separately in Figures 3.3.2 - 3.3.6

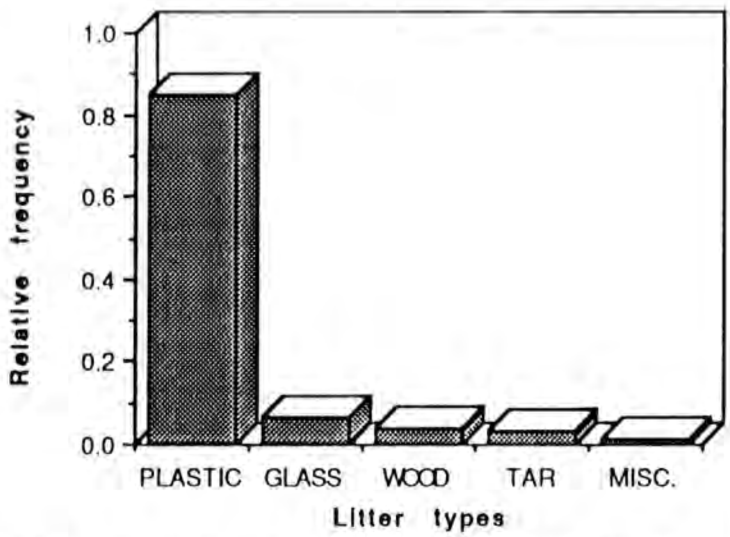


FIG.3.2.5. The Relative frequency of items of litter in relation to their litter type over all 5 beaches sampled.

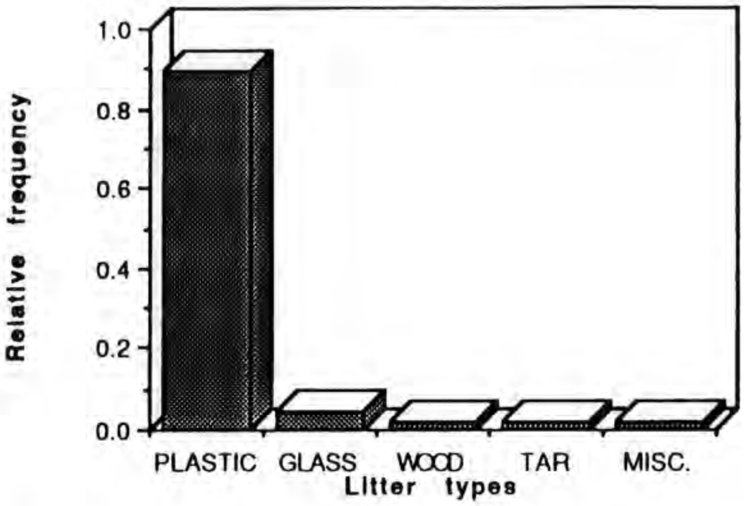


FIG. 3.2.6. Relative frequency of items of litter in relation to their litter type sampled on Chelones 1.

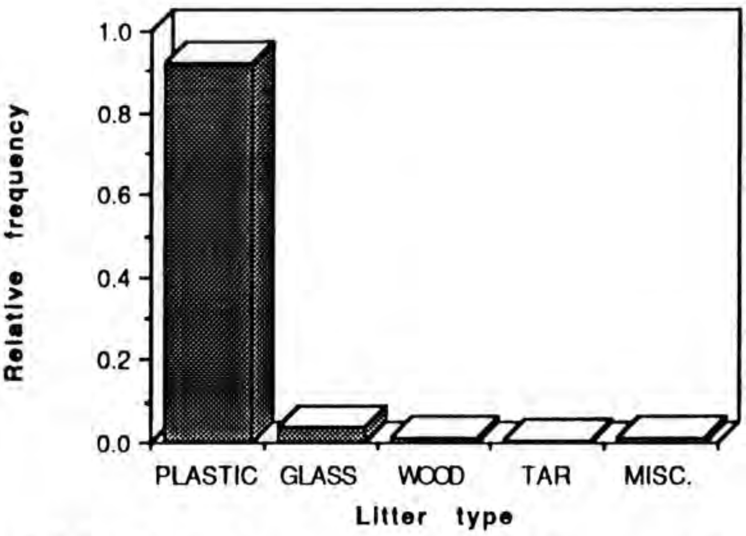


FIG. 3.2.7. Relative frequency of items of litter in relation to their litter type sampled on Chelones 2.

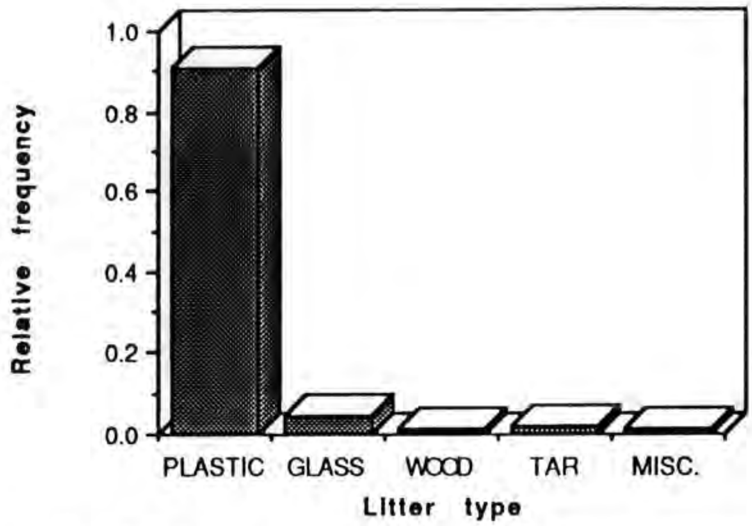


FIG. 3.2.8. Relative frequency of items of litter in relation to their litter type sampled on Chelones 3.

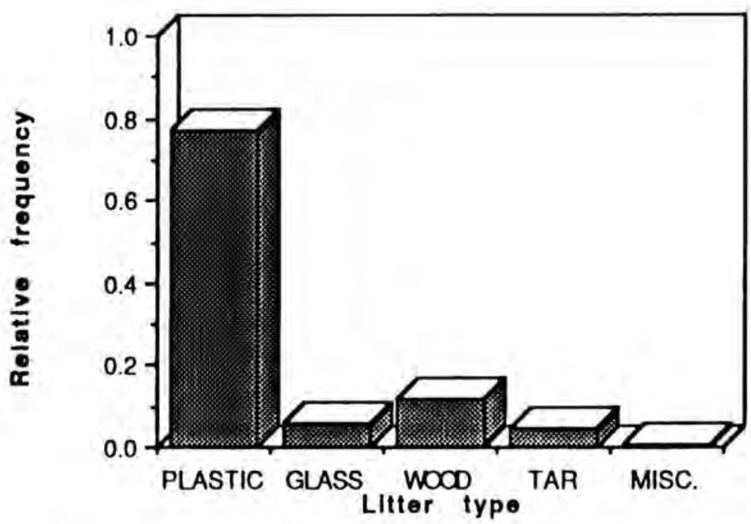


FIG. 3.2.9. Relative frequency of items of litter in relation to their litter type sampled on Chelones 4.

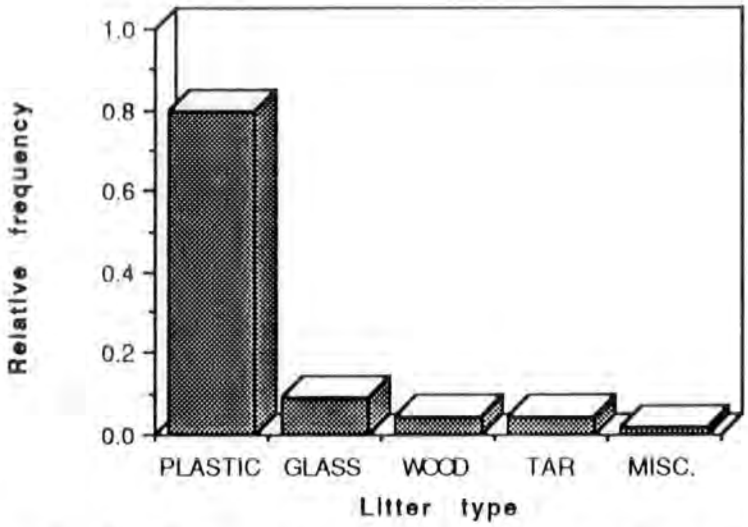


FIG. 3.2.10 Relative frequency of items of litter in relation to their litter type sampled on Chelones 5.

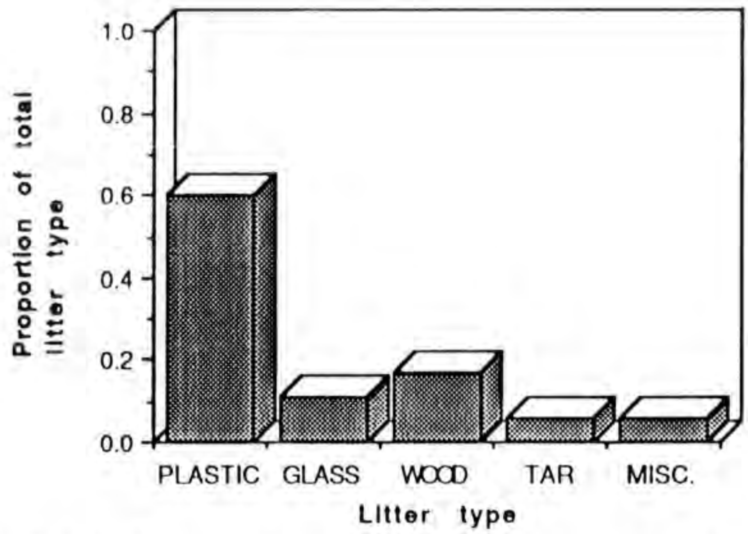


FIG. 3.3.1. The weight of each litter type recorded as a proportion of the total weight of litter sampled for all five beaches collectively.

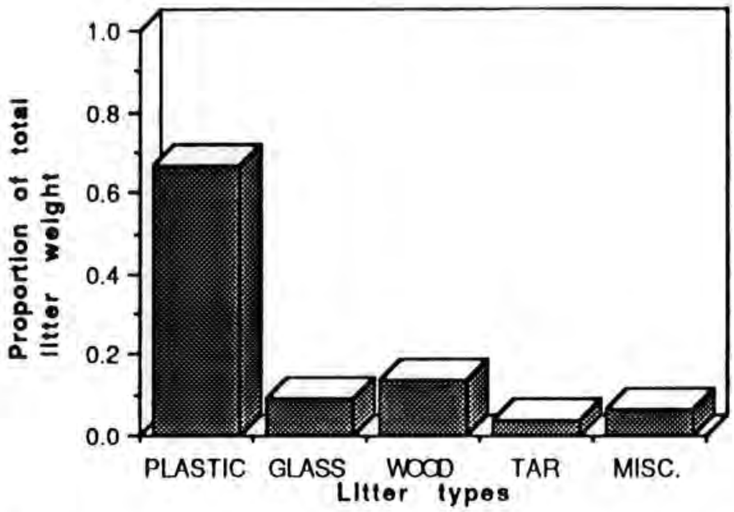


FIG. 3.3.2. The weight of each litter type recorded as a proportion of the total weight of litter sampled Chelones 1.

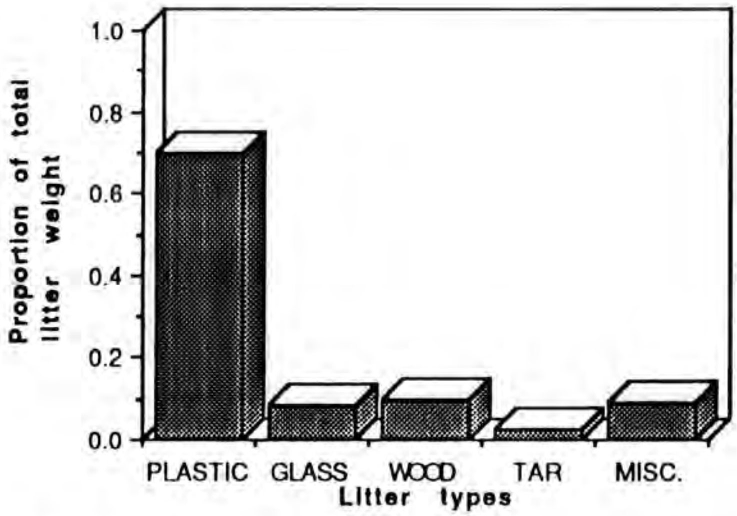


FIG. 3.3.3. The weight of each litter type recorded as a proportion of the total weight of litter sampled on Chelones 2.

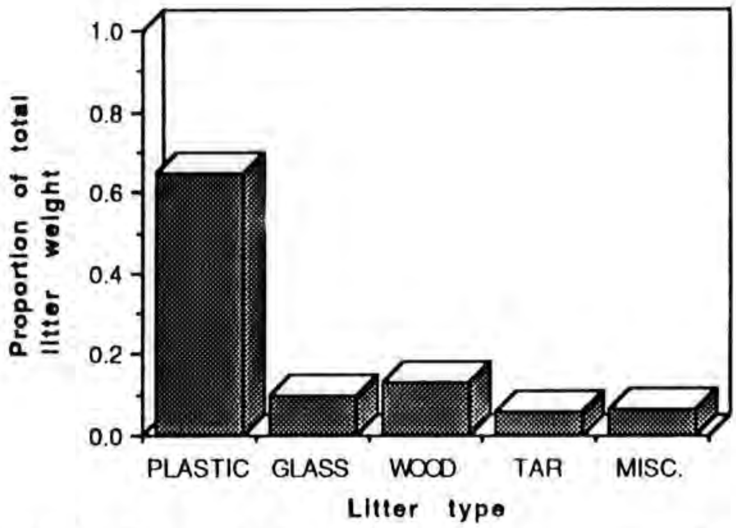


FIG. 3.3.4. The weight of each litter type recorded as a proportion of the total weight of litter sampled Chelones 3.

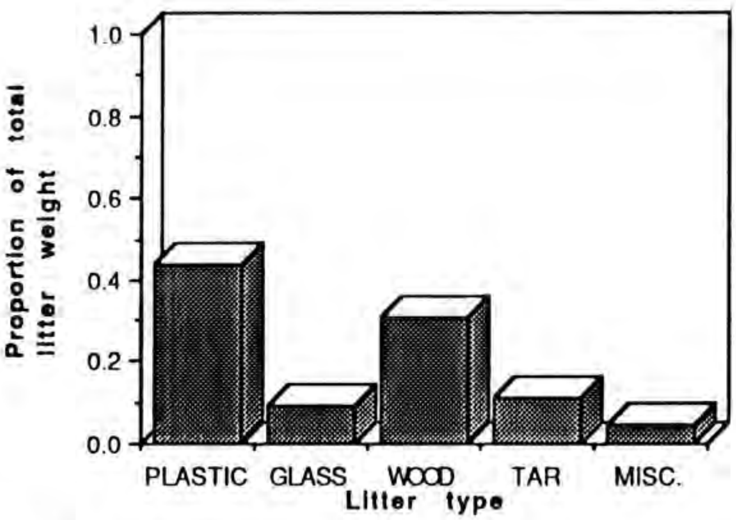


FIG. 3.3.5. The weight of each litter type recorded as a proportion of the total weight of litter sampled on Chelones 4.

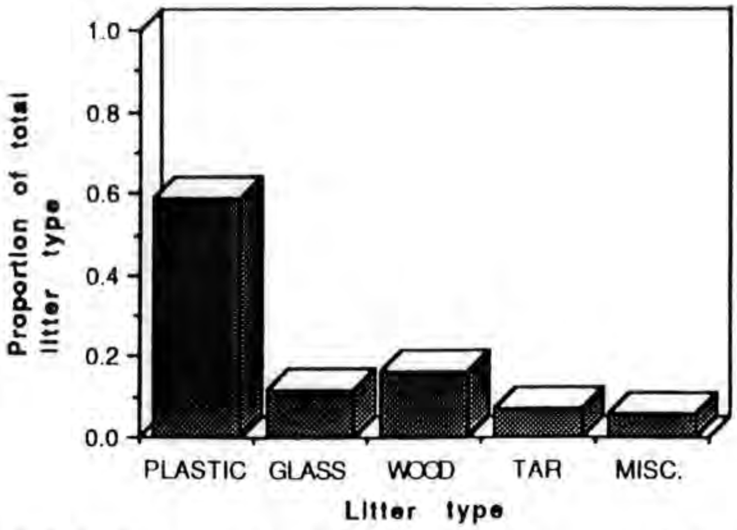


FIG. 3.3.6. The weight of each litter type recorded as a proportion of the total weight of litter sampled on Chelones 5.

3.4. Comparison of mean weight/m^2 quadrat.

Since the weight of each litter type is more representative of the overall effect of litter on the beach than the number of items greater than 2cm recorded in each litter category, the majority of analyses was based on comparisons of mean weight of litter types in each quadrat. Table 3.4.1. compares these means of each litter type between the five beaches. Clearly, plastic was the major litter type recorded.

	Mean weight (g) ± SE of litter type/ quadrat					Total mean
Beach	**Plastic**	**Glass**	**Wood**	**Tar**	**Misc.**	**wt/quadrat**
Chelones 1	1051.3 ± 43.8	147.5 ± 13.6	211.3 ± 27.9	58.0 ± 6.8	103.8 ± 14.7	1689.3 ± 148.8
Chelones 2	969.4 ± 64.0	118.2 ± 19.5	140.1 ± 33.8	37.9 ± 34.4	122.9 ± 19.5	1405.8 ± 81.8
Chelones 3	732.2 ± 33.1	114.6 ± 11.6	152.5 ± 31.6	63.3 ± 8.6	76.8 ± 13.9	1164.6 ± 54.5
Chelones 4	732.5 ± 84	156.1 ± 26.6	518.0 ± 73.5	187.3 ± 38.8	74.6 ± 24.3	1708.5 ± 432.7
Chelones 5	1263.2±46.5	250.9 ± 12.3	357.1 ± 22.6	151.3 ± 6.6	134.8 ± 10.9	2147.3 ± 186.0
MEAN mean	**949.7 ± 28.4**	**157.5 ± 24.7**	**275.8 ± 71.8**	**99.6 ± 29.3**	**102.6 ± 12**	**1623 ± 164.9**

Table 3.4.1. The mean weight per quadrat for each litter type on each of the five beaches was calculated and the total mean weight of litter per quadrat examined in a comparison of the beaches.

To compare the mean total weights between beaches a one way ANOVA was calculated (see Table 3.4.2.). The results showed that there was a difference between the beaches at a level of $P<0.058$. As the sample sizes were not the same in each category a Tukey test could not be conducted to show where the differences lay. Although a P-value of 0.058 is not highly significant, to err on the side of caution I have treated each beach as a separate sample in further analyses. However, from the total mean litter weights shown, Chelones 5 has a greater amount of litter (2147.3g/m^2) than the others and Chelones 3 (1164.6g/m^2) the least.

Source of Variation	SS	df	MS	F	P-value
Between Groups	9051143.05	4	2262785.76	2.44	0.058
Within Groups	64920060.6	70	927429.437		
Total	73971203.7	74			

Table 3.4.2. Results of a one-way ANOVA comparing the mean total weights of litter per quadrat for each beach.

3.5. Comparing the distribution of litter up the beach.

Each transect was divided into the top middle and bottom of the beach by dividing the number of quadrats at each station by 3 and thus calculating the mean total weight of litter per quadrat for each of the three sections of beach (see Appendix VIII for these values). The beaches were treated as separate samples, as discussed above, hence are tested individually.

A one-way ANOVA test was used to compare the mean total weight per quadrat for each section up the beach and a Tukey test to find where the difference lies if the means were significantly different. The ANOVA test (see Table 3.5.1.) showed the means of the mean weight/quadrat for top middle and bottom sections of the beach to be significantly different ($p<0.001$).The Tukey test was applied in each case and showed the significant difference between the three sections of the beaches to be between the top and middle and the top and bottom thirds on all five beaches. There was no significant difference between the middle and bottom sections. The direction of the difference is such that there is significantly more litter on the top third of the beach than the bottom or middle thirds (Table 3.5.1.)

Chelones 1					
Source of Variation	SS	df	MS	F	P-value
Between Groups	12348512.81	2	6174256.406	12.85	0.001
Within Groups	23056605.18	48	480345.9412		
Total	35405117.99	50			
TUKEY					
		2	3		
Sample 1		409.4	1186.4		
Sample 2			777.1		
Sample 3					
	T=574.8	d.f. =3,48			

Chelones 2					
Source of Variation	SS	df	MS	F	P-value
Between Groups	2521339.237	2	1260669.619	12.08	0.001
Within Groups	1252691.732	12	104390.9777		
Total	3774030.969	14			
TUKEY					
		2	3		
Sample 1		46.52	892.04		
Sample 2			845052		
Sample 3					
	T=544.74	d.f. =3,12			

Chelones 3					
Source of Variation	SS	df	MS	F	P-value
Between Groups	10856355.79	2	5428177.897	49.73	0.001
Within Groups	3602327.289	33	109161.433		
Total	14458683.08	35			
TUKEY					
		2	3		
Sample 1		435.2	1319.9		
Sample 2			884.67		
Sample 3					
	T=330.005	d.f.=3,33			

Chelones 4					
Source of Variation	SS	df	MS	F	P-value
Between Groups	47338662.27	2	23669331.14	6.76	0.001
Within Groups	136543368.6	39	3501112.014		
Total	183882030.8	41			
TUKEY					
		2	3		
Sample 1		38.7	2271.2		
Sample 2			2232.5		
Sample 3					
	T=1725.3	d.f.=3,39			

Chelones 5					
Source of variation	SS	df	MS	F	P-value
Between Groups	72348481.72	2	36174240.86	17.65	0.0001
Within Groups	159852840.1	78	2049395.386		
Total	232201321.9	80			
TUKEY					
		2	3		
Sample 1		142.7	2143.8		
Sample 2			1828.5		
Sample 3					
	T=939.47	d.f.=3,78			

Table 3.5.1. Results of one-way ANOVAs & Tukey tests to compare the total mean weight per quadrat in the top middle and bottom sections of each beach.

3.6 Comparing the weight of litter distributed along the beach.

A similar comparison was made between the average total weights of litter per quadrat at each station to see whether there was a difference in the spread of litter along the beach length. None of the tests were significant using a one way ANOVA (Table 3.6.1.). Thus there is no apparent difference in the litter cover along the beach with respect to litter weight.

Chelones 1					
Source of Variation	SS	df	MS	F	P-value
Between Groups	15988294.1	16	999268.384	1.75	0.083
Within Groups	19416823.8	34	571083.054		
Total	35405118	50			
Chelones 2					
Source of Variation	SS	df	MS	F	P-value
Between Groups	401715.163	4	100428.791	0.29	0.87
Within Groups	3372315.81	10	337231.581		
Total	3774030.97	14			
Chelones 3					
Source of Variation	SS	df	MS	F	P-value
Between Groups	1180201.24	11	107291.021	0.19	0.996
Within Groups	13278481.8	24	553270.077		
Total	14458683.1	35			
Chelones 4					
Source of Variation	SS	df	MS	F	P-value
Between Groups	101670888	13	7820837.55	2.09	0.15
Within Groups	82211142.7	28	2936112.24		
Total	183882031	41			
Chelones 5					
Source of Variation	SS	df	MS	F	P-value
Between Groups	73659884	26	2833072.46	0.96	0.53
Within Groups	158541438	54	2935952.55		
Total	232201322	80			

Table 3.6.1. Results of one-way ANOVAs to compare the mean total weight of litter per quadrat at each station along each beach. As none were significantly different a Tukey test was not applied.

3.7. Turtle nesting activity.

During the study period a total of 197 nesting activities were recorded. These can be divided into the three behaviour classes (Nest (N), False crawl attempt (FCA) and False crawl U-turn (FCU)) for each of the two species. Individual dates and activities for each beach are shown in Appendix XI. A summary of the recorded nesting activities is shown in Table 3.7.1.

	Chelonia mydas			Caretta caretta			
BEACH	Nest	FCA	FCU	Nest	FCA	FCU	TOTAL
CHELONES 1	8	5	4	1	0	1	19
CHELONES 2	15	1	4	4	0	3	27
CHELONES 3	23	8	16	3	1	4	57
CHELONES 4	5	4	9	2	0	2	22
CHELONES 5	20	19	18	7	4	4	72
TOTAL	73	37	51	17	5	14	197

Table 3.7.1. The number of nests, false crawl attempts and false crawl U-turns recorded for each species on each beach giving the total number of activities in each case.

For the whole of Chelones Bay, these nesting figures give an average density of 46.9 nests and 102.3 activities / km of beach. From the total number of emergences this gives an emergence success (when successful nesting has occurred) of 46%. Figure 3.7.2. below illustrates the period of nesting and the peaks that occurred this season for all five beaches grouped together. Individual beaches alone gave little graphical information due to the small numbers of activities occurring.

The nesting population size of Mediterranean marine turtles can be estimated by dividing the total number of nests by three (Groombridge 1988). Thus the total number of nests recorded over all five beaches was 90 giving an estimate for the number of nesting females at Chelones bay in 1993 of 30. The specific identification of crawls can divide this number into 24 *Chelonia mydas* and 6 *Caretta caretta*. It should be noted that a team from Glasgow were monitoring the total number of nests laid on the beaches of Northern Cyprus and recorded a total of 570 nests. The beaches in Chelones Bay thus were recorded as having approximately 16% of all nesting activity.

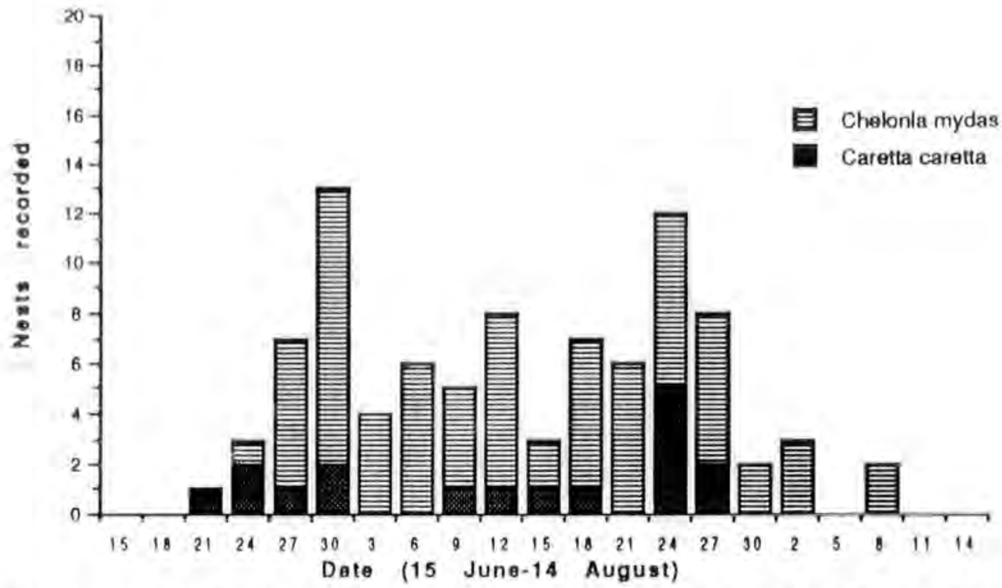


FIG 3.7.2. The nesting activities recorded showing dates for both species on all five beaches collectively.

The means track widths of *Chelonia mydas* was found to be 71.4±0.79 cm, and for *Caretta caretta* 61.7±1.47 cm. These were found to be significantly different using a one tailed t-test ($t=5.54$, d.f.$=148$, $P<0.005$). Green turtles are larger at full maturity than loggerheads, hence a one tailed t-test was used.

3.8. Turtle hatching activity.

A total of 13 nests were recorded as hatched. These were 2 *Caretta caretta,* 7 *Chelonia mydas* and 4 unidentified. Of these 2 *Chelonia mydas* nests were predated after hatching. Five nests were also recorded as predated with no apparent hatching having occurred. These predated nests were divided into 2 *Chelonia mydas*, 1 *Caretta caretta* and 2 unidentified. Thus of the total number of nests laid (90) only 14% hatched and 8% of nests were predated pre- or post-hatching. Of those nests predated fox tracks were recorded around three and dog tracks around two. The dates of the hatching activities recorded are shown in figure 3.8.1.

A full breakdown of these details is given in Appendix XII.

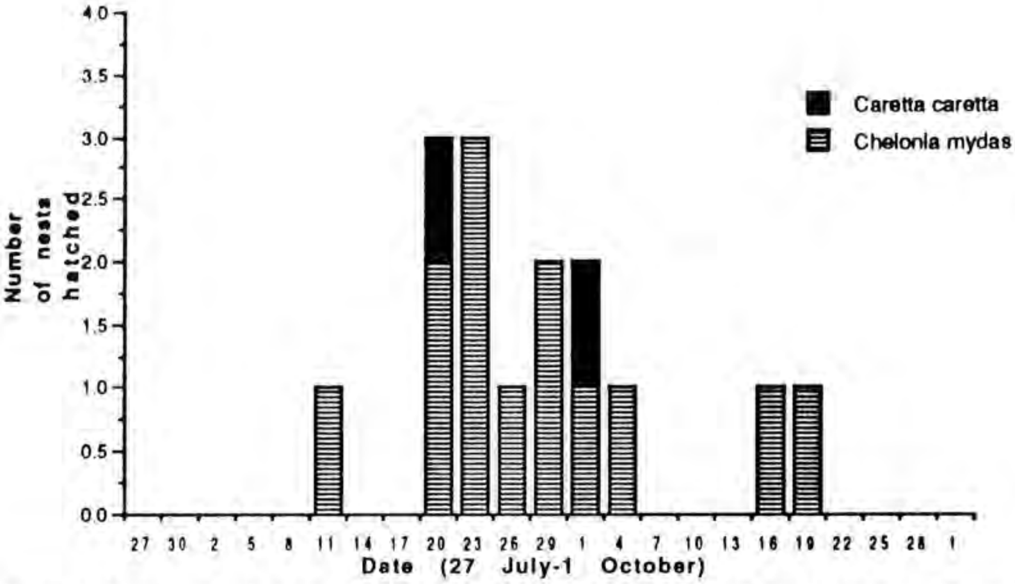


FIG.3.8.1. The dates of hatching activities recorded showing each species collectively for all five beaches.

To illustrate the low hatching rate found on Chelones Bay, results collected by a Glasgow University team have been examined to compare the level of hatching with respect to the number of nests recorded as laid. Of 43 beaches surveyed using the same criteria as Chelones Bay, a total of 334 nests were laid with 80 recorded hatchings and 83 predated pre- or post-hatching. Of these, 24% of recorded nests hatched and 26% were predated.

Upon excavation of hatched nests the hatching success of each nest could be calculated (see equation below). Due to the small sample size it was not possible to carry out statistical tests on these data.

$$\% \text{ Success} = \frac{\text{Number of hatched eggs}}{\text{Total number of eggs}} \times 100$$

The hatching morphometrics for each species are shown below in Table 3.8.1.

Hatching morphometrics for Chelones Bay		
	Chelonia mydas	Caretta caretta
	6 nests	1 nest
Mean % hatching success	76.3 ± 11.06	83.7
Mean clutch size	105.3 ± 9.6	19
Mean depth to top egg chamber (cm)	71.6 ± 3.8	33
Mean depth to bottom egg chamber (cm)	82.3 ± 5.43	40

Table 3.8.1. The hatching morphometrics *Chelonia mydas* and *Caretta caretta* (gained through nest excavation).

3.9. Comparison of the position of litter and turtle activities.

The position of false crawl attempts, nests laid and nests hatched were divided into top middle and bottom of the beach. False crawl U-turns were not included in this analysis as their position on the beach could not be precisely mapped. Loggerhead and green turtle activities were grouped as one sample for this analysis, owing to the small amount of loggerhead activity recorded. A $\chi 2$ test was used to compare the frequency of the different nesting activities in the three areas of the beach. Yates correction is not needed as there are 3 categories under comparison and 2 degrees of freedom. It was expected that the activities would be equally distributed in their positions on the beach.

The $\chi 2$ shows that there is a significant difference in the position of nests laid, there were very low numbers recorded in the top third of the beach. There was no significant difference in the positions of FCA's although there are more recorded in the middle third of the beach compared to the remaining sections.

It was not possible to perform a $\chi 2$ test on the hatching data as the expected values were less than five. However there were twice as many recorded in the middle third of the beach than the top or bottom which were equal.

	Position on beach			
Activity	Top	Middle	Bottom	Total
NEST				
Observed	5	37	48	90
Expected	30	30	30	
ˇ2	ˇ2 =33.26, d.f.=2, p<0.01*			
FCA				
Observed	9	18	15	42
Expected	14	14	14	
ˇ2	ˇ2 =2.14, d.f.=2, p>0.05 not sig.			
HATCHING				
Observed	3	7	3	13
Expected	4.33	4.33	4.33	
ˇ2	Sample sizes too small to test			

Table 3.9.1.χ^2 test to compare the positions of nests, false crawl attempts and hatching activities with respect to a division of the beach into top middle and bottom thirds.

DISCUSSION OF RESULTS

4.1. Litter composition.

From the results obtained in this study the dominant litter type on all beaches in Chelones Bay was plastic. When examining the frequency of items of litter recorded, plastic represented 85.1% of samples, glass 6.5%, wood 3.8%, tar 3.1%, and miscellaneous items constituted only 1.5%.

When the relative weight of litter items was examined, similarly plastic represented 60%, wood 17%, glass 11%, tar 6%, and miscellaneous constituting 6% by weight. A comparison of the ranking of predominance of relative frequency of items versus proportion of weight of litter on the beach shows their similarity. Only the ranking of glass and wood are reversed in the latter set of data, the remainder following the same order. This dominance of plastic was expected as, due to its reduced density, plastic is much more easily washed in and blown onto the beach.

Although plastic was the most frequent litter type recorded in both cases, it constituted a lower proportion by weight due to the greater density of other litter types recorded. As the recording of frequency only involved examination of items greater than 2cm, this did not take into account the relative sizes of items and therefore beach coverage. Thus weight was used to compare the distribution of litter between and within beaches. This, however does not take into account the fact that a large plank of wood is much denser and heavier in proportion to the area of beach it covers than a piece of plastic sheeting of the same weight. A denser item of litter may prove to be a larger obstacle to nesting and hatching turtles, however large items of plastic sheeting, for example, are often spread throughout the sand column trapping hatchlings and making it extremely difficult for an adult to dig or hatchlings to emerge.

The range of items within each category was extensive. There were for example, shoes, clothes, toy-dolls, bottles, bags, medical waste, cans, crates, planks. Some items were identified to have been of Arabic origin, some were written in English and thus could have come from virtually any source.

Litter surveys did not take into account litter in the sand column. If an item was partially on the surface it was pulled from the sand and included. It would have proved extremely difficult to survey litter to 1m depth and machinery would have been needed.

4.2. The distribution of litter within and between beaches.

Owing to the varying lengths and widths of the five surveyed beaches, it was necessary to calculate the mean weight of litter per quadrat to compare between and within beaches. A comparison of the mean litter weight showed no significant difference in the mean total litter weight per quadrat between beaches. This suggests that litter is distributed evenly by tides and currents on all five beaches. This was probably due to the fact that all beaches face the same direction and are in the same bay.

There was significantly more litter in the top third of all beaches compared to the middle and bottom thirds. This is probably due to the fact that plastic is the dominant litter type and is easily blown up the beach. The effect of tides also means that litter in general is pushed up the beach. As most litter tends to be deposited in winter, with storms and high waters most litter will end up at the top of the beach.

There was no difference in the spread of litter along the beach in all five cases. This had been investigated as it was thought that the direction of tides and currents might deposit litter in clumped areas.

4.3. Turtle nesting activity

Chelones Bay has very little human disturbance, this therefore eliminates this source of litter and also reduces human disturbance with respect to nesting and hatching turtles. There are no beach developments near Chelones Bay. The nearest building is situated approximately 300 m from the beach, and is a very small restaurant, not open at night and not seen from the beaches. The main problems highlighted from this study to the turtles nesting on Chelones Bay are litter and predation.

From the overall number of nests recorded (90), a population estimate of 24 *C. mydas* and 6 *C.Caretta* was made (Groombridge 1990). This method of estimation must be treated cautiously. Some turtles will lay more than three nests per season and some less than three. This is also assuming that turtles are philopatric to this bay within a season, using the same beach or group of beaches exclusively. Only tagging programs and continual monitoring can show such details. Such estimates are more accurate when examining larger populations such as that of the whole island.

Assuming that this population estimate is fairly accurate, 24 C. mydas turtles is a significant proportion of the overall Mediterranean estimate of annual nesting females which is currently estimated at 300 - 700 (Groombridge 1990).

Nesting activity in Chelones Bay took place from mid June-mid August, with the peak nesting occurring in July. Ninety nests, 42 false crawl attempts and 65 false crawl u-turns were recorded, giving a total of 197 nesting activities. Chelones 3 and Chelones 5 were the most popular beaches, having 65% of all activities and 59% of nests between the two of them.

From the overall number of nesting activities recorded, the emergence success of adults can be used to compare beaches. This is the number of successful nestings divided by the number of nesting activities recorded. Collectively there was an emergence success of 46%. So, 46% of nesting attempts were successful. Chelones 1-5 had an emergence success of 42%, 56%, 40%, 23% and 28% respectively. This emergence success relates favourably to that at Kazanli in 1990 (Coley & Smart 1992) of 15.5%. They suggested that low successes on these beaches in Turkey were connected with the changes in chemical composition of the sand and loss of nesting areas of the beach due to erosion, agriculture and nearby developments.

At Chelones Bay there may be a number of reasons for the variety and levels of emergence success. The sand type, moisture and temperature may vary between beaches and with position on a particular beach, making it unsuitable for nesting and leading a female to abandon a nesting attempt.

An adult turtle may simply emerge from the sea, find herself at an unsuitable point for example too rocky or excessively littered and inaccessible and return to the water to move down the beach to a preferred area rather than crawling further up or along the beach which is more exhaustive.

The approach to the beach must play some part in where turtles emerge on beaches. Mortimer (1982) demonstrated that more emergences occurred where there was a steep approach to the beach, assuming that this made it easier for the females to swim in very close before starting to crawl laboriously up the shore. Similarly turtles must avoid being washed onto rocks when approaching the beach and this may dictate where they emerge.

The gradient of the beach has also been also shown to affect nesting turtles. Nesting beaches of the leatherback are often steeply sloping, reducing the distance between the water line and nest site (Mortimer 1982). Possibly then as the gradient varies in certain areas of these beaches, these areas may be favoured nesting sites. Mortimer also suggests that there are more marine predators around rocky shores which may be a choice factor by the female in nest site selection. There was no apparent difference between the beaches in Chelones Bay, all had rocky outcrops and were surrounded by rocky shores.

It was expected that the mean track widths of greens would be significantly larger than loggerheads as was shown, due to their differing mean sizes at maturity. Data collected on track widths can be used to correlate carapace length and width with track width where these measurements are obtained. Thus when track widths alone are measured an estimate of the sizes and hence ages and possible structure of the turtle population using the beach can be gained. In this case the track widths were measured purely to demonstrate the size differences in the two species. There is not yet enough data on these nesting populations to be able to correlate carapace measurements with track widths (Godley & Broderick 1992).

Although most turtle activity occurs at night, beaches were patrolled during the day. This meant that actual observations were not made and a tagging program was not possible. However, this still allowed accurate collection of data from adult and hatchling tracks and pits as a result of these activities. Night time work on these beaches was prohibited by the government with day time work being supervised by local police.

There was therefore a possibility that some activities were recorded incorrectly, however, having the experience of working on turtles, and witnessing actual nestings for three seasons, it is hoped that this error was minimal. The position of nests could only be recorded to the nearest approximate m^2 due to covering up by the adult. In some research where nesting is observed, markers can be placed in the nests so that upon post-hatching excavation records can be related to actual nesting dates, as was carried out by Glasgow University Expedition in 1993 on intensive study beaches (personal communication). It was therefore not possible to directly relate individual nests to hatching or relocate unhatched nests to examine reasons for failure.

If a false crawl U-turn was recorded, it was not always possible to record the position of the activity in relation to vegetation and strand as crawls often weave all over the beach, thus this activity could not be examined accurately in relation to position on the beach.

4.4. Turtle hatching activity

The number of nests recorded as hatched was very low. Only 13 nests were recorded to have hatched, which when compared to the number of laid nests recorded, means a hatching rate of only 14%. There are many factors to be considered in examining why this was. The methodology of surveying the beaches every three days may mean that some hatching tracks are washed away if high winds or tides preside. There was some stormy weather in August which was unusual for this time of year. The effect of such high waters may also cause flooding and erosion of nests and loss of tracks (McGehee 1990).

However a comparison with data collected by Glasgow University this year illustrates that as a proportion of the total number of nests recorded (334) the hatching rate (80 hatched nests) was only 24%. This is not the complete data for the whole island but the total numbers for beaches (43 out of 84) surveyed using the same methodology to collect data as this study. If we refer to 1992 data collected

(Godley & Broderick 1992), the number of nest recorded on beaches monitored every three days was 137, hatched was 76, giving a hatching rate of 55%. There are some reasons why this might be higher, for example surveying started at a later date, thus some nests were not recorded when laid but were as hatched. However, taking this into account, although this year was a more successful nesting year in Northern Cyprus, hatching in general was poor.

Even compared to the low hatching rate of 28% of 1993 for 43 beaches, Chelones Bay is lower with 14%. This could possibly be related to litter densities. I visited all nesting beaches in Northern Cyprus this year and from personal observations feel than none are as heavily polluted with litter as those in Chelones Bay.

The predation level was low at only 8% of the total number nests recorded having being predated. However most predation is thought to occur at or post hatching when emerging hatchlings produce a scent for predators to trace. Thus as hatching numbers were low, low predation might also be expected.

The equation for calculating hatching success of an individual nest is the actual hatching success and does not take into account those that hatched and died whilst still in the sand or on their way to the water. This is sometimes called the excavation success of a nest. The equation also does not take into account the fact that non viable eggs (unyolked) may never have been meant to hatch and are thus not strictly 'unsuccessful eggs'. In recording egg contents the term 'yolked unfertilised' is somewhat ambiguous. In retrospect this category should have been, no sign of development with the naked eye.

The hatching morphometrics for both species of turtles cannot be compared to one another or to other surveys due to the small sample sizes. However in the 1992 survey of Northern Cyprus (Godley & Broderick 1992), all but one of the parameters considered, as in this study, were significantly different between the two species. Green turtles laid nests at ~20cm greater depths than loggerheads, mean clutch size in *C. mydas* was 113, whereas in *C. caretta* it was 61. The mean hatching success however was not significantly different between the two, with *C. mydas* having a success of 85% and *C. caretta* 81%.

Due to the lack of knowledge concerning mortaltity at all stages of the life cycle, it is not apparent whether such hatching numbers will sustain this population.

4.5. Comparison of the distribution of litter and turtle activity.

More litter was found on the top third of the beach, this may be the reason why there were less nests recorded in the top third of the beach. However there was no significant difference between the positions of false crawl attempts on the beach, as might have been expected.

It was impossible to relate actual nests to quadrats for reasons discussed earlier. Also due to the fact that whilst digging, a female tends to move some litter from the area. So in order to find the preferred nest positions in relation to litter, litter surveys had to be conducted prior to nesting.

There may of course be many other reasons for the lack of nests in the top third of the beach, such as depth and quality of sand , temperature and moisture content and distance from the sea.

Hatching positions could not be statistically analysed due to the small sample sizes. However, 7 nests hatched in the middle third of the beach, whilst 3 hatched in each of the top and bottom thirds. This variation could again be attributed to any of the above reasons. However, figures may be especially low in the bottom third of the beach, even though a greater proportion of nests were laid here due to the high tides and stormy weather described previously which may have stopped or slowed development by floodings or obliterated tracks so that recording of hatching was missed.

Chelones 3 and Chelones 5 proved to be more popular nesting beaches than Chelones 1,2 or 4. However, there was shown to be no significant difference between the litter densities on each of the five beaches, hence it appears that litter in these densities does not put turtles off nesting. Alternatively, as litter tends to be clumped the females may avoid areas with litter chosing their nest sites in clearer areas. Litter however, may interfere with the subsequent success of nests, leading to a low hatching rate and success. Certainly the low rates recorded indicate there being a problem on these beaches, but numerous factors effect successful incubation, litter may be just one of these.

In this study I have been unable to demonstrate the direct effect of litter on turtle nesting and hatching as there was no significant difference between litter quantities on the five study beaches.

It would be interesting to follow up this study by cleaning areas of each of the beaches prior and during the season to compare the success of adults and young on the same beaches cleaned. As populations fluctuate annually an idea would be to clean half of each beach as a comparison.

4.6. Recommendations.

During the latter part of my study I heard anecdotal accounts from local people that permission has been given to build a 60 room hotel on a site near Chelones bay where now stands a small restaurant. The owner is aware of the importance of this bay to turtles and is keen to be advised on how to keep disturbance to the turtles to a minimum. Such a development will undoubtedly increase the human usage of these beaches, however the hotelier proposes to clean the beaches when his development is opened which may be beneficial. Building has not yet started. It is important that developers be advised and educated on the threats facing both nesting and hatching turtles and tourists using the development also be made aware of their possible damaging effects.

The National Trust for Northern Cyprus has proposed a National Park to be designated covering the eastern tip of the Karpaz Peninsula. Unfortunately, the proposal is that the National Park include all land east of Dipkarpaz village, therefore it does not include Chelones Bay which lies 3 miles to the west of Dipkarpaz. Owing to the numbers of turtles nesting here, and the majority being *Chelonia mydas*,whose numbers are extremely low in the Mediterranean, it is strongly recommended that Chelones Bay be included in the proposal and that the Government designate and declare the area a National Park.

The use of machinery is certainly a factor that needs to be addressed if cleaning operations of beaches are being undertaken. Litter has been so heavily spread through the sand column that in order to clean a beach so that turtles can nest and hatch without the obstruction, would need complex machinery. In some areas such machines are used. Dixon & Dixon (1981) report that in some areas of the Eastern Mediterranean ground nut harvesters have been adapted for use as beach cleaners.

Members of KKKKD/SPOT, the Society for the Protection of Turtles in Northern Cyprus, have been campaigning for several years to gain a grant to buy such beach cleaning machinery. At present the Ministry of Tourism have been paying locals to clean those beaches used by tourists. It was for this reason that I was unable to compare other beaches to Chelones Bay as they are now being cleaned at regular intervals. Although this study cannot conclude that litter is detrimental to turtle populations it is likely that it will have some effect and the removal of litter from beaches could only be expected to improve nesting and hatching success of these endangered turtles.

It is recommended that Chelones Bay and other important nesting sites in Northern Cyprus be cleaned thoroughly in May of each year prior to the start of the nesting season. Then small clean ups at regular intervals throughout the nesting and hatching season can be carried out with minimal disturbance to incubating nests. It is also recommended that litter cleaned off a beach be taken away to inland dumps. At present where beaches have been cleaned large piles of rubbish have been collected in the rocks or vegetation just off the beach. This results in litter being blown back onto the beach or spread around the vegetation in the event of wind. This also increases the possibility of leaching of toxic substances.

If cleaning of these beaches cannot be undertaken or does not result in an increase in hatching success, transplantation should be considered. Similarly if with an increase in hatching success, predation increases, caging of nests should be attempted, however this would mean monitoring beaches at dawn every day to release hatchlings, and may be impractical. It is inhumane and dangerous to lay poisoned bait to decrease predator numbers. The accidental poisoning of other animals and the accumulation of toxins in the food chain must all be considerations.Removal by trapping can also be a consideration although this method of reducing predation would be very time consuming. Other studies suggest the removal of nests to low predation beaches or hatcheries.

It was disturbing to find so much medical waste amongst the litter. It has been suggested in the past that much of the marine debris washed up onto the shores of Northern Cyprus is either coming from shipping traffic or the Lebanon and Syria (pens. comb. Ilkay Salihoglu). Certainly Golik and Gertner (1992) discuss in their paper the well known fact that Lebanon dump most of their rubbish off the coast of Lebanon. It is unfortunate that the prevailing Mediterranean currents bring it North and it is washed onto the coasts of other countries.

Lebanon apparently has no waste incinerators, a problem which Members of the European Parliament promised to investigate when they visited Northern Cyprus in 1992. If they could be assisted in improving their waste disposal, many other countries bordering the Mediterranean sea, and the sea turtles nesting on its beaches and living in its waters, would undoubtedly benefit.

Northern Cyprus has no official political status, having unofficially declared itself the Turkish Republic of Northern Cyprus. It is not recognised by any other countries except Turkey. It thus has no political lobbying force to inform and object to this litter problem. The Lebanon and Syria are contracting parties to the Barcelona Convention as are all Mediterranean bordering countries (Groombridge 1990). More studies are needed to quantify and identify the sources of the problem of pollution that the Mediterranean now faces so that legislation can be implemented or changed.

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APPENDIX I

DATA SHEETS =

1a) LITTER SURVEYS
1b) DAY TIME NESTING DATA
1c) HATCHING DATA

LITTER SURVEY SHEET

DATE BEACH

STATION QUADRAT

SHEET NO.

Item no.	Composition	Type	Weight	Origin / Notes

DAY TIME SURVEY SHEET

Day of week **Beach name**

Present

Weather description **Human activity on the beach**

	1	2	3	4
Species				
N/FCU/FCA				
Position on beach				
Veg				
Strand				
Notes				

Chelonia mydas
Total number of greens:
Number of possible nestings:
Number of false crawls:
Of above false crawls how many;
U-turns:
Nest attempts:

Caretta caretta
Total number of loggerheads:
Number of possible nestings:
Number of false crawls:
Of above false crawls how many;
U-turns:
Nest attempts:

Use letters N(nest) or FCU/FCA (false crawl U-turn or Faalse crawl **attempted nest**) where appropriate.

HATCHING DATA SHEET

DATE: BEACH NAME:
PRESENT:

Species:
Tag number if found/appropriate:
Depth ofegg chamber -Top:
-Bottom:

Total clutch size:
Number of: 1)hatched eggs from fragment count:
2)live full term hatchlings found
and depth of discovery:

Of live hatchlings record measurements of carapace width and length of as many as possible from each nest. Also measurements of the diameter of as many as possible of the unhatched eggs prior to opening recording whether they contained no embryo(NE) less than half term embryo (<H) or more than half developed embryo (>H).

3)dead full term hatchlings:
4)unhatched eggs-
i)total:
ii)non viable(no yolk):
iii)unfertilised yolked:
iv)dead in shell:
v)number of abnormal hatchlings:
(state dead or alive in/out of shell. Description of any abnormalities in dead or live individuals seen.)

Hatchability %:
[(number of hatched eggs/total number of eggs)* 100]

Position on beach:
Strand:
Veg/top beach:
Any evidence/notes on predation?

Notes on any preserved hatchlings, shell abnormalities (fungus etc.), retained shells
Use overleaf if necessary.

APPENDIX II

CHELONES 4 - STATION A:

Example of items of litter recorded at one station.

CHELONES 4 - STATION A					
	Item	Composition	Type	Weight (g)	Origin/Notes
QUADRAT 1	1	Plastic	sheeting	10	white
	2	Plastic	carton	50	white
	3	Plastic	lid	30	
	4	Plastic	bottle	80	Arabic writing
	5	Plastic	lid	20	
	6	Plastic	sheet	20	blue
	7	Plastic	tube	30	
	8	Metal	post	1320	
	9	Glass	bottle	120	Medical
	10	Tar ball		60	
	11	Tar ball		10	
QUADRAT 2	1	Plastic	bottle	60	fairy liquid
	2	Plastic	bottle	70	drink
	3	Plastic	tube	40	
	4	Plastic	lighter	60	green
	5	Plastic	bag	20	clear
	6	Plastic	bag	10	black
	7	Plastic	sheet	80	clear
	8	Plastic	dolls arm	10	
	9	Plastic	syringe	20	insulin
	10	Plastic	beer pack	20	
	11	Rubber	shoe	430	trainer
	12	Wood	plank	1230	
	13	Tar ball		60	
	14	Tar ball		90	
	15	Glass	bottle	160	
QUADRAT 3	1	Plastic	carton	80	
	2	Plastic	lid	5	drink bottle
	3	Plastic	lid	10	
	4	Plastic	bag	10	clear
	5	Plastic	bag	10	white
	6	Plastic	bag	20	blue
	7	Plastic	sheet	70	white
	8	Plastic	fishing net	540	orange
	9	Plastic	drip bag	120	medical
	10	Plastic	ball	40	
	11	Plastic	shoe	330	flip flop
	12	Plastic	piece	150	
	13	Cloth	rag	240	
	14	Glass	bottle	180	small, blood bottle
	15	Glass	piece	40	
	16	Tar ball		30	
	17	Tar ball		20	
	18	Wood	board	530	
	19	Wood	piece	170	
QUADRAT 4	1	Plastic	bottle	60	clear
	2	Plastic	bag	10	black
	3	Plastic	handle	10	white
	4	Plastic	lighter	60	blue
	5	Plastic	piece	10	blue
	6	Plastic	syringe	20	clear
	7	Plastic	sheet	10	clear
	8	Plastic	shoe	320	flip flop
	9	Aluminium	can	170	
	10	Tar ball		20	
	11	Glass	syringe	70	
	12	Glass	piece	40	
	13	Wood	bamboo	50	
QUADRAT 5	1	Plastic	bottle	50	clear
	2	Plastic	bottle	40	Arabic
	3	Plastic	bottle	60	drinks Turkish
	4	Plastic	tube	30	white
	5	Plastic	bag	10	white
	6	Plastic	bag	20	white
	7	Plastic	bag	25	clear
	8	Plastic	bag	10	blue
	9	Plastic	sheet	50	black

	Item	Composition	Type	Weight (g)	Origin/Notes
	10	Plastic	sheet	40	green
	11	Plastic	sheet	10	blue
	12	Plastic	piece	10	white
	13	Plastic	piece	20	green
	14	Plastic	piece	30	clear
	15	Plastic	piece	10	clear
	16	Plastic	beer pack	20	
	17	Plastic	lid	10	white
	18	Plastic	carton	30	white
	19	Plastic	lighter	60	clear
	20	Plastic	lighter	50	green
	21	Plastic	doll	220	
	22	Aluminium	can	140	
	23	Tar ball		120	
	24	Tar ball		80	
	25	Tar ball		90	
	26	Glass	bottle	160	drinks
	27	Glass	piece	30	
	28	Glass	tube	140	light strip
	29	Wood	piece	90	
	30	Wood	bamboo	70	
	31	Wood	bamboo	60	
	32	Wood	bamboo	110	
	33	Rubber	shoe	660	
	34	Polystyrene	item	230	white
QUADRAT 6	1	Plastic	bottle	60	green
	2	Plastic	bottle	50	clear
	3	Plastic	bottle	70	white
	4	Plastic	bottle	30	white Arabic
	5	Plastic	bottle	80	white English
	6	Plastic	bag	10	black
	7	Plastic	bag	10	black
	8	Plastic	bag	20	clear
	9	Plastic	bag	10	clear
	10	Plastic	bag	10	white
	11	Plastic	bag	15	blue
	12	Plastic	bag	5	blue
	13	Plastic	sheet	30	yellow
	14	Plastic	sheet	160	clear
	15	Plastic	sheet	20	black
	16	Plastic	sheet	50	blue
	17	Plastic	sheet	30	white
	18	Plastic	sheet	40	clear
	19	Plastic	sheet	110	clear
	20	Plastic	sheet	220	white
	21	Plastic	lid	10	white
	22	Plastic	lid	5	green
	23	Plastic	carton	30	white
	24	Plastic	crate	1350	blue
	25	Plastic	syringe	30	clear
	26	Plastic	syringe	20	clear
	27	Plastic	piece	20	blue
	28	Plastic	piece	10	white
	29	Plastic	piece	30	white
	30	Plastic	piece	50	green
	31	Plastic	piece	140	black
	32	Plastic	piece	60	blue
	33	Plastic	piece	280	white
	34	Plastic	piece	10	clear
	35	Plastic	piece	10	yellow
	36	Plastic	strapping	20	white box packaging
	37	Tar ball		220	
	38	Tar ball		60	
	39	Tar ball		50	
	40	Glass	bottle	230	brown medical
	41	Glass	bottle	120	clear
	42	Glass	tube	60	opaque
	43	Glass	piece	70	clear
	44	Wood	piece	330	
	45	Wood	piece	90	

	Item	Composition	Type	Weight (g)	Origin/Notes
QUADRAT 7	1	Plastic	bottle	60	clear
	2	Plastic	bag	10	blue
	3	Plastic	bag	10	blue
	4	Plastic	bag	20	black
	5	Plastic	bag	10	white
	6	Plastic	sheet	30	clear
	7	Plastic	sheet	10	white
	8	Plastic	sheet	50	black
	9	Plastic	sheet	120	clear
	10	Plastic	piece	60	blue
	11	Plastic	piece	210	blue
	12	Plastic	piece	30	white
	13	Plastic	piece	20	green
	14	Plastic	piece	10	white
	15	Plastic	piece	30	white
	16	Plastic	piece	70	yellow
	17	Plastic	piece	140	opaque
	18	Plastic	dolls arm	30	
	19	Plastic	dolls body	60	
	20	Plastic	dolls shoe	40	
	21	Plastic	carton	120	white
	22	Plastic	tub	50	white
	23	Plastic	blood bag	230	
	24	Plastic	water canister	860	yellow
	25	Plastic	lid	10	green
	26	Plastic	lid	10	white
	27	Plastic	lighter	70	blue
	28	Plastic	lighter	50	clear
	29	Aluminium	can	110	Turkish
	30	Glass	piece	30	brown
	31	Glass	piece	60	green of bottle
	32	Wood	stick	40	
	33	Wood	plank	390	
	34	Wood	bamboo	80	
	35	Wood	bamboo	90	
	36	Wood	bamboo	160	
	37	Tar ball		60	
	38	Tar ball		180	
	39	Tar ball		430	

APPENDIX III

CHELONES 1 - SUMMARY OF LITTER SURVEY.

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
STATION A										
1	24	3410	3	610	0	0	0	0	0	0
2	32	1250	5	580	2	660	2	410	0	0
3	29	1640	4	370	1	1080	1	130	1	460
4	19	860	8	590	3	2460	1	270	0	0
5	34	1840	2	320	1	560	1	90	0	0
Total	138	9000	22	2470	7	4760	5	900	1	460
STATION B										
1	21	1620	1	230	0	0	1	90	2	500
2	32	1030	3	460	1	580	1	210	1	210
3	27	1240	4	600	0	0	3	390	3	890
4	20	970	2	290	0	0	2	260	1	1100
5	17	990	1	210	0	0	1	80	2	210
6	20	1410	0	0	1	260	0	0	2	640
7	36	1310	0	0	2	1300	1	60	2	380
8	28	1060	2	340	1	710	2	160	1	90
9	30	1200	1	90	3	1050	2	230	1	50
Total	231	10830	14	2220	8	3900	13	1480	15	4070
STATION C										
1	16	560	0	0	0	0	1	100	0	0
2	12	410	0	0	0	0	2	180	0	0
3	9	250	0	0	1	60	1	40	0	0
4	13	400	0	0	0	0	0	0	0	0
5	20	740	6	580	2	1140	2	260	0	0
6	29	1260	0	0	1	340	0	0	1	40
7	24	1060	1	310	0	0	0	0	0	0
8	38	1370	1	260	0	0	3	300	1	60
9	30	2100	2	810	1	460	1	110	0	0
10	42	1670	1	130	1	290	1	60	2	610
11	16	860	0	0	1	90	0	0	1	240
12	43	1420	3	510	2	400	1	90	0	0
13	37	3640	7	490	1	130	2	510	1	60
14	26	1080	2	120	1	610	0	0	1	860
Total	355	16820	23	3210	11	3520	14	1650	7	1870
STATION D										
1	20	810	0	0	3	910	0	0	0	0
2	14	530	1	110	2	380	0	0	0	0
3	23	1170	0	0	1	550	1	60	0	0
4	29	1260	0	0	0	0	0	0	0	0
5	21	940	0	0	0	0	0	0	0	0
6	20	1000	2	200	0	0	0	0	1	60
7	42	1440	3	660	1	140	0	0	0	0
8	16	880	0	0	0	0	0	0	2	100
9	12	430	0	0	2	1170	0	0	0	0
10	8	420	1	70	0	0	0	0	1	120
11	3	70	0	0	1	200	0	0	2	370
12	6	100	0	0	0	0	0	0	1	210
13	2	50	0	0	0	0	2	610	0	0
14	19	540	0	0	0	0	0	0	0	0
15	22	1710	1	60	3	820	0	0	1	50
16	27	1110	4	310	2	1030	1	100	0	0
17	31	1500	0	0	1	250	0	0	2	410
Total	315	13960	12	1410	16	5450	4	770	10	1320
STATION E										
1	12	670	0	0	1	220	0	0	1	410
2	16	460	0	0	0	0	0	0	0	0
3	20	930	0	0	1	320	1	40	0	0
4	18	970	0	0	0	0	1	120	1	860
5	13	390	2	630	0	0	0	0	1	80
6	10	450	3	800	0	0	0	0	0	0
7	8	330	0	0	0	0	0	0	0	0
8	4	180	0	0	0	0	0	0	1	180
9	3	90	0	0	0	0	0	0	0	0
10	7	370	0	0	0	0	1	90	0	0
11	9	420	0	0	1	450	1	60	0	0
12	11	510	0	0	1	80	2	310	0	0
13	19	890	0	0	1	140	2	260	1	300
14	27	1350	1	60	1	290	0	0	1	270
15	38	1660	1	130	2	1150	1	100	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
16	44	2770	0	0	0	0	0	0	0	0
17	35	2050	2	560	0	0	0	0	0	0
18	29	1120	2	420	0	0	0	0	1	90
19	30	1260	0	0	0	0	1	90	3	1130
20	34	1110	0	0	0	0	1	130	1	560
21	27	1340	1	300	0	0	0	0	1	160
Total	414	19320	12	2900	8	2650	11	1200	12	4040
STATION F										
1	11	380	0	0	0	0	0	0	0	0
2	20	560	0	0	2	1150	1	60	0	0
3	13	510	0	0	0	0	0	0	0	0
4	7	300	0	0	0	0	0	0	0	0
5	10	260	2	700	0	0	0	0	0	0
6	8	210	3	180	0	0	0	0	0	0
7	12	460	0	0	0	0	0	0	0	0
8	8	400	0	0	0	0	0	0	0	0
9	8	890	0	0	0	0	0	0	0	0
10	14	580	0	0	0	0	0	0	0	0
11	10	350	0	0	2	900	0	0	1	0
12	27	1310	5	590	1	770	0	0	0	710
13	32	1520	4	270	0	0	1	120	0	0
14	30	1030	0	0	0	0	0	0	0	0
15	20	860	0	0	0	0	0	0	0	0
16	26	940	0	0	2	560	0	0	0	0
17	21	1140	0	0	0	0	0	0	0	0
18	18	760	1	100	0	0	1	90	0	0
19	12	820	0	0	0	0	0	0	0	0
20	19	1070	0	0	1	840	0	0	0	0
21	34	1470	2	410	0	0	0	0	0	0
22	24	2110	1	180	0	0	1	150	0	0
23	41	1840	0	0	0	0	0	0	0	0
24	23	1220	0	0	0	0	0	0	0	0
Total	448	20990	18	2430	8	4220	4	420	1	710
STATION G										
1	10	390	0	0	1	510	0	0	0	0
2	7	340	0	0	1	1060	1	60	0	0
3	3	180	0	0	0	0	0	0	0	0
4	9	480	0	0	0	0	0	0	0	0
5	11	600	1	90	0	0	0	0	1	70
6	3	90	0	0	0	0	0	0	0	0
7	12	400	0	0	0	0	0	0	0	0
8	22	980	0	0	0	0	0	0	0	0
9	29	1450	0	0	1	120	0	0	0	0
10	31	1880	0	0	0	0	0	0	0	0
11	26	2410	0	0	0	0	1	90	0	0
12	18	970	1	200	0	0	0	0	0	0
13	14	830	0	0	0	0	0	0	0	0
14	10	500	2	240	2	370	0	0	0	0
15	16	950	4	310	1	110	0	0	0	0
16	29	2220	2	500	0	0	0	0	1	180
17	45	1820	0	0	1	710	0	0	0	0
18	51	1550	3	260	1	270	0	0	0	0
19	22	1410	8	470	0	0	0	0	0	0
20	26	1620	0	0	0	0	0	0	1	60
21	20	1050	0	0	1	160	0	0	2	920
22	30	1350	0	0	0	0	0	0	0	0
23	21	1380	1	300	3	1160	1	100	0	0
24	24	1610	0	0	0	0	0	0	0	0
25	31	1840	1	420	0	0	0	0	0	0
26	40	1520	2	860	2	880	0	0	1	40
27	38	2000	0	0	1	410	1	210	0	0
Total	598	31820	25	3650	15	5760	4	460	6	1270
STATION H										
1	17	650	3	120	0	0	2	180	0	0
2	21	810	1	60	1	620	1	60	1	450
3	15	510	0	0	0	0	1	200	3	310
4	9	320	0	0	0	0	0	0	0	0
5	12	550	0	0	0	0	0	0	0	0
6	7	290	0	0	0	0	0	0	1	70

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
7	5	90	0	0	0	0	0	0	0	0
8	2	70	0	0	0	0	0	0	0	0
9	8	150	0	0	0	0	0	0	1	730
10	14	370	1	170	0	0	0	0	0	0
11	10	560	0	0	0	0	1	130	0	0
12	21	940	2	640	0	0	0	0	0	0
13	17	860	5	350	3	1010	0	0	0	0
14	26	1140	1	230	1	140	1	70	1	490
15	34	1420	0	0	0	0	1	310	0	0
16	25	1030	0	0	0	0	2	210	0	0
17	30	1850	3	160	2	840	0	0	0	0
18	32	1490	7	310	0	0	0	0	0	0
19	22	1180	4	260	0	0	1	80	1	120
20	41	1620	2	80	0	0	2	340	0	0
21	33	2870	0	0	0	0	1	100	0	0
22	38	2030	1	90	0	0	0	0	2	570
23	36	1880	2	120	1	1420	0	0	1	60
24	41	1960	6	420	0	0	0	0	0	0
25	32	3740	3	310	0	0	0	0	0	0
26	32	2360	2	450	1	710	2	260	0	0
Total	**580**	**30740**	**43**	**3770**	**9**	**4740**	**15**	**1950**	**11**	**2800**
STATION I										
1	10	270	0	0	1	1740	4	340	0	0
2	9	340	0	0	0	0	2	180	0	0
3	21	780	0	0	0	0	1	60	0	0
4	17	540	1	120	0	0	0	0	1	70
5	6	180	0	0	0	0	0	0	3	390
6	10	430	0	0	1	900	0	0	0	0
7	12	710	0	0	0	0	0	0	0	0
8	8	640	3	810	0	0	0	0	0	0
9	3	80	0	0	0	0	1	130	2	810
10	4	100	0	0	0	0	0	0	0	0
11	2	80	0	0	0	0	0	0	0	0
12	5	120	0	0	0	0	0	0	0	0
13	13	500	4	600	0	0	0	0	0	0
14	24	910	5	440	0	0	0	0	1	330
15	17	770	2	300	0	0	0	0	0	0
16	16	530	1	90	0	0	0	0	0	0
17	13	630	0	0	0	0	0	0	0	0
18	11	410	0	0	0	0	1	370	0	0
19	27	1240	2	710	0	0	0	0	1	200
20	31	1180	4	930	0	0	0	0	0	0
21	35	2560	4	470	0	0	0	0	0	0
22	30	1050	2	180	0	0	0	0	0	0
23	22	3190	0	0	0	0	0	0	0	0
24	18	1110	0	0	0	0	0	0	2	210
25	26	1950	6	630	3	2280	3	480	0	0
26	37	2470	10	1030	2	540	1	90	0	0
27	30	1310	5	420	2	760	0	0	0	0
Total	**457**	**24080**	**49**	**6730**	**9**	**6220**	**13**	**1650**	**10**	**2010**
STATION J										
1	12	600	0	0	0	0	0	0	0	0
2	16	830	0	0	2	470	0	0	2	460
3	24	1150	0	0	1	1160	0	0	0	0
4	17	560	0	0	0	0	0	0	0	0
5	7	310	0	0	0	0	1	60	0	0
6	6	250	0	0	1	3580	0	0	0	0
7	3	100	1	90	0	0	0	0	0	0
8	18	760	0	0	0	0	0	0	4	270
9	14	800	0	0	0	0	0	0	3	160
10	4	130	0	0	0	0	0	0	0	0
11	9	450	1	310	0	0	1	630	0	0
12	20	920	0	0	0	0	0	0	0	0
13	15	630	2	160	0	0	0	0	0	0
14	10	510	0	0	0	0	0	0	0	0
15	24	1230	4	500	2	1820	0	0	1	70
16	20	2280	5	480	1	390	1	100	0	0
17	31	1100	1	70	0	0	0	0	0	0
18	33	1540	0	0	0	0	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
19	53	1460	0	0	0	0	0	0	0	0
20	42	1830	2	130	0	0	0	0	0	0
21	28	2060	1	50	1	630	0	0	0	0
22	35	1920	3	460	1	2470	0	0	0	0
23	21	1160	0	0	0	0	0	0	0	0
24	43	1990	0	0	0	0	2	210	0	0
25	48	2120	1	370	0	0	1	80	0	0
26	16	1510	1	80	0	0	0	0	0	0
27	26	3420	1	100	1	190	0	0	1	760
28	30	1640	0	0	0	0	0	0	0	0
29	22	1090	2	680	1	700	0	0	0	0
30	39	1720	1	210	0	0	1	140	0	0
31	40	1800	0	0	0	0	1	340	0	0
Total	726	37870	26	3690	11	11410	8	1560	11	1720
STATION K										
1	11	490	0	0	0	0	1	100	0	0
2	16	670	0	0	0	0	1	70	0	0
3	12	710	0	0	1	520	0	0	0	0
4	8	340	0	0	0	0	0	0	0	0
5	3	100	0	0	0	0	0	0	0	0
6	7	260	0	0	0	0	0	0	0	0
7	2	70	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	3	200
9	3	130	0	0	0	0	0	0	1	750
10	6	200	0	0	0	0	0	0	0	0
11	14	500	0	0	0	0	0	0	0	0
12	22	1280	0	0	0	0	1	80	0	0
13	26	1190	1	310	0	0	0	0	0	0
14	18	2480	0	0	0	0	0	0	0	0
15	9	640	0	0	0	0	0	0	0	0
16	4	210	0	0	1	280	0	0	0	0
17	15	880	0	0	0	0	0	0	0	0
18	29	2360	2	410	0	0	1	120	0	0
19	33	1500	1	460	0	0	0	0	0	0
20	20	1010	0	0	0	0	0	0	1	70
21	28	1320	0	0	0	0	0	0	1	90
Total	286	16340	4	1180	2	800	4	370	6	1110
STATION L										
1	7	300	0	0	1	220	0	0	0	0
2	10	660	0	0	0	0	1	160	0	0
3	24	3210	0	0	0	0	2	430	2	520
4	16	810	0	0	0	0	0	0	0	0
5	6	240	0	0	0	0	0	0	0	0
6	6	190	2	460	0	0	0	0	0	0
7	10	530	0	0	0	0	0	0	2	130
8	20	980	0	0	0	0	0	0	0	0
9	15	740	0	0	1	1130	0	0	0	0
10	12	630	0	0	0	0	0	0	1	200
11	27	1250	1	100	0	0	1	90	1	1110
12	38	2650	3	270	0	0	0	0	0	0
13	31	1720	0	0	0	0	0	0	0	0
14	26	3310	0	0	0	0	0	0	0	0
15	22	1260	0	0	0	0	0	0	0	0
16	30	2010	1	310	0	0	1	230	3	830
17	29	2220	0	0	0	0	0	0	2	1420
Total	329	22710	7	1140	2	1350	5	910	11	4210
STATION M										
1	22	1420	3	100	0	0	1	60	0	0
2	14	750	2	120	0	0	1	170	0	0
3	7	320	0	0	0	0	0	0	0	0
4	3	120	0	0	0	0	0	0	0	0
5	20	760	0	0	0	0	0	0	0	0
6	6	140	0	0	0	0	0	0	0	0
7	12	580	0	0	0	0	0	0	0	0
8	18	630	0	0	0	0	1	200	0	0
9	34	1630	1	410	0	0	0	0	0	0
10	20	2370	0	0	0	0	0	0	0	0
11	26	1120	0	0	0	0	0	0	0	0
12	22	1470	0	0	1	1350	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
Total	204	11310	6	630	1	1350	3	430	0	0
STATION N										
1	10	340	0	0	0	0	1	90	0	0
2	24	830	0	0	0	0	1	60	0	0
3	29	1310	1	250	1	170	0	0	0	0
4	30	1140	0	0	0	0	0	0	0	0
5	22	2860	0	0	0	0	0	0	0	0
6	11	560	0	0	0	0	1	90	0	0
7	5	230	0	0	0	0	0	0	0	0
8	8	190	3	310	0	0	0	0	2	80
9	19	660	1	60	0	0	0	0	0	0
10	33	1870	2	180	0	0	0	0	6	300
11	28	2420	0	0	1	470	0	0	0	0
Total	219	12410	7	800	2	640	3	240	8	380
STATION O										
1	19	670	3	660	0	0	2	390	0	0
2	12	700	1	420	0	0	1	100	0	0
3	8	490	0	0	1	270	0	0	0	0
4	7	300	0	0	0	0	0	0	0	0
5	3	80	2	100	0	0	0	0	0	0
6	7	260	7	410	0	0	0	0	0	0
7	10	420	3	120	0	0	0	0	0	0
8	24	1470	0	0	0	0	0	0	0	0
9	18	1030	0	0	0	0	0	0	0	0
10	16	900	1	60	0	0	0	0	0	0
11	34	2160	3	800	0	0	0	0	0	0
12	27	1880	0	0	1	860	2	530	0	0
13	22	1430	0	0	0	0	0	0	0	0
Total	207	11790	20	2570	2	1130	5	1020	0	0
STATION P										
1	23	1220	2	310	0	0	0	0	0	0
2	19	760	3	1280	0	0	2	100	0	0
3	14	810	0	0	0	0	1	90	0	0
4	26	1170	0	0	0	0	0	0	1	540
5	9	350	0	0	1	2470	0	0	0	0
6	2	70	0	0	0	0	0	0	0	0
7	15	670	0	0	0	0	1	40	0	0
8	27	960	1	420	0	0	2	300	0	0
9	34	1520	1	80	1	260	1	210	0	0
Total	169	7530	7	2090	2	2730	7	740	1	540
STATION Q										
1	19	1040	2	130	0	0	1	80	1	50
2	10	430	6	370	0	0	1	130	2	180
3	12	390	2	200	0	0	3	380	1	1330
4	9	310	0	0	0	0	2	600	0	0
5	26	1480	1	250	0	0	0	0	0	0
6	20	2960	3	670	1	810	0	0	1	1290
7	34	1210	1	500	1	260	0	0	3	810
8	30	1630	1	60	0	0	0	0	1	140
Total	160	9450	16	2180	2	1070	7	1190	9	3800

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
STATION A	138	9000	22	2470	7	4760	5	900	1	460
STATION B	231	10830	14	2220	8	3900	13	1480	15	4070
STATION C	355	16820	23	3210	11	3520	14	1650	7	1870
STATION D	315	13960	12	1410	16	5450	4	770	10	1320
STATION E	414	19320	12	2900	8	2650	11	1200	12	4040
STATION F	448	20990	18	2430	8	4220	4	420	1	710
STATION G	598	31820	25	3650	15	5760	4	460	6	1270
STATION H	580	30740	43	3770	9	4740	15	1950	11	2800
STATION I	457	24080	49	6730	9	6220	13	1650	10	2010
STATION J	726	37870	26	3690	11	11410	8	1560	11	1720
STATION K	286	16340	4	1180	2	800	4	370	6	1110
STATION L	329	22710	7	1140	2	1350	5	910	11	4210
STATION M	204	11310	6	630	1	1350	3	430	0	0
STATION N	219	12410	7	800	2	640	3	240	8	380
STATION O	207	11790	20	2570	2	1130	5	1020	0	0
STATION P	169	7530	7	2090	2	2730	7	740	1	540
STATION Q	160	9450	16	2180	2	1070	7	1190	9	3800
TOTAL	5836	306970	311	43070	115	61700	125	16940	119	30310
% WEIGHT		66.9		9.4		13.4		3.7		6.6
% ITEM	89.7		4.8		1.8		1.9		1.8	

APPENDIX IV

CHELONES 2 - SUMMARY OF LITTER SURVEY.

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
STATION A										
1	16	670	1	210	1	160	0	0	2	610
2	12	560	3	170	1	200	0	0	1	70
3	19	800	2	100	0	0	0	0	0	0
4	24	990	0	0	0	0	2	400	0	0
5	18	910	0	0	0	0	1	80	0	0
6	10	260	0	0	0	0	0	0	0	0
7	9	370	0	0	0	0	0	0	1	150
8	16	870	0	0	1	310	0	0	0	0
9	20	1060	1	90	2	960	1	180	0	0
10	31	1270	0	0	1	810	0	0	0	0
11	29	1160	0	0	1	140	0	0	0	0
Total	204	8920	7	570	7	2580	4	660	4	830
STATION B										
1	10	240	0	0	0	0	1	60	0	0
2	17	560	1	260	1	200	1	140	1	300
3	26	900	0	0	0	0	0	0	0	0
4	38	1160	0	0	0	0	0	0	1	90
5	25	1080	1	40	0	0	0	0	0	0
6	19	500	3	610	0	0	0	0	0	0
7	10	180	1	60	0	0	0	0	0	0
8	6	100	0	0	0	0	0	0	0	0
9	12	340	0	0	0	0	1	100	0	0
10	20	780	0	0	0	0	0	0	1	60
11	24	810	0	0	0	0	0	0	2	1650
12	20	940	2	270	0	0	0	0	0	0
13	30	1180	1	80	2	810	0	0	0	0
14	31	1030	4	260	1	1320	0	0	0	0
15	22	920	6	380	0	0	0	0	0	0
16	39	1150	1	50	0	0	0	0	1	310
17	28	2410	1	170	0	0	1	120	0	0
18	30	1210	0	0	0	0	0	0	0	0
Total	407	15490	21	2180	4	2330	4	420	6	2410
STATION C										
1	20	900	1	50	0	0	0	0	0	0
2	16	640	3	720	0	0	0	0	0	0
3	13	340	3	160	0	0	0	0	0	0
4	12	390	2	140	0	0	0	0	0	0
5	23	660	4	280	1	90	0	0	0	0
6	9	300	1	60	0	0	0	0	0	0
7	7	150	0	0	0	0	0	0	0	0
8	11	310	0	0	1	160	0	0	0	0
9	20	880	0	0	0	0	0	0	0	0
10	29	1190	0	0	1	210	1	80	0	0
11	36	1070	1	80	0	0	0	0	0	0
12	30	1360	0	0	1	450	0	0	1	230
13	37	1250	0	0	0	0	0	0	0	0
14	32	1000	4	260	0	0	0	0	0	0
15	41	1200	8	510	0	0	0	0	0	0
16	35	1460	5	290	0	0	1	160	1	190
17	26	2210	1	90	0	0	0	0	2	640
18	22	950	0	0	0	0	0	0	0	0
19	28	2750	0	0	1	1100	0	0	0	0
20	43	1840	1	250	0	0	0	0	0	0
21	31	1110	1	120	0	0	0	0	0	0
22	36	1330	2	560	0	0	0	0	0	0
23	30	1280	1	370	0	0	0	0	0	0
Total	587	24570	38	3940	5	2010	2	240	4	1060
STATION D										
1	14	770	0	0	0	0	0	0	0	0
2	21	800	0	0	0	0	0	0	1	600
3	16	610	0	0	0	0	0	0	1	370
4	11	510	1	90	0	0	0	0	0	0
5	7	160	1	110	0	0	1	180	0	0
6	10	300	0	0	0	0	0	0	0	0
7	19	440	0	0	0	0	0	0	0	0
8	26	1210	0	0	0	0	0	0	1	230
9	20	890	1	560	0	0	0	0	0	0
10	34	1290	0	0	1	1140	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
11	46	1160	0	0	0	0	0	0	0	0
12	29	1310	0	0	0	0	1	250	2	840
13	22	1870	1	220	1	280	0	0	3	1420
14	34	1570	1	460	0	0	0	0	1	160
15	30	1060	0	0	1	500	0	0	1	410
Total	339	13950	5	1440	3	1920	2	430	10	4030
STATION E										
1	14	470	0	0	1	180	0	0	0	0
2	26	1230	0	0	1	370	0	0	0	0
3	37	2940	1	220	0	0	1	40	0	0
4	16	590	0	0	0	0	1	90	0	0
5	8	440	0	0	0	0	2	510	1	840
6	17	630	0	0	1	500	1	400	1	290
7	38	1280	1	130	0	0	0	0	0	0
8	46	1330	4	400	0	0	0	0	0	0
9	25	1060	1	90	1	280	0	0	0	0
10	31	1740	1	130	1	620	1	130	0	0
Total	258	11710	8	970	5	1950	6	1170	2	1130

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
STATION A	204	8920	7	570	7	2580	4	660	4	830
STATION B	407	15490	21	2180	4	2330	4	420	6	2410
STATION C	587	24570	38	3940	5	2010	2	240	4	1060
STATION D	339	13950	5	1440	3	1920	2	430	10	4030
STATION E	258	11710	8	970	5	1950	6	1170	2	1130
TOTAL	1795	74640	79	9100	24	10790	18	2920	26	9460
% WEIGHT		69.8		8.5		10.1		2.7		8.8
% ITEM	92.4		4.2		1.2		0.9		1.3	

APPENDIX V

CHELONES 3 - SUMMARY OF LITTER SURVEY.

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
STATION A										
1	8	340	0	0	0	0	0	0	0	0
2	6	440	0	0	0	0	1	110	0	0
3	9	480	0	0	0	0	1	80	0	0
4	11	600	0	0	0	0	0	0	2	350
5	10	590	2	310	1	150	0	0	0	0
6	6	210	3	640	0	0	0	0	2	180
7	9	470	2	450	0	0	0	0	0	0
8	24	870	1	90	0	0	2	140	3	640
9	26	1210	0	0	0	0	1	30	1	900
10	19	1030	0	0	1	490	0	0	0	0
11	30	1880	3	230	0	0	0	0	0	0
12	25	1620	4	400	1	240	1	160	0	0
13	20	2120	3	520	0	0	0	0	0	0
Total	203	11860	18	2640	3	880	6	520	0	2070
STATION B										
1	12	510	0	0	0	0	0	0	0	0
2	9	300	0	0	1	140	0	0	2	720
3	7	210	0	0	2	630	0	0	0	0
4	12	380	0	0	0	0	0	0	1	30
5	10	410	0	0	0	0	0	0	0	0
6	16	440	0	0	0	0	0	0	1	680
7	14	670	0	0	0	0	1	80	2	410
8	18	890	0	0	1	80	0	0	0	0
9	20	810	0	0	0	0	0	0	0	0
10	15	640	4	320	0	0	0	0	1	80
11	19	1090	3	190	0	0	0	0	0	0
12	26	1240	5	200	0	0	0	0	0	0
13	20	760	0	0	1	200	0	0	1	150
14	18	1000	0	0	0	0	0	0	1	60
15	25	1400	2	110	0	0	0	0	0	0
16	26	1380	3	160	2	480	1	80	0	0
17	31	1570	1	150	1	340	0	0	0	0
18	29	1180	2	360	0	0	0	0	1	130
19	30	2310	0	0	0	0	0	0	0	0
20	27	1230	1	240	0	0	1	100	0	0
Total	384	18420	21	1730	8	1870	3	260	10	2260
STATION C										
1	7	310	3	160	0	0	0	0	0	0
2	6	240	4	230	1	180	1	60	2	140
3	12	280	1	50	0	0	1	70	3	260
4	8	200	7	420	0	0	0	0	0	0
5	6	190	1	100	0	0	0	0	0	0
6	11	270	0	0	0	0	1	300	0	0
7	9	300	0	0	0	0	2	420	0	0
8	14	630	0	0	0	0	0	0	1	80
9	10	420	0	0	1	720	0	0	0	0
10	21	710	0	0	0	0	0	0	0	0
11	16	640	2	500	0	0	0	0	0	0
12	14	750	1	60	0	0	3	210	1	250
13	18	820	0	0	0	0	0	0	0	0
14	24	860	0	0	0	0	0	0	0	0
15	12	430	0	0	0	0	1	100	0	0
16	10	350	0	0	1	990	0	0	0	0
17	16	600	0	0	0	0	0	0	2	280
18	17	660	1	80	0	0	0	0	1	620
19	21	900	0	0	0	0	0	0	0	0
20	19	930	2	510	0	0	2	280	0	0
21	25	1090	2	360	2	3650	1	110	0	0
22	29	1460	3	120	1	270	1	370	0	0
23	22	1280	4	450	0	0	2	230	0	0
24	30	1370	2	140	0	0	0	0	1	200
25	26	1040	0	0	0	0	0	0	0	0
26	38	2380	2	190	0	0	1	80	1	1290
27	40	1660	3	400	1	2300	0	0	0	0
28	34	1500	2	640	0	0	2	620	0	0
Total	515	22270	40	4410	7	8110	18	2850	12	3120
STATION D										
1	13	460	0	0	0	0	1	60	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
2	10	210	0	0	0	0	1	80	1	660
3	9	160	0	0	0	0	1	120	0	0
4	11	290	0	0	0	0	1	90	0	0
5	14	340	1	540	0	0	2	250	0	0
6	10	270	0	0	0	0	0	0	0	0
7	6	170	0	0	0	0	0	0	0	0
8	2	70	0	0	0	0	0	0	0	0
9	4	120	0	0	0	0	1	320	0	0
10	7	400	0	0	0	0	2	140	0	0
11	12	510	0	0	0	0	0	0	0	0
12	29	600	6	330	0	0	0	0	1	230
13	7	320	5	360	0	0	1	60	0	0
14	14	550	7	340	1	170	2	200	0	0
15	21	600	2	100	0	0	1	100	0	0
16	24	730	0	0	0	0	2	90	0	0
17	16	620	0	0	0	0	0	0	0	0
18	20	820	0	0	0	0	0	0	1	380
19	25	900	0	0	0	0	3	700	0	0
20	19	640	1	280	0	0	1	320	0	0
21	29	1270	0	0	1	200	0	0	0	0
22	30	1060	2	610	0	0	0	0	1	870
23	56	1160	1	370	1	360	0	0	0	0
24	47	1050	0	0	0	0	1	140	0	0
25	38	960	1	480	1	1300	2	600	1	550
26	34	1180	1	300	0	0	3	490	0	0
Total	507	15460	27	3710	4	2030	25	3760	5	2690
STATION E										
1	14	500	0	0	0	0	1	130	0	0
2	10	340	0	0	1	370	0	0	1	560
3	9	260	0	0	0	0	0	0	0	0
4	12	400	0	0	0	0	0	0	0	0
5	16	460	0	0	0	0	0	0	0	0
6	20	820	0	0	2	830	2	210	0	0
7	13	640	1	190	0	0	1	90	0	0
8	10	480	3	430	0	0	0	0	1	960
9	9	390	4	500	0	0	0	0	0	0
10	14	710	0	0	1	2870	1	100	0	0
11	29	1190	0	0	0	0	1	640	0	0
12	30	1060	0	0	0	0	1	280	0	0
Total	186	7250	8	1120	4	4070	7	1450	2	1520
STATION F										
1	8	360	0	0	0	0	0	0	0	0
2	5	180	1	60	1	310	1	60	0	0
3	2	90	5	240	0	0	2	270	1	420
4	12	370	3	180	0	0	0	0	0	0
5	6	190	0	0	0	0	0	0	0	0
6	9	350	0	0	1	170	0	0	0	0
7	16	670	0	0	0	0	0	0	1	180
8	12	390	0	0	2	2460	1	80	0	0
9	10	400	1	160	0	0	0	0	0	0
10	15	720	0	0	0	0	1	90	0	0
11	20	840	0	0	1	280	0	0	0	0
12	18	690	0	0	0	0	0	0	0	0
13	30	960	1	290	0	0	2	370	0	0
14	35	1140	2	540	1	560	1	340	0	0
15	25	1060	0	0	0	0	1	170	0	0
16	29	1190	0	0	0	0	1	260	0	0
Total	252	9600	13	1470	6	3780	10	1640	2	600
STATION G										
1	12	540	0	0	0	0	0	0	0	0
2	10	310	0	0	1	230	0	0	1	260
3	7	200	0	0	0	0	0	0	0	0
4	3	100	0	0	0	0	0	0	0	0
5	8	190	0	0	0	0	0	0	0	0
6	14	370	0	0	0	0	1	90	0	0
7	26	710	0	0	0	0	0	0	0	0
8	15	600	0	0	1	190	0	0	0	0
9	10	260	2	410	2	810	0	0	0	0
10	19	480	3	670	1	1210	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No.Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
11	22	880	1	70	0	0	1	170	1	610
12	26	960	0	0	0	0	0	0	0	0
13	30	900	0	0	0	0	0	0	0	0
14	19	830	0	0	1	310	0	0	0	0
15	14	930	4	280	0	0	0	0	0	0
16	17	620	3	300	0	0	0	0	0	0
17	10	410	5	340	0	0	2	370	0	0
18	24	850	1	50	0	0	1	60	0	0
19	43	1180	0	0	0	0	0	0	0	0
20	31	1050	0	0	0	0	0	0	0	0
21	29	1270	0	0	1	460	0	0	1	1070
22	47	1140	1	90	0	0	0	0	1	490
Total	436	14780	20	2210	7	3210	5	690	4	2430
STATION H										
1	3	80	0	0	0	0	0	0	0	0
2	2	90	0	0	0	0	0	0	0	0
3	1	40	0	0	0	0	0	0	0	0
4	3	40	0	0	0	0	0	0	0	0
5	6	80	1	80	0	0	0	0	0	0
6	0	0	1	60	0	0	0	0	0	0
7	2	50	4	200	0	0	0	0	0	0
8	4	100	6	320	0	0	0	0	0	0
9	12	230	2	100	0	0	0	0	0	0
10	20	410	0	0	0	0	0	0	0	0
11	17	560	0	0	0	0	0	0	0	0
12	31	890	0	0	0	0	0	0	0	0
13	25	710	0	0	1	100	0	0	0	0
14	15	640	0	0	0	0	0	0	0	0
15	37	1050	1	70	0	0	0	0	0	0
16	29	1280	2	130	0	0	0	0	0	0
17	16	600	1	60	2	540	0	0	0	0
18	32	970	0	0	0	0	0	0	0	0
19	20	800	0	0	0	0	0	0	1	130
20	24	940	0	0	1	280	0	0	0	0
21	32	1170	0	0	2	410	0	0	0	0
22	41	2860	1	230	0	0	1	120	0	0
23	18	580	1	180	0	0	0	0	1	710
24	14	710	1	410	1	630	0	0	0	0
25	46	1430	0	0	0	0	0	0	0	0
26	30	1350	0	0	0	0	0	0	0	0
Total	480	17660	21	1840	7	1960	1	120	2	840
STATION I										
1	11	310	0	0	0	0	0	0	0	0
2	8	290	0	0	0	0	0	0	0	0
3	15	400	0	0	0	0	0	0	1	30
4	7	150	0	0	0	0	0	0	0	0
5	4	90	1	90	0	0	1	100	0	0
6	6	70	0	0	0	0	1	60	0	0
7	9	140	0	0	0	0	1	130	0	0
8	14	270	0	0	0	0	1	80	0	0
9	12	210	0	0	0	0	0	0	0	0
10	10	200	0	0	0	0	0	0	0	0
11	18	570	0	0	0	0	0	0	0	0
12	26	790	0	0	1	160	0	0	0	0
13	20	860	0	0	0	0	0	0	0	0
14	27	900	0	0	0	0	1	180	1	270
15	34	1030	3	370	0	0	1	40	0	0
16	48	1120	5	400	0	0	2	90	0	0
17	52	1270	1	170	0	0	1	80	0	0
18	16	870	0	0	1	520	0	0	0	0
19	26	1000	0	0	0	0	3	590	0	0
20	19	950	0	0	0	0	1	170	0	0
21	25	1040	0	0	0	0	0	0	1	90
22	37	1170	0	0	0	0	1	60	0	0
23	32	1370	1	260	1	890	0	0	1	650
24	34	1090	1	430	0	0	0	0	0	0
Total	510	16160	12	1720	3	1570	14	1580	4	1040
STATION J										
1	15	410	0	0	0	0	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
2	21	690	10	510	1	280	0	0	1	200
3	19	560	7	380	0	0	0	0	0	0
4	11	470	0	0	0	0	1	110	0	0
5	14	670	0	0	0	0	0	0	0	0
6	7	260	0	0	0	0	0	0	0	0
7	5	140	0	0	0	0	0	0	0	0
8	13	280	0	0	0	0	0	0	0	0
9	20	610	0	0	0	0	1	50	0	0
10	27	820	1	60	1	2480	0	0	0	0
11	38	970	0	0	0	0	0	0	0	0
12	46	1060	0	0	0	0	0	0	0	0
13	24	1140	2	210	0	0	0	0	0	0
14	12	740	3	180	0	0	2	300	0	0
15	26	900	0	0	2	860	0	0	1	420
16	34	1070	1	340	0	0	1	150	0	0
17	30	990	1	250	0	0	1	80	0	0
Total	362	11780	25	1930	4	3620	6	690	2	620
STATION K										
1	19	440	0	0	1	160	0	0	0	0
2	12	310	1	210	0	0	0	0	0	0
3	8	180	0	0	0	0	0	0	0	0
4	10	240	0	0	0	0	0	0	0	0
5	20	660	0	0	0	0	0	0	0	0
6	17	710	0	0	0	0	0	0	0	0
7	32	920	0	0	0	0	0	0	0	0
8	28	1140	1	0	0	0	0	0	0	0
9	39	1020	3	620	0	0	0	0	0	0
10	30	2470	0	0	1	2100	0	0	0	0
11	25	1280	1	90	0	0	0	0	0	0
12	30	1160	1	140	0	0	0	0	0	0
Total	270	10530	7	1060	2	2260	0	0	0	0
STATION L										
1	21	810	0	0	1	220	0	0	0	0
2	16	600	1	260	0	0	2	200	0	0
3	20	940	3	310	0	0	1	70	1	80
4	10	270	5	390	0	0	0	0	0	0
5	6	160	1	70	0	0	0	0	0	0
6	19	540	0	0	0	0	0	0	0	0
7	39	1060	1	60	1	730	0	0	0	0
8	29	2820	6	480	0	0	0	0	0	0
9	30	1770	2	370	0	0	1	410	0	0
Total	190	8970	19	1940	2	950	4	680	1	80

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
STATION A	203	11860	18	2640	3	880	6	520	8	2070
STATION B	384	18420	21	1730	8	1870	3	260	10	2260
STATION C	515	22270	40	4410	7	8110	18	2850	12	3120
STATION D	507	15460	27	3710	4	2030	25	3760	5	2690
STATION E	186	7250	8	1120	4	4070	7	1450	2	1520
STATION F	252	9600	13	1470	6	3780	10	1640	2	600
STATION G	436	14780	20	2210	7	3210	5	690	4	2430
STATION H	480	17660	21	1840	7	1960	1	120	2	840
STATION I	510	16160	12	1720	3	1570	14	1580	4	1040
STATION J	362	11780	25	1930	4	3620	6	690	2	620
STATION K	270	10530	7	1060	2	2260	0	0	0	0
STATION L	190	8970	19	1940	2	950	4	680	1	80
TOTAL	4295	164740	231	25780	57	34310	99	14240	52	17270
% WEIGHT		64.4		10		13.3		5.6		6.7
% ITEM	90.7		4.9		1.2		2.1		1.1	

APPENDIX VI

CHELONES 4 - SUMMARY OF LITTER SURVEY.

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
STATION A										
1	7	240	1	120	0	0	2	70	1	1320
2	10	390	1	160	1	1230	2	150	1	430
3	12	1365	2	220	2	700	2	50	1	240
4	8	490	2	110	1	50	1	20	1	170
5	21	805	3	330	4	330	3	290	2	800
6	36	3105	4	480	2	420	3	330	0	0
7	28	2420	2	90	5	760	3	670	1	110
Total	122	8835	15	1510	15	3490	16	1580	6	3070
STATION B										
1	9	330	2	170	0	0	0	0	0	0
2	6	220	3	230	0	0	0	0	0	0
3	7	280	1	90	0	0	1	60	0	0
4	33	1850	3	330	2	220	2	360	0	0
5	28	2010	5	440	4	650	4	820	0	0
Total	83	4690	14	1260	6	870	7	1240	0	0
STATION C										
1	2	90	0	0	0	0	0	0	0	0
2	3	120	0	0	0	0	1	30	0	0
3	3	60	0	0	0	0	0	0	0	0
4	8	340	2	130	1	230	2	110	0	0
Total	16	610	2	130	1	230	3	140	0	0
STATION D										
1	4	70	0	0	0	0	0	0	0	0
2	5	110	1	90	0	0	0	0	0	0
3	12	330	0	0	1	430	1	180	0	0
4	10	1050	2	140	2	380	2	260	1	780
Total	31	1560	3	230	3	810	3	440	1	780
STATION E										
1	1	10	0	0	0	0	0	0	0	0
2	3	40	0	0	1	110	0	0	0	0
3	2	30	0	0	0	0	0	0	0	0
4	4	60	0	0	0	0	0	0	0	0
5	15	430	1	60	0	0	0	0	0	0
6	21	520	3	290	2	380	1	30	0	0
Total	46	1090	4	350	3	490	1	30	0	0
STATION F										
1	6	140	1	40	0	0	0	0	0	0
2	11	360	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	2	20	0	0	0	0	0	0	0	0
6	3	50	0	0	0	0	1	60	0	0
7	27	720	2	480	2	420	2	480	0	0
8	23	960	1	210	3	350	1	150	0	0
Total	72	2250	4	730	5	770	4	690	0	0
STATION G										
1	2	60	0	0	1	1180	0	0	0	0
2	4	80	0	0	0	0	0	0	0	0
3	3	50	0	0	2	680	0	0	0	0
4	2	30	0	0	0	0	0	0	0	0
5	8	140	0	0	0	0	0	0	0	0
6	5	90	0	0	2	970	1	160	0	0
7	23	720	0	0	1	640	2	130	0	0
8	32	840	1	190	9	3890	3	1550	0	0
9	38	2580	3	680	13	2540	2	280	0	0
10	35	1160	2	430	8	4220	5	2440	0	0
Total	152	5750	6	1300	36	14120	13	4560	0	0
STATION H										
1	5	90	0	0	0	0	0	0	0	0
2	31	465	0	0	0	0	0	0	0	0
3	25	340	0	0	0	0	0	0	0	0
4	11	150	0	0	0	0	0	0	0	0
5	6	90	0	0	0	0	1	140	0	0
6	10	130	2	60	0	0	0	0	0	0
7	16	210	0	0	0	0	1	30	0	0
8	12	230	0	0	0	0	2	240	0	0
9	8	110	0	0	1	580	0	0	0	0
10	46	1120	1	280	0	0	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
11	31	730	0	0	0	0	0	0	0	0
12	36	1320	0	0	0	0	2	90	0	0
13	42	2050	0	0	0	0	1	230	0	0
14	58	1790	0	0	3	640	0	0	0	0
15	10	230	1	130	0	0	3	480	0	0
16	15	480	0	0	0	0	1	20	0	0
17	39	640	0	0	0	0	0	0	0	0
18	28	730	2	330	0	0	1	50	0	0
19	40	1620	4	490	0	0	0	0	0	0
20	38	2950	3	310	5	1170	1	210	0	0
21	42	4960	1	160	6	1330	0	0	0	0
22	6	80	0	0	8	2040	4	300	0	0
23	5	190	0	0	4	560	1	100	0	0
24	3	50	0	0	6	870	1	20	0	0
Total	563	20755	14	760	33	7190	19	1910	0	0
STATION I										
1	4	100	0	0	0	0	0	0	0	0
2	3	50	0	0	1	60	0	0	0	0
3	5	160	0	0	0	0	0	0	0	0
4	2	60	0	0	0	0	0	0	0	0
5	6	130	0	0	2	260	0	0	0	0
6	3	40	0	0	0	0	0	0	0	0
7	6	80	2	310	3	460	0	0	0	0
8	2	20	0	0	0	0	0	0	0	0
9	1	20	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	1	690	0	0
11	2	60	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	6	90	0	0	2	310	0	0	0	0
14	8	330	0	0	1	90	0	0	0	0
Total	48	1140	2	310	9	1180	1	690	0	0
STATION J										
1	16	480	0	0	0	0	0	0	0	0
2	8	300	0	0	0	0	0	0	0	0
3	2	30	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	31	1050	0	0	0	0	0	0	0	0
6	25	1890	1	140	0	0	0	0	0	0
7	13	290	0	0	0	0	0	0	0	0
8	2	70	0	0	2	360	0	0	0	0
9	1	30	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	1	10	0	0	0	0	1	90	0	0
12	2	20	0	0	0	0	0	0	0	0
13	3	40	0	0	1	330	0	0	0	0
14	1	20	1	350	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	1	110	0	0	0	0
18	5	250	2	620	0	0	0	0	0	0
19	2	50	0	0	0	0	1	30	0	0
20	11	670	0	0	0	0	1	220	0	0
Total	123	5200	4	110	4	800	3	340	0	0
STATION K										
1	14	360	1	140	0	0	0	0	0	0
2	21	890	0	0	1	210	0	0	0	0
3	15	650	0	0	0	0	1	50	0	0
4	13	380	2	360	0	0	0	0	0	0
5	20	1260	0	0	0	0	0	0	0	0
6	3	40	0	0	0	0	0	0	0	0
7	5	230	0	0	1	70	0	0	0	0
8	6	190	0	0	0	0	0	0	0	0
9	8	140	0	0	0	0	0	0	0	0
10	13	430	0	0	0	0	0	0	0	0
11	5	100	1	90	9	840	2	180	0	0
12	1	10	3	730	12	1080	1	120	1	650
13	3	150	2	310	8	970	0	0	0	0
14	6	140	1	190	13	2460	1	30	0	0
Total	133	4970	10	1820	44	5630	5	380	1	650

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
STATION L										
1	10	320	1	50	1	110	1	150	0	0
2	21	680	2	60	3	2080	0	0	0	0
3	18	790	2	230	2	590	2	390	0	0
4	16	1040	2	110	2	1260	0	0	0	0
5	12	580	1	60	0	0	0	0	0	0
6	9	460	0	0	3	980	1	40	0	0
7	5	220	1	380	2	1200	0	0	0	0
8	4	90	2	410	1	80	0	0	0	0
9	6	320	1	80	8	2340	3	710	0	0
10	18	950	4	1350	6	3330	4	1150	0	0
11	14	1020	5	860	8	4200	2	80	2	2560
12	24	1560	11	2040	7	1890	2	1420	1	890
Total	157	8030	32	5630	43	18060	15	3940	3	3450
STATION M										
1	12	1360	1	230	1	130	0	0	0	0
2	15	2100	1	30	1	2450	0	0	0	0
3	8	350	2	520	3	1650	0	0	0	0
4	6	480	0	0	0	0	0	0	0	0
5	5	190	0	0	0	0	1	60	0	0
6	6	140	3	280	1	290	0	0	0	0
7	24	1010	0	0	0	0	0	0	0	0
8	35	2540	1	50	0	0	0	0	0	0
9	18	1980	5	530	3	1280	0	0	0	0
10	11	1350	2	140	6	1350	2	360	0	0
11	7	180	1	140	8	2680	1	450	1	1160
12	13	860	0	0	9	960	2	630	0	0
13	24	2220	5	1320	10	3630	3	1130	0	0
14	15	1170	3	850	9	2980	1	560	1	430
Total	199	15930	24	4090	51	17400	10	3190	2	1590
STATION N										
1	35	2890	1	320	3	180	1	230	0	0
2	42	3620	2	230	1	210	1	450	0	0
3	18	2060	3	480	2	310	0	0	0	0
4	12	890	1	80	4	560	2	840	0	0
5	23	3680	0	0	2	390	1	230	0	0
6	36	3770	5	890	8	1450	3	660	0	0
7	48	4720	3	1500	11	1870	1	430	1	560
8	29	3890	7	1630	14	1240	5	2860	0	0
9	39	4280	2	210	9	970	6	3450	2	1160
Total	282	29800	24	5340	54	7180	20	9150	3	1720

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
STATION A	122	8835	15	1510	15	3490	16	1580	6	3070
STATION B	83	4690	14	1260	6	870	7	1240	0	0
STATION C	16	610	2	130	1	230	3	140	0	0
STATION D	31	1560	3	230	3	810	3	440	1	780
STATION E	46	1090	4	350	3	490	1	30	0	0
STATION F	72	2250	4	730	5	770	4	690	0	0
STATION G	152	5750	6	1300	36	14120	13	4560	0	0
STATION H	563	20755	14	760	33	7190	19	1910	0	0
STATION I	48	1140	2	310	9	1180	1	690	0	0
STATION J	123	5200	4	110	4	800	3	340	0	0
STATION K	133	4970	10	1820	44	5630	5	380	1	650
STATION L	157	8030	32	5630	43	18060	15	3940	3	3450
STATION M	199	15930	24	4090	51	17400	10	3190	2	1590
STATION N	282	29800	24	5340	54	7180	20	9150	3	1720
TOTAL	2027	110610	158	23570	307	78220	120	28280	16	11260
% WEIGHT		43.9		9.4		31		11.2		4.5
% ITEM	77.1		6		11.7		4.6		0.6	

APPENDIX VII

CHELONES 5 - SUMMARY OF LITTER SURVEY.

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
STATION A	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
1	16	1250	2	280	1	140	0	0	0	0
2	28	2620	2	330	2	360	0	0	0	0
3	11	640	0	0	1	120	0	0	0	0
4	7	340	0	0	0	0	0	0	0	0
5	21	1810	3	840	1	580	0	0	0	0
6	32	2250	2	550	1	980	1	260	0	0
Total	115	8910	126	2000	6	2180	1	260	0	0
STATION B										
1	23	970	0	0	1	210	1	30	0	0
2	19	1520	0	0	1	150	1	80	1	230
3	13	960	0	0	0	0	2	250	0	0
4	5	620	0	0	0	0	1	20	0	0
5	9	460	0	0	1	90	0	0	0	0
6	11	810	0	0	0	0	1	260	0	0
7	15	1340	1	540	0	0	3	620	3	1170
8	31	2110	0	0	2	2450	2	110	5	820
Total	126	8790	1	540	5	2900	11	1370	9	2220
STATION C										
1	24	1520	1	220	1	410	1	30	0	0
2	11	870	7	160	2	370	1	50	0	0
3	19	1320	2	80	0	0	2	70	1	230
4	13	650	0	0	2	210	1	180	0	0
5	21	480	1	50	0	0	1	20	0	0
6	10	390	3	140	0	0	1	30	0	0
7	8	410	5	390	0	0	0	0	0	0
8	29	1810	7	850	0	0	0	0	0	0
9	35	3310	3	910	3	1430	3	460	2	440
10	30	2520	2	230	1	770	5	410	2	1960
Total	200	13280	31	3030	9	3190	15	1250	5	2630
STATION D										
1	19	1540	0	0	1	130	0	0	0	0
2	11	820	0	0	1	340	1	150	0	0
3	7	210	0	0	0	0	3	690	0	0
4	31	2130	0	0	0	0	1	30	0	0
5	28	3410	7	3650	3	3690	2	420	3	530
Total	96	8110	7	3650	5	4160	7	1290	3	530
STATION E										
1	26	4710	1	60	1	190	1	80	0	0
2	18	1200	13	230	0	0	3	560	0	0
3	12	820	1	240	0	0	1	30	0	0
4	8	430	0	0	0	0	0	0	0	0
5	14	620	2	100	0	0	3	110	0	0
6	24	1420	6	290	0	0	0	0	0	0
7	42	3380	2	440	1	870	0	0	0	0
8	31	2690	1	310	0	0	2	10	0	0
Total	175	15270	26	1670	2	1060	10	790	0	0
STATION F										
1	32	1980	1	160	0	0	3	130	2	430
2	19	620	3	520	0	0	2	210	3	210
3	6	230	0	0	0	0	1	40	0	0
4	8	160	0	0	0	0	2	60	0	0
5	13	680	1	340	0	0	2	80	0	0
6	28	2300	0	0	0	0	2	20	0	0
7	42	3610	3	610	2	640	1	30	1	60
8	30	3150	1	30	0	0	3	230	1	280
Total	178	12730	9	1660	2	640	16	800	7	980
STATION G										
1	26	1520	1	50	2	380	1	30	0	0
2	30	2140	2	90	2	510	3	130	1	430
3	21	980	1	40	0	0	0	0	0	0
4	15	1020	0	0	0	0	1	50	0	0
5	6	240	1	110	0	0	1	80	0	0
6	8	310	3	350	0	0	7	270	0	0
7	29	1450	4	660	1	160	2	90	1	520
8	24	2690	1	60	3	1170	1	120	0	
Total	159	10350	13	1360	8	2220	16	770	2	950
STATION H										
1	12	650	0	0	1	230	1	30	0	0
2	15	890	0	0	2	980	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No.Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
3	26	1540	0	0	1	80	1	10	0	0
4	33	1230	0	0	1	410	2	40	0	0
5	22	760	5	240	1	1230	2	80	0	0
6	28	940	4	290	1	100	2	90	1	510
7	31	1350	1	60	0	0	0	0	0	0
8	14	640	0	0	0	0	5	210	0	0
9	15	840	0	0	0	0	0	0	0	0
10	21	850	0	0	0	0	0	0	0	0
11	15	210	0	0	2	480	0	0	3	1180
12	24	1110	0	0	0	0	5	400	0	0
13	19	860	3	150	1	710	0	0	0	0
14	20	1320	0	0	3	870	0	0	0	0
15	11	380	4	810	0	0	0	0	0	0
16	9	420	7	560	0	0	3	410	0	0
17	27	1010	11	1020	0	0	1	60	0	0
18	30	2140	8	600	1	140	2	140	0	0
19	33	2030	3	130	0	0	0	0	1	210
20	26	1880	2	870	0	0	4	1130	3	550
21	41	2410	5	1450	2	320	0	0	0	0
22	30	3100	1	50	3	4410	0	0	0	0
23	22	960	0	0	2	810	3	770	3	1450
24	26	1050	2	610	2	1540	2	540	1	140
Total	550	28570	56	6840	23	12310	33	3910	12	4040
STATION I										
1	9	260	2	120	1	300	0	0	0	0
2	11	340	1	240	2	480	0	0	0	0
3	8	210	0	0	0	0	0	0	0	0
4	14	310	0	0	0	0	1	10	0	0
5	6	90	1	180	3	220	0	0	0	0
6	10	150	4	600	0	0	1	60	0	0
7	15	180	1	30	0	0	1	120	0	0
8	8	230	0	0	0	0	0	0	0	0
9	9	170	1	40	0	0	0	0	0	0
10	16	560	3	170	1	380	3	430	0	0
11	18	510	0	0	0	0	0	0	0	0
12	13	600	0	0	0	0	1	30	1	410
13	24	1420	0	0	0	0	0	0	0	0
14	31	1640	0	0	2	320	4	260	0	0
15	15	1020	1	310	0	0	5	300	0	0
16	16	870	4	630	0	0	1	30	0	0
17	15	610	3	510	0	0	9	510	0	0
18	24	1010	0	0	0	0	2	90	0	0
19	28	1300	6	820	3	480	1	40	0	0
20	19	1610	4	300	2	500	0	0	1	960
21	34	2250	8	670	0	0	4	210	0	0
22	28	2030	0	0	0	0	3	200	0	0
23	24	2830	0	0	1	410	2	60	0	0
24	25	840	1	30	0	0	0	0	1	140
25	30	1420	4	640	0	0	2	60	0	0
26	17	620	0	0	0	0	0	0	0	0
27	22	1380	5	510	2	620	0	0	0	0
28	31	2080	2	150	2	540	0	0	0	0
29	30	2400	0	0	4	660	0	0	0	0
30	29	1440	4	860	0	0	4	240	0	0
31	18	640	5	620	1	170	3	120	0	0
32	20	610	2	110	1	130	1	30	0	0
33	41	2410	5	730	0	0	0	0	1	360
34	34	2630	8	1060	2	240	0	0	0	0
35	27	1400	4	1200	1	1030	1	100	0	0
Total	719	38070	79	10530	28	6480	49	2900	4	1870
STATION J										
1	11	240	0	0	0	0	0	0	0	0
2	7	330	3	350	0	0	0	0	0	0
3	14	210	0	0	0	0	0	0	0	0
4	12	530	1	200	0	0	0	0	0	0
5	6	100	3	680	0	0	0	0	3	840
6	10	230	3	510	0	0	0	0	2	250
7	8	150	0	0	0	0	0	0	0	0
8	21	640	0	0	0	0	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No.Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
9	16	430	0	0	0	0	0	0	1	60
10	15	240	0	0	0	0	0	0	0	0
11	20	1040	0	0	1	370	0	0	0	0
12	30	1220	0	0	0	0	2	530	0	0
13	21	960	0	0	0	0	1	200	0	0
14	16	640	0	0	0	0	0	0	0	0
15	13	710	0	0	0	0	0	0	0	0
16	21	870	0	0	0	0	1	80	0	0
17	31	1620	3	360	3	180	0	0	3	640
18	9	800	11	710	0	0	2	610	1	290
19	10	560	8	430	2	260	3	840	0	0
20	13	340	2	130	0	0	1	530	0	0
21	19	620	1	120	1	410	0	0	0	0
22	12	350	3	630	0	0	2	400	0	0
23	16	550	0	0	4	1030	0	0	0	0
24	31	1080	4	210	3	630	0	0	2	590
25	29	1400	6	560	1	230	0	0	0	0
26	22	1360	2	280	0	0	0	0	0	0
27	39	1850	6	1140	0	0	1	130	4	400
28	33	1610	0	0	0	0	4	1040	0	0
29	23	900	0	0	0	0	2	430	0	0
30	26	2130	0	0	0	0	3	560	6	930
31	19	690	2	350	1	100	0	0	2	230
32	20	1010	1	200	2	630	0	0	1	60
33	38	2410	3	620	0	0	0	0	3	1170
34	46	3650	9	1200	0	0	0	0	0	0
35	29	1230	14	930	1	150	1	500	0	0
36	42	2100	0	0	2	700	1	310	2	190
37	30	2540	0	0	3	1520	0	0	2	380
38	24	1000	2	410	0	0	0	0	2	510
39	22	1380	0	0	2	230	0	0	3	600
40	28	1620	0	0	3	820	0	0	1	130
41	35	1420	0	0	1	410	0	0	0	0
42	40	1265	1	130	0	0	1	230	0	0
43	29	1630	10	600	0	0	2	810	2	560
44	32	1820	2	540	2	1320	4	2130	0	0
Total	**988**	**47475**	**100**	**11290**	**32**	**8990**	**31**	**9330**	**40**	**7830**
STATION K										
1	16	560	0	0	0	0	0	0	0	0
2	8	310	0	0	0	0	0	0	0	0
3	12	340	0	0	0	0	0	0	0	0
4	30	2350	1	160	1	160	0	0	0	0
5	37	2890	3	480	1	270	3	180	1	230
6	48	4970	5	910	8	690	5	660	4	1860
7	35	4510	2	510	3	1390	2	70	6	640
8	40	3120	3	370	6	670	1	60	2	530
9	31	2670	9	1350	4	560	3	460	3	510
10	26	1030	2	400	1	280	0	0	1	220
11	18	490	0	0	0	0	0	0	0	0
12	21	670	1	280	1	310	2	570	0	0
Total	**322**	**23910**	**26**	**4460**	**25**	**4330**	**16**	**2000**	**17**	**3990**
STATION L										
1	2	140	0	0	0	0	0	0	0	0
2	6	250	0	0	0	0	0	0	0	0
3	23	880	0	0	0	0	2	110	1	230
4	31	1020	1	100	0	0	1	60	2	490
Total	**62**	**2290**	**1**	**100**	**0**	**0**	**3**	**170**	**3**	**720**
STATION M										
1	4	90	1	60	0	0	0	0	0	0
2	8	200	0	0	0	0	0	0	0	0
3	25	1120	0	0	0	0	1	40	1	410
4	40	1310	3	570	2	790	1	310	0	0
Total	**77**	**2720**	**4**	**630**	**2**	**790**	**2**	**350**	**1**	**410**
STATION N										
1	6	200	0	0	0	0	0	0	0	0
2	8	90	0	0	0	0	0	0	1	200
3	4	110	0	0	0	0	0	0	0	0
4	1	30	2	140	0	0	0	0	0	0
5	0	0	0	0	0	0	1	40	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No.Items	Wt(g)
6	12	230	0	0	1	290	0	0	0	0
7	26	860	3	120	0	0	1	100	1	160
8	34	1520	8	510	0	0	0	0	0	0
9	20	950	2	90	2	500	0	0	2	950
10	31	1420	3	310	0	0	0	0	1	1420
Total	**142**	**5410**	**18**	**1170**	**3**	**790**	**2**	**140**	**5**	**2730**
STATION O										
1	9	260	0	0	1	270	1	60	2	40
2	2	60	0	0	0	0	0	0	3	200
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	2	30	0	0	0	0	0	0	0	0
6	1	10	0	0	0	0	0	0	0	0
7	7	90	0	0	0	0	1	30	0	0
8	11	160	0	0	0	0	0	0	0	0
9	24	630	0	0	0	0	0	0	0	0
10	20	510	1	120	2	480	0	0	0	0
11	18	870	2	380	1	100	2	210	1	250
12	30	840	0	0	1	360	0	0	3	550
Total	**124**	**3460**	**3**	**500**	**5**	**1210**	**4**	**300**	**9**	**1040**
STATION P										
1	10	140	0	0	0	0	0	0	0	0
2	2	30	1	30	0	0	0	0	0	0
3	2	50	0	0	0	0	0	0	0	0
4	5	60	0	0	0	0	0	0	0	0
5	10	230	0	0	0	0	0	0	0	0
6	29	640	0	0	0	0	0	0	0	0
7	35	1420	2	90	0	0	0	0	0	0
8	32	1640	2	410	0	0	1	30	1	420
Total	**125**	**4210**	**5**	**530**	**0**	**0**	**1**	**30**	**1**	**420**
STATION Q										
1	12	870	0	0	1	90	0	0	0	0
2	14	2100	1	170	1	230	0	0	0	0
3	9	680	0	0	1	270	1	30	0	0
4	6	390	0	0	1	340	1	10	0	0
5	23	480	2	80	3	1850	0	0	0	0
6	19	1120	7	440	4	2220	3	70	0	0
7	27	960	0	0	2	600	5	190	0	0
8	34	2410	0	0	2	540	5	480	1	350
9	20	830	0	0	3	780	4	640	0	0
10	16	880	9	2450	3	490	2	300	0	0
11	18	920	0	0	3	640	3	1170	0	0
12	33	3560	0	0	5	2140	1	10	0	0
13	40	1650	3	360	4	3250	4	110	0	0
14	21	2340	5	3660	2	570	2	50	1	1540
Total	**292**	**19190**	**27**	**7160**	**35**	**14010**	**31**	**3060**	**2**	**1890**
STATION R										
1	12	410	0	0	0	0	1	30	1	60
2	8	300	2	60	0	0	2	140	1	210
3	6	230	0	0	0	0	0	0	2	90
4	4	100	0	0	0	0	3	220	1	60
5	11	310	0	0	0	0	0	0	0	0
6	13	390	0	0	0	0	0	0	0	0
7	16	460	1	30	0	0	0	0	0	0
8	9	330	5	140	1	270	0	0	0	0
9	18	440	6	190	0	0	0	0	1	250
10	22	780	4	130	0	0	1	30	3	480
11	12	290	0	0	0	0	0	0	0	0
12	26	810	1	100	0	0	1	70	0	0
13	16	610	0	0	2	1170	0	0	0	0
14	19	670	0	0	0	0	2	510	0	0
15	15	540	0	0	0	0	0	0	0	0
16	23	930	3	230	0	0	0	0	0	0
17	30	1030	5	260	1	90	0	0	3	390
18	14	640	1	80	2	250	0	0	0	0
19	19	800	0	0	1	440	0	0	0	0
20	27	1120	0	0	0	0	0	0	0	0
21	25	850	0	0	0	0	0	0	0	0
22	32	980	6	200	0	0	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)
23	20	500	4	260	2	190	0	0	2	620
24	24	1060	3	180	0	0	1	20	0	0
25	21	840	1	60	1	320	3	230	0	0
26	17	610	2	130	0	0	0	0	0	0
27	26	970	1	110	2	600	0	0	1	80
28	34	1140	0	0	1	410	2	120	1	750
29	18	700	2	90	0	0	0	0	0	0
Total	537	18840	47	2250	13	3740	16	1370	16	2990
STATION S										
1	14	750	0	0	1	90	0	0	0	0
2	9	810	0	0	1	150	0	0	0	0
3	11	1230	0	0	2	230	1	60	0	0
4	6	27	1	320	2	560	2	70	0	0
5	21	1180	1	150	1	110	1	40	0	0
6	18	930	2	280	0	0	3	590	0	0
7	11	460	1	30	0	0	1	10	0	0
8	6	140	3	220	0	0	0	0	0	0
9	9	280	2	110	1	60	2	40	0	0
10	12	640	0	0	1	80	3	90	0	0
11	18	930	0	0	0	0	2	60	0	0
12	40	2450	4	380	1	230	1	30	0	0
13	32	2660	8	2340	2	660	0	0	0	0
14	29	2150	7	1140	1	60	2	680	0	0
15	26	3880	2	80	5	620	2	40	0	0
16	19	4520	6	1270	3	260	2	30	0	0
17	21	1750	3	860	5	1140	1	540	1	230
18	31	3650	5	670	4	840	3	440	2	1270
Total	333	28437	45	7850	30	5090	26	2720	3	1500
STATION T										
1	12	1450	0	0	0	0	0	0	0	0
2	16	1750	0	0	0	0	1	30	0	0
3	13	2230	0	0	1	80	1	80	0	0
4	21	1890	1	60	2	470	0	0	0	0
5	8	420	0	0	0	0	0	0	0	0
6	6	510	0	0	1	110	2	70	0	0
7	14	680	0	0	3	650	0	0	0	0
8	11	710	1	180	5	1450	0	0	0	0
9	22	650	0	0	6	2780	0	0	1	150
10	18	1420	0	0	4	750	0	0	0	0
11	34	3320	1	330	7	4580	1	240	0	0
12	40	2690	3	850	2	840	0	0	0	0
13	31	4420	2	440	1	210	0	0	2	480
14	19	1470	4	1250	3	630	0	0	0	0
15	25	1180	1	90	5	1310	3	410	3	2310
16	21	3240	0	0	8	810	2	550	0	0
Total	311	28030	13	3200	48	14670	10	1380	6	2940
STATION U										
1	23	2650	3	460	0	0	1	60	0	0
2	28	2800	4	150	0	0	1	80	0	0
3	39	4030	2	340	0	0	1	90	0	0
4	43	4960	6	610	0	0	1	40	1	570
5	30	1270	0	0	1	440	2	230	1	460
6	34	3060	1	290	0	0	1	160	0	0
7	27	4120	2	430	1	160	0	0	0	0
8	19	3520	5	550	0	0	3	600	2	350
9	36	2690	6	280	0	0	1	70	1	110
10	26	2840	4	310	1	300	2	310	0	0
Total	305	31940	33	3420	3	900	13	1640	5	1490
STATION V										
1	20	2210	1	50	0	0	0	0	0	0
2	19	1310	3	160	0	0	0	0	0	0
3	30	2450	8	220	0	0	0	0	0	0
4	27	2600	0	0	0	0	1	200	0	0
5	32	3070	1	30	0	0	0	0	0	0
6	26	3340	0	0	1	1170	0	0	2	310
7	19	1410	0	0	0	0	1	130	0	0
8	31	1950	0	0	0	0	2	130	0	0
9	18	640	6	160	0	0	2	220	1	100
10	22	2840	1	80	1	280	2	460	2	260

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt(g)	No.Items	Wt(g)
11	37	3100	0	0	3	1420	0	0	0	0
12	21	2040	0	0	0	0	2	190	3	670
Total	**302**	**26960**	**20**	**700**	**5**	**2870**	**10**	**1330**	**8**	**1340**
STATION W										
1	13	460	0	0	0	0	0	0	0	0
2	10	500	0	0	0	0	1	60	1	340
3	8	350	2	390	0	0	1	190	0	0
4	3	160	0	0	0	0	1	130	0	0
5	12	870	0	0	1	230	0	0	2	560
6	7	640	4	270	0	0	0	0	0	0
7	14	710	0	0	0	0	0	0	0	0
8	21	670	0	0	1	610	2	410	0	0
9	16	600	6	450	0	0	0	0	0	0
10	18	740	0	0	0	0	0	0	0	0
Total	**122**	**5700**	**12**	**1110**	**2**	**840**	**5**	**790**	**3**	**900**
STATION X										
1	19	900	3	210	0	0	0	0	0	0
2	16	1010	0	0	2	400	1	70	0	0
3	21	940	0	0	0	0	1	90	1	610
4	12	760	1	100	0	0	2	380	2	750
5	17	820	0	0	3	620	0	0	0	0
6	24	1130	0	0	0	0	1	140	0	0
Total	**109**	**5560**	**4**	**310**	**5**	**1020**	**5**	**680**	**3**	**1360**
STATION Y										
1	12	1850	0	0	0	0	0	0	0	0
2	6	980	2	90	0	0	1	30	0	0
3	8	1160	1	50	0	0	1	80	0	0
4	1	60	2	70	0	0	2	240	0	0
5	2	60	1	60	1	140	3	210	0	0
6	6	310	1	50	1	210	2	90	0	0
7	4	190	1	50	1	1040	2	60	0	0
8	11	640	0	0	2	1310	2	40	0	0
9	21	1450	7	310	1	280	4	460	0	0
10	39	2240	2	490	4	3540	2	170	0	0
11	15	2440	12	1750	6	4880	6	780	1	560
12	49	4410	13	2290	8	3650	5	550	1	1240
13	24	2110	18	560	6	1220	8	3620	0	0
Total	**198**	**17900**	**60**	**5770**	**30**	**16270**	**38**	**6330**	**2**	**1800**
STATION Z										
1	20	1320	0	0	1	110	1	40	0	0
2	13	440	0	0	1	90	0	0	0	0
3	27	2740	0	0	1	70	2	60	0	0
4	22	2880	1	230	0	0	0	0	0	0
5	14	780	0	0	0	0	0	0	0	0
6	9	160	0	0	0	0	0	0	0	0
7	6	280	0	0	0	0	3	310	0	0
8	18	770	2	560	3	770	4	540	1	990
9	22	1240	1	60	5	400	0	0	0	0
10	27	2220	2	460	4	560	2	120	0	0
11	16	450	1	140	6	890	0	0	0	0
12	31	2260	3	430	0	0	2	330	1	230
13	20	1540	5	860	1	60	1	410	0	0
14	15	1170	4	540	2	210	3	660	0	0
15	34	4890	3	180	5	840	5	1200	1	550
16	26	1560	6	740	3	320	2	240	0	0
17	17	2250	7	1450	0	0	2	480	2	870
18	15	1350	4	260	1	40	3	610	1	340
19	39	3690	6	710	2	1140	2	580	0	0
Total	**391**	**31990**	**45**	**6620**	**35**	**5500**	**32**	**5580**	**6**	**2980**
STATION ZZ										
1	13	440	1	150	0	0	1	90	0	0
2	14	320	0	0	0	0	2	220	0	0
3	21	1540	2	310	0	0	1	230	0	0
4	18	2310	1	60	0	0	1	50	0	0
5	8	240	1	80	0	0	0	0	0	0
6	5	90	0	0	1	230	0	0	0	0
7	6	80	0	0	0	0	1	50	0	0
8	9	160	0	0	1	90	0	0	0	0
9	5	150	0	0	1	120	0	0	0	0

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
10	11	270	0	0	3	560	0	0	0	0
11	12	890	0	0	3	890	1	110	0	0
12	23	870	1	200	2	2450	0	0	0	0
13	15	710	0	0	3	630	0	0	0	0
14	18	1140	1	340	11	2310	2	450	0	0
15	31	2820	1	210	7	650	3	320	0	0
16	22	1690	2	530	2	630	2	660	0	0
17	20	810	5	480	8	840	0	0	0	0
18	14	1280	3	210	6	1250	1	80	0	0
19	16	1580	4	690	5	3620	2	560	0	0
20	19	2110	1	130	3	530	3	1240	0	0
21	11	930	0	0	4	880	1	90	0	0
22	28	1640	2	890	2	390	1	350	1	860
23	23	3640	3	1110	6	1170	0	0	1	420
24	17	2400	3	860	5	1230	3	1990	0	0
Total	379	28110	31	6250	73	18470	25	6490	2	1280

	PLASTIC		GLASS		WOOD		TAR		MISCELLANEOUS	
	No. Items	Wt (g)	No. Items	Wt(g)	No. Items	Wt(g)	No. Items	Wt.(g)	No. Items	Wt(g)
STATION A	115	8910	126	2000	6	2180	1	260	0	0
STATION B	126	8790	1	540	5	2900	11	1370	9	2220
STATION C	200	13280	31	3030	9	3190	15	1250	5	2630
STATION D	96	8110	7	3650	5	4160	7	1290	3	530
STATION E	175	15270	26	1670	2	1060	10	790	0	0
STATION F	178	12730	9	1660	2	640	16	800	7	980
STATION G	159	10350	13	1360	8	2220	16	770	2	950
STATION H	550	28570	56	6840	23	12310	33	3910	12	4040
STATION I	719	38070	79	10530	28	6480	49	2900	4	1870
STATION J	988	47475	100	11290	32	8990	31	9330	40	7830
STATION K	322	23910	26	4460	25	4330	16	2000	17	3990
STATION L	62	2290	1	100	0	0	3	170	3	720
STATION M	77	2720	4	630	2	790	2	350	1	410
STATION N	142	5410	18	1170	3	790	2	140	6	2730
STATION O	124	3460	3	500	5	1210	4	300	9	1040
STATION P	125	4210	5	530	0	0	1	30	1	420
STATION Q	292	19190	27	7160	35	14010	31	3060	2	1890
STATION R	537	18840	47	2250	13	3740	16	1370	16	2990
STATION S	333	28437	45	7850	30	5090	26	2720	3	1500
STATION T	311	28030	13	3200	48	14670	10	1380	6	2940
STATION U	305	31940	33	3420	3	900	13	1640	5	1490
STATION V	302	26960	20	700	5	2870	10	1330	8	1340
STATION W	122	5700	12	1110	2	840	5	790	3	900
STATION X	109	5560	4	310	5	1020	5	680	3	1360
STATION Y	198	17900	60	5770	30	16270	38	6330	2	1800
STATION Z	391	31990	45	6620	35	5500	32	5580	6	2980
STATION ZZ	379	28110	31	6250	73	18470	25	6490	2.	1280
TOTAL	7437	476212	842	94600	434	134630	428	57030	174	50830
% WEIGHT		58.6		11.6		16.6		7		6.2
% ITEM	79.8		9		4.7		4.6		1.9	

APPENDIX VIII

Tables to show the mean weight/mquadrat of litter in the top, middle and bottom sections of the beaches used for an ANOVA and TUKEY test for each beach to test the difference between these beach sections.

Results for comparison of sections the beach			
Chelones 1			
Mean weight (g) / quadrat			
STATION	Bottom	Middle	Top
STATION A	3572	3624	3357.9
STATION B	268.3	2140	2676.6
STATION C	817.1	2207.9	2775
STATION D	1334.1	1163.5	1545.3
STATION E	1097.1	900	2304.3
STATION F	646.3	1425	1525
STATION G	757.7	1818.8	2196.6
STATION H	687.3	1593.8	2795.8
STATION I	1057.7	686.6	2776.6
STATION J	1180.9	1739.4	2523.2
STATION K	475.7	1017.1	1335.7
STATION L	1232.4	1425.9	2692.4
STATION M	765	577.5	2087.5
STATION N	1039.1	1176.4	1730.9
STATION O	936.9	804.6	2068.5
STATION P	1523.3	1533.3	1486.7
STATION Q	1478.8	1993.8	3161.3
Chelones 2			
Mean weight (g) / quadrat			
STATION	Bottom	Middle	Top
STATION A	1220.9	716.4	1760.9
STATION B	1023.3	881.7	1900
STATION C	677.4	1386.1	2086.9
STATION D	840	1212	2302
STATION E	1703	1501	1875
Chelones 3			
Mean weight (g) / quadrat			
STATION	Bottom	Middle	Top
STATION A	634.6	1342.3	2170
STATION B	783.5	1108.5	1789
STATION C	671.4	993.6	2702.1
STATION D	468.9	807.3	1914.2
STATION E	640	1277.5	1935
STATION F	544.4	1170.6	1489.4
STATION G	445	1350.5	1384.6
STATION H	156.9	862.3	1567.7
STATION I	276.3	898.8	1583.8
STATION J	785.9	1032.4	1471.2
STATION K	385	857.5	2220
STATION L	1163.3	476.7	2566.7

Chelones 4			
Mean weight (g) / quadrat			
STATION	Bottom	Middle	Top
STATION A	2129.3	1825.7	3958.6
STATION B	480	900	3456
STATION C	105	105	622.5
STATION D	102.5	570	2192.5
STATION E	80	45	855
STATION F	202.5	21.3	1441.3
STATION G	618	712	6389
STATION H	271.9	1285	2395
STATION I	147.9	276.4	287.1
STATION J	612.5	175.5	329.5
STATION K	831.4	264.3	1786.4
STATION L	1956	1125	6687.5
STATION M	2028.6	1982.1	5032.1
STATION N	3660	4480	9590

Chelones 5			
Mean weight (g) / quadrat			
STATION	Bottom	Middle	Top
STATION A	2490	550	1835
STATION B	1498.8	731.3	3702.5
STATION C	1703	701	4610
STATION D	1526	1234	7884
STATION E	2908.8	822.5	3315
STATION F	1665	818.8	3820
STATION G	2235	806.3	2827.5
STATION H	1573.8	1445	3940
STATION I	607.1	2132.9	2361.1
STATION J	778.9	1952.9	3057.8
STATION K	970	6252.5	2450
STATION L	167.5	735	1557.5
STATION M	162.5	885	2627.5
STATION N	197	450	2425
STATION O	222.5	80	1325
STATION P	87.5	195	1663.7
STATION Q	1454.3	2958.6	5296.4
STATION R	586.2	1112.8	1320.7
STATION S	1262.8	1040	5296.7
STATION T	1629.4	2911.3	4875.6
STATION U	3816	3951	4050
STATION V	2300	2885	3115
STATION W	716	971	1115
STATION X	1295	1815	1355
STATION Y	1100	1377.7	8615.4
STATION Z	1439.5	2483.2	4393.7
STATION ZZ	842.5	2450	4282.5

APPENDIX IX

NESTING DATA: CHELONES 1 - 5

CHELONES 1						
DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
15th June	–	NA	–	–	–	–
18	–	NA	–	–	–	–
21	–	NA	–	–	–	–
24	–	NA	–	–	–	–
27	–	NA	–	–	–	–
30	GREEN	FCA	65m RHS	12m	0m	62cm
30	GREEN	FCA	65m LHS	18m	0m	59cm
30	GREEN	NEST	94m RHS	16m	0m	61cm
3rd July	GREEN	NEST	56m LHS	11m	5m	73cm
3rd	GREEN	FCA	260m LHS	12m	0m	73cm
6	–	NA	–	–	–	–
9	GREEN	NEST	46m RHS	10m	2m	56cm
9	GREEN	NEST	60m RHS	9m	3m	50cm
9	GREEN	NEST	10m RHS	5m	4m	73cm
12	GREEN	NEST	85m LHS	7m	15m	72cm
12	GREEN	NEST	72m LHS	10m	7m	83cm
12	LOGGERHEAD	NEST	47m LHS	7m	5m	87cm
15	–	NA	–	–	–	–
18	–	NA	–	–	–	–
21	–	NA	–	–	–	–
24	GREEN	NEST	126m LHS	14m	10m	64cm
27	GREEN	FCU	80m RHS	13m	6m	67cm
27	GREEN	FCU	160m RHS	7m	23m	72cm
27	LOGGERHEAD	FCU	8m LHS	0m	6m	61cm
30	GREEN	FCU	210m LHS	13m	6m	
30	GREEN	FCU	210M LHS	18m	2m	
2nd August	–	NA	–	–	–	–
5	GREEN	FCA	63m LHS	5m	13m	68cm
8	GREEN	FCA	79m LHS	4m	16m	74cm
11	–	NA	–	–	–	–
14	–	NA	–	–	–	–

Chelones 2						
DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
15th June	–	NA	–	–	–	–
18	–	NA	–	–	–	–
21	–	NA	–	–	–	–
24	GREEN	NEST	13m RHS	12m	0m	–
27	GREEN	NEST	2m RHS	8m	2m	–
27	GREEN	NEST	12m RHS	14m	1m	–
30	GREEN	NEST	35m RHS	18m	0m	–
30	GREEN	NEST	56m RHS	20m	0m	–
30	GREEN	NEST	24m RHS	16m	2m	–
30	GREEN	FCU	20m LHS	–	–	–
3rd July	GREEN	FCU	4m RHS	–	–	61cm
3	GREEN	FCU	40m LHS			
6	GREEN	FCA	2m RHS	0m	16m	
6	GREEN	FCU	4m LHS	–	–	
9	GREEN	NEST	30m RHS	10m	9m	60.5cm
12	GREEN	NEST	29m RHS	4m	16m	93cm
15	–	NA	–	–	–	–
18	–	NA	–	–	–	–
21	–	NA	–	–	–	–
24	GREEN	NEST	30m LHS	14m	1m	60cm
24	GREEN	NEST	28m LHS	16m	0m	75cm
24	LOGGERHEAD	NEST	35m RHS	17m	2m	57cm
24	LOGGERHEAD	NEST	30m RHS	10m	10m	53cm
24	LOGGERHEAD	NEST	15m RHS	16m	0m	52cm
24	LOGERHEAD	FCU	1m LHS	–	–	63cm
24	LOGGERHEAD	FCU	10m LHS	–	–	56cm
27	GREEN	NEST	8m RHS	12m	2m	70cm
27	LOGGERHEAD	NEST	50m RHS	10m	6m	52cm
27	GREEN	NEST	65mRHS	13m	4m	74cm
27	LOGGERHEAD	FCU	60m RHS	12m	7m	59cm

DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
30	_	NA	_	_	_	_
2nd August	GREEN	NEST	10m LHS	10m	2m	69cm
2	GREEN	NEST	15m LHS	6m	9m	66cm
5	_	NA	_	_	_	_
8	GREEN	NEST	2m RHS	5m	6m	66cm
11	GREEN	FCU	30m LHS	_	_	79cm
14	_	NA	_	_	_	_

CHELONES 3						
DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
15th June	_	NA	_	_	_	_
18	_	NA	_	_	_	_
21	_	NA	_	_	_	_
24	_	NA	_	_	_	_
27	GREEN	NEST	25m RHS	13m	12m	64cm
27	GREEN	FCU	10m RHS	_	_	65cm
27	GREEN	NEST	180m LHS	14m	3m	74cm
30	GREEN	NEST	174 m LHS	12m	7m	70cm
30	GREEN	NEST	168m LHS	20m	1m	_
30	GREEN	NEST	119m LHS	12m	8m	_
30	GREEN	NEST	106m LHS	17m	0m	_
30	GREEN	NEST	55m LHS	22m	3m	_
30	GREEN	FCU	8m RHS	_	_	70cm
30	GREEN	FCA	160m LHS	18m	5m	_
30	GREEN	FCA	24m LHS	14m	7m	_
30	GREEN	FCA	147m LHS	12m	12m	_
30	GREEN	FCA	143m LHS	8m	20m	_
3rd July	GREEN	FCU	110m LHS	5m	11m	_
6	GREEN	NEST	40m RHS	16m	2m	70cm
6	GREEN	NEST	91m LHS	12m	0m	70cm
6	GREEN	FCU	40m RHS	_	_	69cm
6	GREEN	FCA	133m LHS	15m	8m	70cm
6	LOGGERHEAD	FCA	136m LHS	20m	6m	57m
6	GREEN	FCU	130m LHS	_	_	66cm
9	GREEN	FCU	45m RHS	_	_	74cm
9	LOGGERHEAD	FCU	110m LHS	_	_	59cm
12	GREEN	NEST	106m RHS	18m	3m	93cm
12	GREEN	NEST	120m LHS	20m	4m	85cm
12	GREEN	NEST	5m LHS	4m	6m	_
12	GREEN	FCA	3m LHS	7m	1m	76cm
15	GREEN	FCU	43m LHS			
18	LOGGERHEAD	NEST	60m RHS	20m	3m	60cm
18	GREEN	NEST	30m LHS	12m	2m	61cm
18	GREEN	NEST	57m LHS	15m	6m	84cm
18	LOGGERHEAD	FCU	5m RHS	4m	5m	55cm
18	GREEN	FCU	70m RHS	_	_	65cm
18	GREEN	FCU	90m RHS	_	_	70cm
18	GREEN	FCU	85m RHS	_	_	58cm
21	GREEN	NEST	13m RHS	1m	10m	72cm
21	GREEN	NEST	214m RHS	14m	3m	61cm
21	GREEN	NEST	2m RHS	2m	5m	63cm
21	GREEN	NEST	160m RHS	11m	13m	69cm
21	GREEN	FCU	80m RHS	_	_	66cm
24	GREEN	NEST	179m RHS	26m	2m	71cm
24	LOGGERHEAD	NEST	3m RHS	10m	2m	63cm
24	LOGGERHEAD	NEST	22m LHS	2m	17m	66cm
24	GREEN	FCU	57m LHS	_	_	75cm
24	GREEN	FCA	47m LHS	9m	8m	61cm
27	GREEN	NEST	3m RHS	5m	3m	61cm
27	GREEN	NEST	144m LHS	15m	10m	_
27	GREEN	NEST	101m LHS	15m	1m	68cm
27	GREEN	FCU	8m RHS	_	_	66cm
27	LOGGERHEAD	FCU	15m RHS	_	_	69cm
27	GREEN	FCU	1m LHS	_	_	71cm
27	LOGGERHEAD	FCU	66m LHS	_	_	_

DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
30	GREEN	NEST	11m RHS	12m	2m	76cm
30	GREEN	FCU	1m RHS	–	–	75cm
30	GREEN	FCA	142m LHS	5m	16m	74cm
30	GREEN	FCU	51m LHS	–	–	–
2nd August	GREEN	NEST	162m LHS	10m	12m	73cm
5	–	NA	–	–	–	–
8	GREEN	NEST	104m LHS	15m	0m	74cm
11	–	NA	–	–	–	–
14	–	NA	–	–	–	–

CHELONES 4

DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
15th June	–	NA	–	–	–	–
18	–	NA	–	–	–	–
21	–	NA	–	–	–	–
24	–	NA	–	–	–	–
27	–	NA	–	–	–	–
30	LOGGERHEAD	NEST	62m RHS	2m	1m	65cm
3rd July	LOGGERHEAD	FCU	31m LHS	–	–	–
6	GREEN	NEST	16m RHS	14m	0m	–
6	GREEN	NEST	8m RHS	6m	2m	–
9	–	NA	–	–	–	–
12	GREEN	FCA	2m RHS	7m	3m	–
15	LOGGERHEAD	FCU	180m LHS	–	–	–
18	GREEN	NEST	116m RHS	20m	5m	65cm
18	GREEN	FCU	10m RHS	–	–	55cm
18	GREEN	FCU	47m RHS	–	–	75cm
18	GREEN	FCU	44m RHS	–	–	98cm
18	GREEN	FCU	20m LHS	–	–	74cm
18	GREEN	FCU	53m RHS	–	–	68cm
21	–	NA	–	–	–	–
24	GREEN	NEST	73m RHS	15m	5m	66cm
24	GREEN	FCU	8m RHS	–	–	86cm
24	GREEN	FCU	5m LHS	–	–	73cm
24	GREEN	FCU	70m RHS	–	–	86cm
27	GREEN	NEST	25m RHS	4m	6m	73cm
27	LOGGERHEAD	NEST	100m LHS	18m	1m	60cm
27	GREEN	FCU	30m RHS	–	–	60cm
27	GREEN	FCA	80m LHS	3m	4m	–
30	GREEN	FCA	25m RHS	–	–	67cm
2nd August	–	NA	–	–	–	–
5	–	NA	–	–	–	–
8	GREEN	FCA	15m RHS	8m	4m	66cm
11	–	NA	–	–	–	–
14	–	NA	–	–	–	–

CHELONES 5

DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
15th June	–	NA	–	–	–	–
18	–	NA	–	–	–	–
21	LOGGERHEAD	NEST	22m RHS	20m	4m	68cm
24	LOGGERHEAD	NEST	164m RHS	10m	1m	62cm
24	LOGGERHEAD	NEST	305m RHS	6m	10m	–
27	GREEN	NEST	150m RHS	8m	3m	–
27	GREEN	NEST	200m RHS	10m	4m	68cm
27	LOGGERHEAD	NEST	498m RHS	6m	5m	68cm
27	GREEN	FCA	180m RHS	4m	6m	60cm
27	LOGGERHEAD	FCU	192m RHS	12m	5m	58cm
27	LOGGERHEAD	FCA	232m RHS	7m	4m	60cm
30	GREEN	NEST	365m RHS	22m	6m	66cm
30	GREEN	NEST	718m RHS	24m	10m	72cm
30	LOGGERHEAD	NEST	670m RHS	28m	6m	55cm
30	GREEN	FCA	760m RHS	12m	11m	70cm
30	LOGGERHEAD	FCA	860m RHS	3m	6m	74cm
3rd July	GREEN	NEST	451m RHS	6m	4m	70cm

DATE	SPECIES	ACTIVITY	POSITION	VEG.	STRAND	TRACK WIDTH
3	GREEN	NEST	291m RHS	10m	6m	78cm
3	GREEN	NEST	253m RHS	8m	5m	69cm
3	LOGGERHEAD	FCU	210m LHS	3m	5m	59cm
3	GREEN	FCA	283m LHS	16m	9m	_
3	GREEN	FCU	335m RHS	20m	3m	_
3	GREEN	FCU	226m RHS	2m	9m	64cm
6	GREEN	NEST	468m RHS	8m	5m	72cm
6	GREEN	NEST	375m RHS	12m	10m	82cm
6	GREEN	FCU	478m RHS	_	_	75cm
9	LOGGERHEAD	NEST	530m RHS	8m	7m	59cm
9	GREEN	FCA	162m RHS	6m	3m	_
12	GREEN	NEST	259m RHS	10m	10m	76cm
15	GREEN	NEST	260m LHS	8m	9m	61cm
15	GREEN	NEST	339m LHS	26m	12m	65cm
15	LOGGERHEAD	NEST	84m RHS	6m	6m	_
15	GREEN	FCU	91m RHS	_	_	69cm
15	GREEN	FCU	256m RHS	_	_	_
15	LOGGERHEAD	FCA	16m RHS	12m	6m	61cm
18	GREEN	NEST	46m RHS	15m	6m	91cm
18	GREEN	NEST	74m RHS	12m	3m	67cm
18	GREEN	NEST	145m RHS	8m	2m	76cm
18	LOGGERHEAD	FCA	150m LHS	3m	4m	48cm
18	GREEN	FCU	210m LHS	_	_	81cm
18	GREEN	FCU	257m RHS	_	_	92cm
18	GREEN	FCA	178m RHS	2m	7m	74cm
18	GREEN	FCA	236m RHS	4m	6m	73cm
18	GREEN	FCA	365m RHS	21m	6m	70cm
18	GREEN	FCA	321m RHS	2m	17m	_
18	GREEN	FCU	84m RHS	_	_	87cm
18	GREEN	FCU	121m RHS	_	_	75cm
21	GREEN	NEST	185m RHS	8m	3m	71cm
21	GREEN	NEST	500mRHS	3m	6m	75cm
21	GREEN	FCA	29m RHS	18m	4m	85cm
21	GREEN	FCA	57m RHS	7m	10m	92cm
21	GREEN	FCU	220m RHS	_	_	81cm
21	GREEN	FCA	360m RHS	20m	8m	_
21	GREEN	FCA	390m RHS	19m	2m	_
21	GREEN	FCA	510m RHS	1m	3m	_
21	GREEN	FCA	524m RHS	4m	1m	80cm
21	GREEN	FCU	573m RHS	_	_	76cm
21	GREEN	FCA	593m RHS	2m	3m	78cm
21	LOGGERHEAD	FCU	625m RHS	_	_	_
21	GREEN	FCU	810m RHS	_	_	_
24	GREEN	NEST	139m RHS	5m	2m	75cm
24	GREEN	NEST	192m RHS	6m	5m	74cm
27	LOGGERHEAD	FCU	443m RHS	4m	3m	73cm
30	GREEN	NEST	546m RHS	3m	8m	79cm
30	GREEN	FCA	39m RHS	13m	7m	_
30	GREEN	FCA	360m RHS	26m	3m	_
30	GREEN	FCU	53m RHS	_	_	_
30	GREEN	FCU	796m RHS	_	_	_
2nd August	GREEN	FCU	95m LHS	7m	0m	77cm
5	GREEN	FCU	320m LHS	24m	11m	75cm
5	GREEN	FCU	425m LHS	6m	0m	73cm
8	GREEN	FCA	510m RHS	5m	5m	70cm
11	GREEN	FCU	40m RHS	10m	9m	65cm
11	GREEN	FCA	730m RHS	16m	17m	76cm
14	_	NA	_	_	_	_

APPENDIX X

HATCHING DATA: CHELONES 1 - 5

HATCHING DATA FOR CHELONES 1																
DATE	SP.	ACTIVITY	POSITION	VEG.	STRAND	CLUTCH SIZE	HD SHELL COUNT	NON-VIABLE	YOLKED UNFERT.	DEAD IN SHELL > HALF	DEAD IN SHELL < HALF	FULL TERM HD LIVE	FULL TERM HD DEAD	% SUCCESS	CHAMBER DEPTH TOP	CHAMBER DEPTH BOTTOM
26th Aug	?	Predated	50m RHS	8m	5m	ANIMAL TRACKS AND EATEN EGGS AND SHELLS-NO FURTHER DATA										

HATCHING DATA FOR CHELONES 2																
DATE	SP.	ACTIVITY	POSITION	VEG.	STRAND	CLUTCH SIZE	HD SHELL COUNT	NON-VIABLE	YOLKED UNFERT.	DEAD IN SHELL > HALF	DEAD IN SHELL < HALF	FULL TERM HD LIVE	FULL TERM HD DEAD	% SUCCESS	CHAMBER DEPTH TOP	CHAMBER DEPTH BOTTOM
31st July	GREEN	Predated	6m RHS	16m	0m	ANIMAL TRACKS AND EATEN EGGS AND SHELLS-NO FURTHER DATA										
23rd Aug	GREEN	Hatched	12m RHS	10m	8m	111	103	0	3	3	2	3	1	92.8	75cm	100cm
23rd Aug	GREEN	Hatched	70m LHS	17m	10m	140	134	0	3	1	2	2	1	95.7	78cm	92cm
19th Sep	GREEN	Hatched	22m LHS	7m	7m	89	20	0	7	61	1	6	1	22.5	91cm	91cm

HATCHING DATA FOR CHELONES 3																
DATE	SP.	ACTIVITY	POSITION	VEG.	STRAND	CLUTCH SIZE	HD SHELL COUNT	NON-VIABLE	YOLKED UNFERT.	DEAD IN SHELL > HALF	DEAD IN SHELL < HALF	FULL TERM HD LIVE	FULL TERM HD DEAD	% SUCCESS	CHAMBER DEPTH TOP	CHAMBER DEPTH BOTTOM
10th Aug	GREEN	Htch/pred	146m LHS	12m	8m	78	66	2	10	0	0	0	0	84.6	50cm	64cm
20th Aug	GREEN	Hatched	25m LHS	13m	6m	NOT FOUND										
20th Aug	LOGG	Hatched	8m RHS	4m	7m	19	16	0	2	0	1	0	0	83.7	33cm	40cm
20th Aug	GREEN	Htch/pred	10m RHS	2m	7m	_	15	0	3	0	0	0	0	_	_	_
23rd Aug	GREEN	Hatched	139m LHS	1m	20m	91	76	0	9	6	0	5	0	83.5	59cm	71cm
26th Aug	?	Hatched	164m LHS	16m	5m	NOT FOUND										
29th Aug	?	Hatched	65m RHS	5m	17m	NOT FOUND										
29th Aug	?	Hatched	122m LHS	13m	10m	NOT FOUND										
3rd Sep.	GREEN	Hatched	26m RHS	15m	0m	123	97	0	16	4	6	0	0	78.9	79cm	86cm

HATCHING DATA FOR CHELONES 4																
DATE	SP.	ACTIVITY	POSITION	VEG.	STRAND	CLUTCH SIZE	HD SHELL COUNT	NON-VIABLE	YOLKED UNFERT.	DEAD IN SHELL > HALF	DEAD IN SHELL < HALF	FULL TERM HD LIVE	FULL TERM HD DEAD	% SUCCESS	CHAMBER DEPTH TOP	CHAMBER DEPTH BOTTOM
NO HATCHING ACTIVITY RECORDED																

HATCHING DATA FOR CHELONES 5																
DATE	SP.	ACTIVITY	POSITION	VEG.	STRAND	CLUTCH SIZE	HD SHELL COUNT	NON-VIABLE	YOLKED UNFERT.	DEAD IN SHELL > HALF	DEAD IN SHELL < HALF	FULL TERM HD LIVE	FULL TERM HD DEAD	% SUCCESS	CHAMBER DEPTH TOP	CHAMBER DEPTH BOTTOM
20th Aug	?	Predated	290m LHS	10m	19m	_	_	0	0	0	0	0	0	_	_	_
31st Aug	?	Hatched	150m RHS	3m	4m	_	_	0	0	0	0	0	0	_	_	_
31st Aug	Logger	Predated	20m RHS	14m	7m	_	34	0	0	1	0	0	0	_	_	_
16th Sep	Green	Predated	590m LHS	2m	4m	_	_	0	0	0	0	0	1	_	_	_