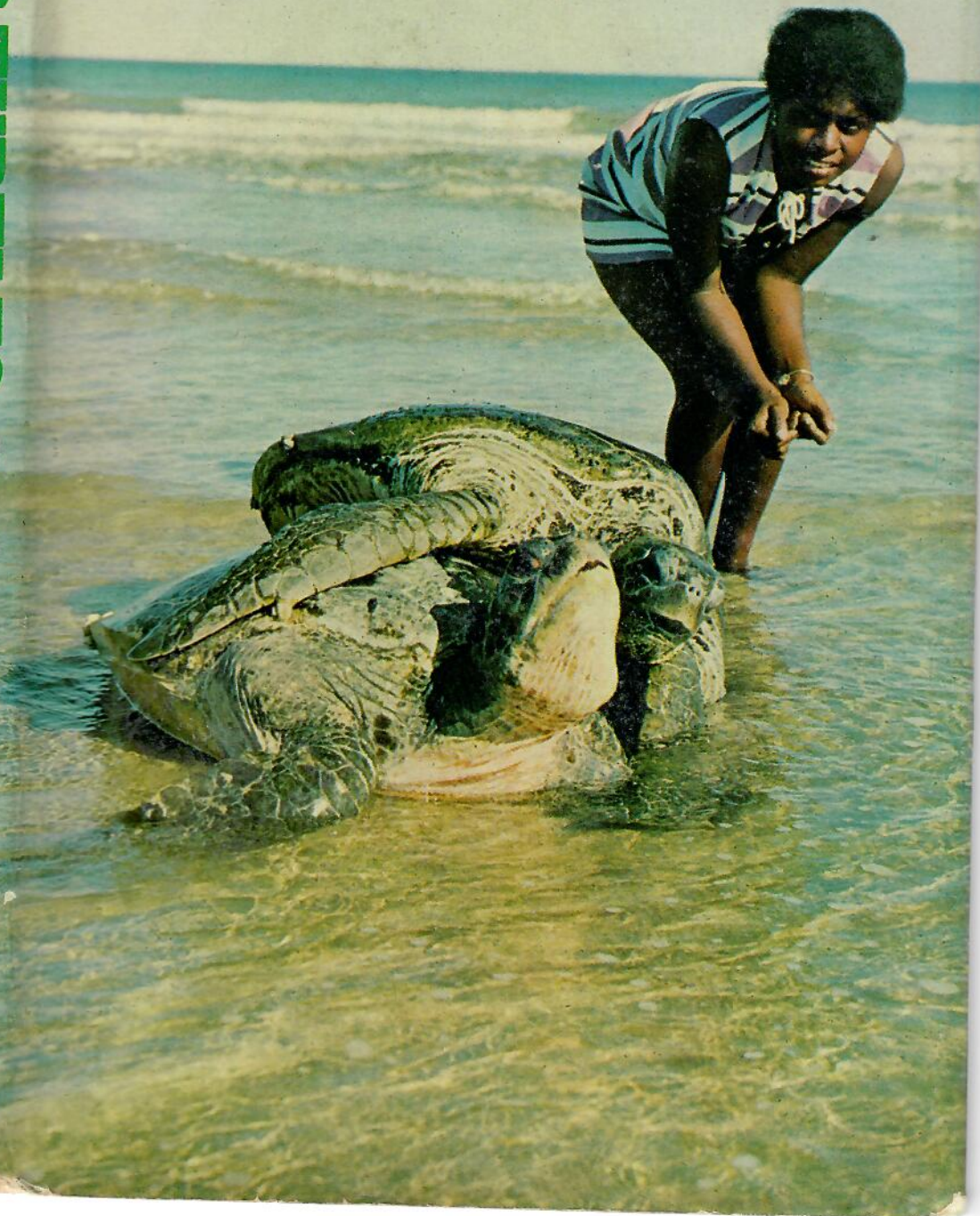


KAY'S TURTLES

Robert Bustard

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COLLINS

Kay's Turtles is an authentic account of a young Melanesian girl's extraordinary relationship with a most unusual animal—the turtle. Turtles are survivors from the age of the dinosaur and it is almost incredible that these creatures should have outlived the depredations of time and chance to be alive today. The enormous sea turtles are little-known relations of the small tortoises, terrapins or turtles so popular as pets in so many parts of the world.

Kay, now twenty, comes from the remotest group of islands in the Torres Strait which lies between Australia and Papua-New Guinea. The Islanders have a long and extremely complicated relationship with turtles—they worshipped the turtle as a god until recently but, at the same time, hunted and ate it. Kay vastly extended this primitive contact.

Dr Robert Bustard, an expatriate Scot at the Australian National University in Canberra, tells us Kay's astounding story of her close relationship with the two turtles Ruth and Gemai, and to a lesser extent with Barry, the lone male. Sea turtles are extremely shy creatures and yet Kay was able to befriend them and introduce us to their primary life processes—nesting, feeding and propagating—in a way that combines rare observational skill with a high degree of interest and drama.

Robert Bustard

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Contents

<i>Introduction</i>	9
1. Introducing turtles and Kay	13
2. First meeting with Ruth	23
3. Lying in the sun	40
4. Adventures on the Reef Flat	48
5. The sex life of Turtles	60
6. Further meetings with Ruth ashore	75
7. The hatching of Ruth's babies	100
8. Kay's pet turtles	116
<i>Epilogue</i>	126

TO KAY, AND RUTH, HER MOTHER

Introduction

As one who has a close understanding with animals and has often been able to convince wild animals that they need not fear me, I was delighted to find this ability so well marked in another – in a young Melanesian girl from the Torres Strait.

This book is an account of her friendships with green turtles. The book is centred around Kay's experiences with two female green turtles throughout a summer nesting season. She christened the turtles Ruth after her mother and Gemai after her grandmother. Turtles evolved in the Age of Dinosaurs some 200 million years ago. The dinosaurs became extinct but the turtles survived. These relics of a bygone age are one of the most fascinating forms of animal life alive in the world today.

In order to put Kay's turtle friendships into perspective I should perhaps state what is well-nigh impossible and what is readily possible with green turtles, based on my own researches spread over the last eight years on the Great Barrier Reef.

During the eight years of my studies I *never* managed closely to approach a turtle on the beach by day without it 'galloping' seawards; nor have I ever got close to one in the water. The sections of the book, and accompanying photographs, describing Kay with turtles on land by day or with turtles in the water are, therefore, truly remarkable.

When turtles emerge from the sea after nightfall to nest

they are very timid and readily about-turn and re-enter the water if they detect the presence of humans. Once they have started digging at the nesting site it is a fairly straightforward matter to observe them from behind, even judiciously using a torch, without frightening them away. After most of the eggs have been laid it is virtually impossible to frighten them until they are ready to return to the water. Likewise during the filling in process. However, only female turtles are involved in the nesting process and this only occupies a tiny fraction of one per cent of their time. The nesting photographs of Kay and Ruth, and Kay and Gemai, therefore, are not at all remarkable in themselves though the relationship between Kay and Ruth and Kay and Gemai is. What is unique is Kay's ability to intermingle with these and certain other wild turtles on land and in the water and to be accepted by them without any signs of fear. The close relationships she has made with Ruth, Gemai and Barry, the last named a male turtle, are incredible. Incidentally, quite a high degree of courage is required by Kay when she is with these turtles in the water as large sharks are numerous off the turtle beaches and I have been with her taking photographs when we have had more close shark encounters than I wish to repeat in the future.

Since many readers will consider the account quite incredible, we photographed most of the episodes described and have included a selection of photographs. Except when nesting when, particularly after egg laying, females ignore the presence of people, green turtles, in my experience, are extremely shy creatures which avoid humans or any large animals, yet all the photographs in this book are completely authentic - none was staged in any way. There is no doubt in

my own mind that Kay does possess a remarkable 'way' with turtles. However, the reader can judge this for himself in the account which follows.

Many readers will wonder how anyone could develop a friendship with a turtle, for reptiles are traditionally undervalued by the general public being dismissed as 'cold and slimy' and lacking in intelligence (both accusations, incidentally, untrue). Scientists who have tested the intelligence of turtles report that they learn readily. Furthermore, people with a close sympathy for animals have recorded a level of intelligence among turtles that one would only expect to find among mammals.

Turtles are often badly frightened as a result of people thoughtlessly trying to ride them on land. For this reason I hesitated to show Kay sitting on a turtle. However, Ruth, Gemai and Barry so obviously do not object that I have included these photographs. I would add, however, that Kay would never try to ride a *moving* turtle ashore as turtles have enough trouble moving their own weight when on land.

This degree of familiarity between a human and a wild animal is sufficiently unusual to have fascinated me and I hope that this account of it with the accompanying photographs will equally enthrall all those who read it.

We would like as many people as possible to share our experiences. With modern colour photographic reproduction and book distribution this is now a practical possibility. This book has been written in the hope that an interest and some knowledge about green turtles, in as many people as possible, may aid their conservation. I do not try to hide this fact. We love sea turtles and we want them to continue to survive so that you and your children's children can visit their rookeries

or read about them – but not read about something which has disappeared for all time.

I am indebted to Kay for her co-operation during the preparation of this book and in particular for helping Barry Parr and me to obtain a unique series of photographs of her with turtles. I would like to thank her parents Mr S. Ettikai Pau and Mrs Ruth Pau for their help and active interest in the project.

I am also most grateful to Mr P. J. Killoran, Director, Department of Aboriginal and Island Affairs in the State of Queensland for his close co-operation.

Mr Barry Parr took many of the photographs and I greatly appreciate his help often under most difficult circumstances. Finally I would like to thank Mr O. L. Tanis of Greenslopes, Brisbane and my mother Mrs R. M. Bustard of Alyth, Perthshire, Scotland, for reading and criticising the entire manuscript.

Introducing turtles and Kay

*

As I craned forward in the darkness, straining to detect any movement in the wind-ruffled waters of the sea as it lapped against the beach, I thought I detected a darker area in the shallows. It was difficult to see since the moon was overcast and I had no previous experience in turtle sighting, but, sure enough, a definite oval shape with a convex back slowly struggled to separate itself from the water. I was seeing my first turtle and as I watched fascinated it slowly emerged from the sea. After many stops, as if unwilling to part company with its watery environment, the huge reptile, for such it was, slowly made its way up the beach towards me, oblivious of my presence. I was hidden in the she-oaks, but I froze, scarcely daring to breathe, lest I frighten this relic from the age of dinosaurs and it return to the sea before I had an opportunity to see it at close quarters and watch its nesting behaviour.

It was December 1964 and I was on a small cay known as Heron Island in the Capricorn Group at the extreme south of the Great Barrier Reef. I had made a pilgrimage to the Reef before returning home to Scotland having completed three years' doctoral research at the Australian National University in Canberra. It had been a fascinating three years studying the ecology of some tiny gecko lizards, lizards which had interested

me since earliest childhood in China. The work had taken me to most parts of the Australian Continent. However, I now planned to study the giant tortoises in the Galapagos Islands off Ecuador and also the land iguana.

My experiences on Heron cay that night early in December 1964 changed all that, as at the end of my first night there I had become completely captivated by the turtles and knew I must return to Australia to study them. Though I had never seen a wild turtle before I knew something of their natural history from the excellent papers of Professor Archie Carr in Florida who works on sea turtles in Costa Rica.

Sure enough by early summer of 1965 I was back on Heron Island with the turtles and so it was to be in every successive year. My calendar became built round the turtles' summer breeding habits and from November to February I was continually absent from Canberra.

As well as proving exceptionally interesting scientifically the turtles also provided my first practical experience in what had always been a major interest of mine – conservation.

The date as I write this is June 1972, I am still turtle-tied, even more stringently than before, as we now work on turtles throughout the State of Queensland. Although those on the Great Barrier Reef from the southern limits (Tropic of Capricorn) to Torres Strait at the extreme north of the Reef, all nest during the summer months, in the Gulf of Carpentaria they start nesting at the beginning of the winter and nest right through until summer. However, I now have more helpers, and the work has broadened out to become a life's work for several people. Furthermore, through turtle farming, which I am pioneering for the indigenous people, we hope to provide gainful employment on their own island or tribal land for

many Torres Strait Islanders and Australian aborigines who have never before had the chance of employment, and at the same time to have an important conservation impact, both internationally and inside Australia. Farming and conservation will proceed hand in hand.

It is difficult for many people to appreciate just how timorous turtles are. Their shyness is undoubtedly partly due to their extreme clumsiness and slowness on land, for the stubby cylindrical limbs of their land tortoise ancestors have been modified over countless ages into the efficient paddles and rudders that we see today. In the sea they are masters of their environment but on land are almost helpless. Sea turtles are completely aquatic except for one vital function – egg laying. From the time that the tiny hatchling enters the sea, minutes after emerging from the nest, the male turtle almost never comes on land (I would not have qualified 'never' had Kay not introduced me to Barry – see Chapter 3). Females, except in areas where basking ashore occurs, only leave the sea to lay their eggs.

During a nesting season, up to six or even eight clutches of eggs are laid at fortnightly intervals. A turtle does not nest every year. Renesting occurs after intervals of several years spent feeding at sea. Hence one can easily understand how reticent the female is to leave her aquatic environment and climb a steep sandy beach on which locomotion is extremely difficult. Only that remarkable urge – the desire to reproduce – overcomes her reticence. However, once out of the water she is ever ready to postpone the great event until another night at the least sign of any large animal, such as man.

This is not the place to launch into an account of sea turtle

behaviour* but it is important that the reader be aware just how difficult it is to approach turtles when they are leaving the sea or be with them when they are moving down the beach after egg laying. This is especially true in instances where they nest by day as their natural nervousness seems to be increased several-fold by the light. Unless the reader is aware of this he will fail to marvel at the remarkable ability Kay has to 'communicate' with wild turtles.

Kay was born on a remote island in the Torres Strait in September 1952. Her father was a schoolteacher and her mother one of a family of ten. When still a baby her parents left the island because her father had been appointed schoolteacher on a neighbouring island. They did not take Kay with them as her grandmother had 'adopted' her. This must seem strange to European minds but is quite normal in island custom. Kay was the second in the family, having an elder brother. Her father had promised the next baby to older relatives and sure enough when Kay's little sister was born she was given away. The next child, also a daughter, they kept, and then the family was swollen by two adoptions.

However, Kay for many years was no part of any of this. She lived quietly in a very small village at one end of her island with only a very few children for company. In fact she spent most of her time with her grandparents. This resulted in Kay obtaining a very conservative island upbringing as her grandmother had never once left the island and the grandparents observed many of the ways of the past. Kay was brought up to understand the uses of many plants and the

* Readers who would like to delve further into the fascinating natural history of sea turtles can do so in my book *Sea Turtles*, Collins, London and Sydney, 1973, in Australia the title is *Australian Sea Turtles*

power of pouri-pouri (black magic) which to this day is held responsible for many deaths and unpleasant happenings on the island. While still a young girl Kay learned the precautions necessary to avoid being pouri-poured, as well as many of the customs of her people. Kay's earliest memories are of going out fishing in a dinghy with her grandfather while Gemai, her grandmother, did the cooking, gardening, washing and cleaned the yard.

In the Torres Strait today it is still the women who do the work. In the 'before times' the men had to keep at a high level of preparedness for war as they might be attacked at any time. They also had to plan attacks on the people of neighbouring islands. Torres Strait Islanders were some of the fiercest fighters that the world has ever known and had a depth of culture unknown in adjacent New Guinea (Papua) or on the Australian mainland. Where they came from no one knows for certain. I subscribe to the view that the ancient Egyptians had visited Torres Strait, which may account for their advanced culture. Even today there are many Egyptian-looking people on the islands. Before the coming of the Christian missionaries in 1871, euphemistically referred to as 'The Coming of the Light', the Islanders used to mummify their dead. The missionaries, of course, stopped this, and the Islanders now erect vast headstones as in Victorian England but at a cost which they cannot afford. Such is progress. Although missionary activity caused the Islanders to cease certain practices, one cannot chain a man's mind, and the belief in their own gods is still strong in 1972, even though they attend Church and observe Christian feast days fervidly. Bomai and Malu are never far from the scene, these all-powerful gods of the 'before days'.

Even though raid and counter-raid, with huge loss of life, has not been part of the Islanders' way of life for a century, the women still maintain their role of doing all the work. Peace was the single greatest contribution of the missionaries. The people of Kay's island traditionally warred with those on a neighbouring island and in one ten-year period about the middle of last century the population of Kay's island was reduced from between five and six hundred to a mere one hundred and twenty, and this entirely due to warfare. This was during a period when the other island held complete ascendancy.

Cooking and the preparation of food occupy much of the women's time. They also maintain huge fruit and vegetable gardens which require daily attention for much of the year. In the tropic climate of the Torres Strait not only food plants but weeds also grow at an alarming rate, and, furthermore, the shifting cultivation practised, means that new areas of land have always to be cleared so that new gardens can be made. Washing is also an enormous task for the women as family size is large – two families on Kay's island each have fifteen children – but more important, Islanders are constantly changing their clothes. At home it is not unusual for Kay or other women to appear in at least three different dresses in the course of a single day. Each of these must then be washed before they can be worn again.

Islanders are scrupulously clean in their personal hygiene and put most Europeans to shame. Even on their own island they would never go out in the evening without first showering and changing their clothes. At all island dances it is accepted custom to show one's approval of the dancing by shaking talcum powder on the dancers' shoulders.

Kay did not see her own parents for about ten years and it is difficult to judge how she felt about this. Probably the worst shock occurred when they eventually returned to live on their own island and took her back. Although for part of this decade they were only one hour away by dinghy, Kay's grandfather never allowed Kay to visit them, because he thought, probably correctly, that if he allowed Kay to visit her parents they would keep her. This, too, is a part of island life. People on the islands love children and it is a compliment to ask someone for their baby. When one gets a loan of a baby – rather than being given it outright which is the more usual custom – there is often considerable haggling before the baby is returned to its natural parents and this may be delayed for years if the two families live far apart.

Kay seems to have been rather a 'loner' which she still is to this day. She certainly spent much of her early years close to her grandparents who did everything for her. She was not considered a strong child, since, like a number of people on her island, she was much bothered by asthma. The school was about two miles from the village in which she lived and on wet days Kay set out with a raincoat and her grandmother's large black umbrella. This was too large for her to carry so when she was very small her grandfather invariably ended up carrying both Kay and the umbrella to school. Kay did not enjoy school work. However, she was extremely good at sports especially flat racing and ball games. Each year the school children of several islands met on one island for the Annual Sports. In 1967 Kay won the Cup as Champion Girl.

Kay kept her own small garden as children do everywhere. She grew sweet potatoes, sweet corn, water melons and tomatoes.

Kay has a highly developed dress and colour sense. Although Islanders love colours it is hard to see where she learned her extreme sophistication in dress, since she had never visited the mainland.

It is extremely difficult to detect when Kay first became interested in animals. However, deep interest in and understanding of animals is often associated with a shy and introspective child who spends much time away from the company of other children of her own age. Long before we met, Kay had developed her well-marked ability with animals in nature. It is not surprising that this interest developed in a practical way with turtles as they are so much a part of island life. Not only is turtle the main meat at island feasts but it is indeed the 'Island bullock', especially in areas of the Strait where dugong (called manatee in the Americas) are not plentiful. Kay had certainly often seen her grandfather harpoon a turtle on the reefs near home, and must frequently have seen turtles lying on their backs above the high tide mark and awaiting slaughter, which is often delayed for several days.

There are good reasons for Kay having this fascination for turtles and an exceptionally close rapport with them. Historically the peoples of her island were deeply involved with the green turtle. Before the coming of Christianity they worshipped a turtle god effigy carved from stone and having the form of a turtle's head. The islanders prayed to this god for good (turtle) harvests. They also used turtle oil to rub on their bodies to cure many kinds of sickness.

Like all Torres Strait Islanders Kay is a Queenslander and as such is an Australian citizen. The people of the Torres Strait also consider themselves quite distinct from Papuans.

Most Islanders do not like the Papuans and none of them have any desire whatsoever to join up with Papua-New Guinea when that Territory achieves independence from Australia. Nor do Islanders like aborigines whom they treat with the utmost contempt.

Life on the islands is very quiet. On special occasions enormous feasts are followed by displays of island dancing, at which most people are spectators, at least most of the time, although several dance teams will perform and each will have its own musicians. Music is provided by two kinds of drum. One is a traditional drum traded from Papua for hundreds of years. It is extremely elongated and the end which is struck with the hand is covered by goanna or file snake skin. The other drum, also traditional, is made on the islands and consists of two segments of bamboo with sections cut out. It is struck with two sticks, each hand maintaining a different tempo. Kay is an expert drummer. The dancing may continue at least until sunrise. Apart from feasts there is not much social activity, and after the evening meal people usually sit down to gossip at home within the family group, or go to sleep.

Islanders enjoy dressing up and on all festive occasions the women adorn their hair with brightly coloured flowers, especially hibiscus. Long hair, such as Kay's, can be worn in many different styles, but requires a lot of management. Island women braid their hair each night gathering as much of it as possible into a series of pigtails all over the head. They also often do this during the day when not dressed up. The object is to keep the hair soft and manageable. It is a constant fight against 'strong' hair. To comb their hair they use special combs with teeth about four inches long. The combs, carved

from wongai wood or occasionally tortoiseshell, are a work of art in themselves.

The reader will notice that no islands are ever referred to by name in this book. This is because one of the greatest charms of the Torres Strait Islands is the fact that the people have been left to proceed with their lives without European interference. To this day the islands are all reserves and Europeans are banned. The very remoteness of most of the islands achieved this purpose until recently, but now with modern means of transport and the building of air strips on some of the islands for hospital emergencies, the islands are threatened with a destruction of their very fabric, for the threads of island life are very fragile in the face of outside, thrusting cultures. Fortunately this threat is still of a theoretical nature only. It would be quite wrong, for islanders and turtles alike, to name the locality where this book is set lest it result in a rush of tourist-sightseers. In this way the Reserve will not run the risk of being violated, and the islanders and turtles will be left to continue their lives undisturbed, as they have done for centuries.

First meeting with Ruth

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As the day reluctantly gave way to night Kay left her home to walk around to the back of the island to look for nesting turtles. She carried a basket woven from pandanus leaves. Turtle eggs are a delicacy to Torres Strait Islanders and she hoped to find some nesting turtles and collect a clutch of eggs. In this way Kay had seen many hundreds of nesting turtles – mostly green turtles, but also a few hawksbill or tortoiseshell turtles – and had come to acquire a considerable fund of knowledge about turtles and their ways. While spearing fish on the reef flat she also often came in contact with turtles and the relaxed tempo of island life meant that she could always stop what she was doing in order to watch and perhaps ponder. Life in the islands is kind in that there is always time to stand and stare.

The sun slipped behind the hill as Kay reached the beach, leaving a row of coconut palms silhouetted against the reddening sky. The rising tide lapped quietly against the sand and a few reef herons looking for fish rose languorously into the air at Kay's approach. The only other sign of life was a small, brilliantly coloured kingfisher sitting on a pandanus branch. It was extremely alert and disappeared in a blur of iridescent blue well before Kay approached its look-out point.

High tide would occur shortly after dark, and, as Kay knew, the high tide would bring in the female green turtles which were ready to go through the arduous business of coming ashore, pulling their great weight up the soft sandy beach, and laying their eggs above the high-water mark in a specially constructed nest which would ensure the correct conditions for the developing young.

As darkness fell a few ghost crabs left their burrows, freshly constructed on the beach after each high tide destroyed them, and started to forage near the high-tide mark for food. These large ghost crabs are able to over power baby green turtles, and later in the summer when the young turtles were hatching, life would be easy for the crabs. At present, however, things were far from easy, and the crabs had to hunt hard to find sufficient scraps to make a meal. There were two species of ghost crab on the island, this large type which kept strictly to the beach, rarely venturing above the high-tide mark and taking refuge in shallow water when frightened, and another smaller, more colourful species, which dug its burrow inland from the beach and spent most of its time well above the high-tide mark.

It was early November and the green turtle nesting season had just begun. Only a few turtles were coming ashore to nest each night, sometimes only one. Later in the season several dozen each night would not be exceptional. Green turtles are strictly seasonal nesters in the Torres Strait where they lay from November to February inclusive. The tortoise-shell turtle, known simply as the 'shell turtle' to the Islanders, on the other hand nests throughout the year in Torres Strait.

Kay had reached a sheltered crescent moon-shaped bay at the back of the island, popular with nesting turtles, and sat

down to await developments. There was no sound except the gentle lapping of the advancing tide on the sand and a faint rustle among the pandanus fronds caressed by a light onshore breeze. Kay was early this evening – no turtles had as yet come ashore – and she sat under a pandanus palm in an area much frequented by nesting turtles and wondered if any would in fact come ashore there that night. It was fruitless to speculate, so Kay stretched out on the sand and proceeded to tear strips off an old dead pandanus leaf and knot them together with her long slender fingers.

Her mother, like all the older generation, could make excellent mats and baskets from pandanus leaves but Kay had never been taught how to do this. Unfortunately the Islanders are rapidly losing their special skills handed down from generation to generation and when the present older people die so much will have been lost forever.

About an hour must have passed when she saw a dark shape emerging from the surf about fifty paces down the beach. The full moon provided excellent visibility and reflected off the wet shell of the green turtle, for that is what it was. As Kay watched, the turtle slowly hauled itself free from the gentle waves, stopping frequently to look about, and then started the slow process of ascending the beach. After some time the turtle disappeared into the vegetation zone and shortly afterwards Kay heard the sound of sand spraying from pandanus leaves indicating that the turtle had selected a nesting spot and was digging in. Kay lay back to wait. After what probably amounted to a further forty-five minutes, she sauntered slowly along the beach towards the turtle.

There had been no sound for some time, indicating that the turtle had completed its preliminary construction and was

now either digging the chamber which would hold the egg clutch or actually laying the eggs. Kay came up behind the turtle so as not to frighten it and bent down to see what stage of nesting it had reached. To her surprise it had scarcely dug any egg chamber. Then, as it started digging again after a rest period, she saw the reason. Its right rear flipper had been damaged, perhaps as the result of an attack by a shark, but instead of being bitten clean off as often happens, only part of the muscle had been cut. The flipper was no longer able to go through the normal, but incredible, motions in which it becomes virtually a hand-scoop to remove sand, so that all the digging activity had to be done by the left flipper. This is not an impossible task although, naturally, it takes somewhat longer than when both flippers work alternately. However, the problem was much worse than this. When one digging flipper has been damaged, even when it has been reduced to a mere stump at the region of the upper thigh, that flipper still goes through the motions of digging in its turn. When the flipper has been damaged but not lost it may actually impede the digging sequence and this was the case with the turtle Kay was watching.

The rear flippers alternately dig into the sand, loosen it, and then cup themselves to remove a flipperful which is deposited on the sand well clear of the developing egg chamber. When its turn came the right rear flipper made a very clumsy initial movement which caused sand to fall down into the hole, it was then inserted into the embryonic chamber where it twisted around but was unable to remove any sand. Hence progress was minimal, the digging effort of the left flipper being negated by the succeeding action of the right.

Kay watched for a while and then looked to see if any

other turtles had come ashore. None had. She therefore decided to see if she could help the turtle dig its egg chamber for she knew that until it had dug an egg chamber no eggs would be laid. Kay lay down behind the turtle and removed sand with her hands, working in the frequent rest periods which occurred between digging sequences by the turtle. At first the task looked hopeless as the damaged flipper continued to negate her efforts. She then saw that the trouble came from its action against the wall of the egg chamber and that by enlarging the chamber on the right side the damaged flipper would have no effect as it would no longer strike any sand. This task completed, she continued to deepen the chamber and after a quarter of an hour it had reached the maximum depth that the undamaged left flipper could reach, which is the cue to the turtle, working by touch alone, that the chamber is ready to receive the eggs. The turtle made a few investigatory movements at the foot of the chamber with the left flipper and then, apparently satisfied, prepared to lay its eggs.

Egg laying was preceded by several contractions of the tail region, and a quantity of clear fluid was exuded prior to the appearance of any eggs. Suddenly, following a more violent contraction, one egg was extruded and dropped to the foot of the egg chamber. It was soon followed by another and then another. Soon eggs started to appear two at a time and then sometimes three were laid one right after the other. Kay lay down flat on the sand and started to collect the eggs from the foot of the egg chamber, taking care not to touch the female turtle's tail in the process. When she had scooped up all the eggs already deposited in the egg chamber, three at a time, and placed them in the basket she had made from pandanus leaves, she sat up and collected the eggs, each slightly larger

than a ping-pong ball, that were now dropping from the turtle's cloaca. The turtle laid 154 eggs. These completely filled the large basket, and since each weighed more than one and a half ounces, making a total of 15 lbs., they would constitute an excellent meal for the family. The eggs, rich in fat and protein, have a watery white which does not coagulate when cooked, and a fishy flavour. However, if the eggs are left in the sun for a day or so or soaked in salt water then the white coagulates as in hen's eggs. Kay went home with her basket of eggs, leaving the turtle to cover up the non-existent eggs and disguise the nest site before returning to the sea, unaware that its nest was now empty.

During the week that followed Kay completely forgot about the turtle whose egg chamber she had helped to dig and did not again go egg hunting.

Just over a fortnight later she was again around at the back of the island one evening, when she again saw a turtle having difficulty in digging its egg chamber. Because of the large barnacle on the top of its head and the nature of the wound to the right rear flipper she knew at once that it was the same turtle. On examining it more closely she was able to confirm this by several other features, some of the scales on one side of the head were abnormal in number and of irregular shape and there were several large barnacles beneath the marginal shields at one side. The turtle was making extremely little progress as before and Kay decided to help it. This time she had no ulterior motive. There were numerous nesting turtles so eggs were plentiful, and besides, Kay had not brought a basket in which to place eggs. The sand was very dry as there had been no rain for several weeks and even with Kay's help digging was extremely difficult. The dry sand fell into the egg

chamber as quickly as the turtle and Kay could remove it. After some strenuous digging efforts Kay realized it was useless and in moving accidentally caused substantial sand slippage on to the undamaged left rear flipper. The turtle which Kay had decided to name Ruth, after her mother, at once stopped digging and after a few minutes moved on to try again elsewhere.

The nest excavation commences with a large shallow depression, somewhat larger than the turtle, called the body pit. This generally allows the turtle to enter somewhat moist, more consolidated sand in which it can dig the egg chamber. Ruth was lucky in that in moving on she slid into the remains of a former body pit. The head down inclination at once released the nesting urge and the turtle quickly completed the body pit and was ready to commence the egg chamber. Once again the sand was extremely dry and Ruth and Kay together could make little progress. When Kay realized this she purposefully dropped a stream of sand from her hands onto the left rear flipper. As before, the turtle stopped its attempts and rested. Purely by chance Kay had found the natural way in which a turtle is 'informed' when digging conditions are quite hopeless. One must remember that all the digging activity goes on behind the turtle, and, just as it cannot see someone lying behind it taking its eggs, it never sees the egg chamber which is constructed purely by touch using the extremely sensitive rear flippers.

Ruth moved on several yards and started digging yet a third body pit. While the turtle was doing this it occurred to Kay that if she could only moisten the sand slightly it would be easy to dig an egg chamber. She looked round for something in which to carry water but was unable to find anything. She

was wearing a red and white patterned towelling mini which would readily soak up water. She decided to use it so slipped it off and went down the beach to the sea. Kay returned with her dress soaked with sea water and waited impatiently for the turtle to complete the body pit and commence the egg chamber. As soon as it had started she carefully wrung out her dress on the precise spot where digging was occurring and made several quick trips back to the sea for more water. She then returned to the turtle to help her to dig.

Progress was rapid once she had cleared sand well away from the region of the damaged flipper. She made a total of five more trips back to the sea then wrung her dress out as completely as possible and draped it over a nearby pandanus to dry in the faint breeze. The egg chamber was now two-thirds dug and had reached moister sand where digging was possible without additional water. Kay was lying flat on the ground in order to reach the foot of the egg chamber. Suddenly she felt something solid in the egg chamber and at its next dig Ruth's left flipper unearthed a tree root passing diagonally across the egg chamber. The root belonged to a nearby she-oak and was fully one inch in diameter. Neither Kay nor Ruth was able to break it. Attempts to dig the egg chamber round it failed to satisfy Ruth, so the third nesting attempt had proved a failure despite Kay's help and her idea of wetting the sand around the egg chamber. Kay and Ruth, simultaneously and independently, decided that they had done enough work for one night and that it was time to go home. Ruth slowly turned about and made for the beach accompanied by Kay. Kay was interested to see Ruth's response to her on the beach where the sudden appearance of a human usually sends returning turtles 'galloping' for the sea, and causes

others that are emerging to lay to do a rapid about-turn and re-enter the water. However, she need not have worried. Ruth was completely undisturbed by Kay's presence and stopped frequently to rest between forward movements down the beach. Turtles are not responsive animals – they do not lick you like dogs – but are rather independently-minded creatures, a trait which will be immediately understood by cat lovers. In this connection it is interesting to note that Kay does not like dogs but is extremely fond of cats. What part this may have played in the friendship with Ruth is impossible to say but it may well have been significant. Kay, of course, had more sense than to walk down the beach standing up and towering over Ruth. Instead she moved alongside Ruth on all fours and during the longer rest periods sat down alongside. Sometimes she stroked Ruth's head.

The tide was now well out though it must have been nearly full when Ruth emerged to nest some four or five hours previously. Near the water's edge was an area of beachrock which was difficult for a turtle to climb from the landward side. Here began yet another co-operative activity between Kay and Ruth. On land, turtles are short-sighted and, of course, their head is only a few inches above the ground giving a very restricted range of vision. On reaching the beachrock, Ruth turned left whereas Kay could see that only four or five yards to the right there was a break in the beachrock. She wondered how she could communicate this information to Ruth. While she pondered this, Ruth slowly and laboriously dragged her great weight for almost twenty yards along the beachrock before deciding to try in the other direction. As it was, she had only stopped several yards short of the end of the rock. Again Kay could not think how to tell

KAY'S TURTLES

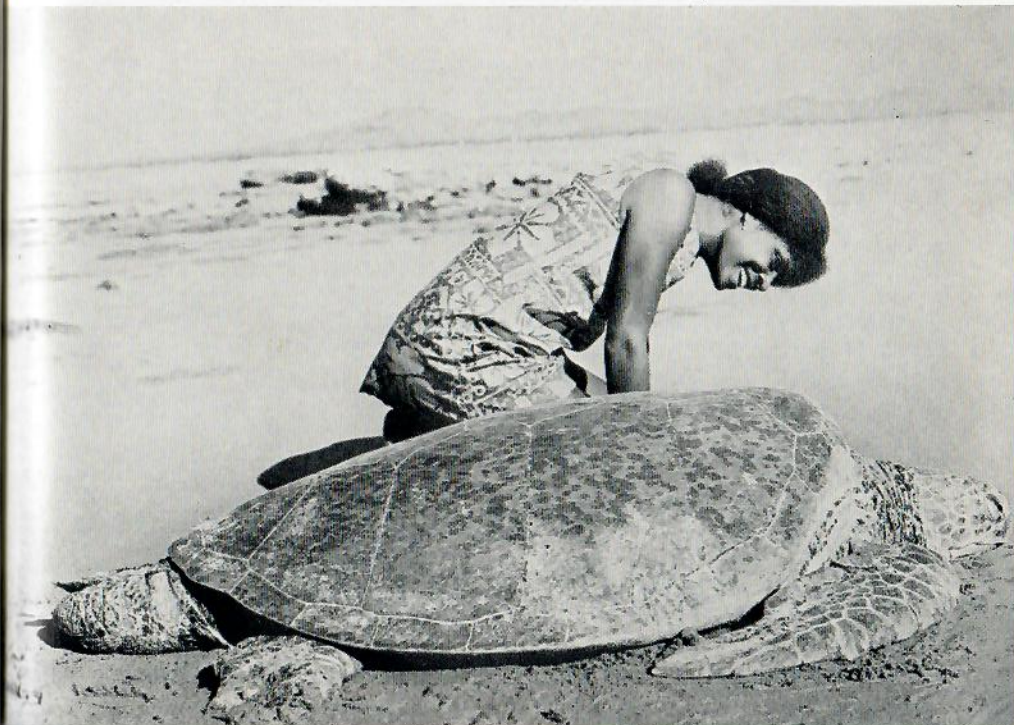
her. Ruth now slowly retraced her steps, with frequent rest periods, and eventually reached and passed through the break that Kay had seen from the start. Soon she reached an area of muddy sand left by the receding tide and started to cross it. Kay remained with her until she was in water reaching halfway to Kay's knees which was just deep enough to allow Ruth to swim. She then slowly swam out towards the edge of the reef and bed – which would be under a coral ledge with head facing inwards where she was comparatively safe from shark attack. Kay, clad in only a pair of bikini briefs as islanders seldom wear bras, was by now very cool. She ran up the beach, put on her dress, which was still slightly damp, and started out for home. On the way back Kay was quite excited and elated at the evening's happenings. However, she determined to tell no one as they would not believe that she had spent the evening making friends with a turtle.

The next night Kay returned to the same beach at the time of high tide. This evening she had brought a small red plastic bucket to wet the sand in the expectation that having failed to lay her eggs the previous night, Ruth would return this evening to have another attempt. Kay detected three sets of tracks in the moonlight, one of which from its much smaller size she knew at once belonged to a shell turtle. The other two tracks, looking even larger than life in the moonlight – almost like those of a tractor – belonged to green turtles. Kay went up behind the first turtle which expired air with a hissing sound and drew in its head at her approach, clearly this nervous turtle was not Ruth. The other green turtle she knew at a glance was not Ruth because of its unusual coloration and exceptionally small head. The carapace was pale green with virtually no darker blotches or spots. The turtle had a



Kay lies talking with Ruth as the tide recedes on a hot afternoon

Kay with Barry, an enormous but very docile male turtle who occasionally hauls out to bask in the sun





At the start of the nesting season Gemai was in excellent condition, the layers of fat being almost noticeable around the hind limbs

Ruth mating with a young turtle. A second male is in close attendance (behind Kay's legs)



FIRST MEETING WITH RUTH

well-dug chamber and, as Kay watched, it suddenly struck some obstruction, then brought up a flipperful of eggs, and then another and another. Some of the eggs were broken but others were intact. Kay looked down the egg chamber and saw that the turtle had dug into the side of a previously laid nest. The carnage continued. As the nesting season had only recently begun the embryos were still small and pink-coloured. Kay picked up one broken egg to look at it. The embryo had a huge head with enormous purple-black eyes, the shell was clearly visible, but completely soft to the touch, and pink, like the soft parts. As Kay turned the small embryo over the heart was conspicuous and its pumping action could be clearly seen. Each time the embryo was touched it moved its tiny limbs. It would soon be dead and the intact eggs would be killed by the heat of the sun the next day in the unlikely event of seagulls not detecting them first. Kay decided to prevent this and collected fifteen intact eggs and sat down to dig an egg chamber for them. Having placed the eggs at the foot and covered them up in approved turtle fashion, Kay noticed two other turtles coming up the beach. As she watched in the overcast moonlight she fancied one was Ruth. She kept still and after a few minutes the turtle was abreast of her and she knew for sure that it was Ruth.

This evening Ruth had come ashore on part of the beach where there was a pronounced bank to climb and where some areas were too steep even for determined turtles. Kay moved slowly towards Ruth, on all fours, and Ruth, who had stopped to rest, showed no sign of fear. Ruth continued straight up the beach and it was clear to Kay that she was heading for an almost unscalable portion of the bank. Crawling up alongside her Kay accidentally placed her weight on her left fore flipper

and Ruth made a slow deliberate turning movement to the right and then continued on up the beach at the new angle. However, the best approach to the bank lay slightly further to the right so, noticing the previous response, Kay again placed her weight on the left front flipper. Ruth responded exactly as before moving even further towards the right. Kay was delighted; she had found a way in which to guide her friend around obstacles and so save her considerable effort.

Turtles forsook the land to return to the sea at least seventy million years ago, and are therefore naturally adapted to life in the water. It is extremely difficult to obtain traction on soft sand but in the water support for the enormous weight is no problem. On land, shifting the weight across soft sand with limbs ill-adapted for terrestrial movement becomes a major task, hence the turtles' frequent rest periods. Furthermore, turtles, like whales, have problems in breathing when on land. Everyone has heard of the mass deaths of stranded whales. Most people know that whales are mammals like ourselves and also breathe by means of lungs but few people realize that stranded whales die ashore from slow asphyxiation. Due to their great weight, much of which is lying on top of the lungs, stranded whales are unable to inflate their lungs and so take in air. Turtles face a similar problem but can overcome it by elevating their head and pushing upwards slightly with their front flippers. Nevertheless this is a considerable effort and the whole nesting process is an arduous one, especially for the heavier turtles. Green turtles have a further handicap not shared by most other species. When on land they do not walk by the alternate limb movements that characterize terrestrial animals and indeed most other turtles. Terrestrial animals move opposing limbs together so that the left front

leg moves simultaneously with the right rear leg and vice versa. Green turtles, on the other hand, move by simultaneous movements of all four limbs. The front flippers are raised, moved forwards, placed on the sand and used to drag the turtle forwards. At the same time the rear flippers push forwards. The overall action serves to slide the turtle across the sand without it being lifted clear off the ground. One has only to watch one of the other species of similar weight, such as a large loggerhead, walking across the beach to see just how inefficient is the green turtles' locomotory pattern.

With Kay's help – Kay acting as the brain and eyes and Ruth providing the motive power – Ruth had now reached an area of bank where ascent was possible and where there were no obstructions. Kay had often marvelled at the way in which turtles climb steep inclines to a height of twelve feet or more without apparent trouble. As soon as she had ascended the bank, using the rear flippers not only to push her forwards but as props to stop her sliding backwards on her smooth lower shell, Ruth started a body pit and Kay lay down in front to watch her. Normally one has to stay behind a nesting turtle to avoid frightening it, at least until it has laid its eggs, but Kay now felt that Ruth was sufficiently accustomed to her presence not to worry about her, an assumption which proved correct. It is a great advantage to be able to sit in front of a nesting turtle as during the construction of the body pit sand is forcefully thrown backwards by powerful strokes of the front flippers and, as the turtle moves slightly from side to side, the sand spray covers almost one hundred and eighty degrees. Kay watched Ruth's slow, purposeful, digging activity. Her eyes remained open throughout the process which seemed rather strange to Kay as clearly visual stimuli

could not be necessary for digging the body pit when they were not needed for the construction of the infinitely more complex egg chamber. Kay noticed that streams of mucus ('tears') slowly oozed from Ruth's eyes and remembered that she had seen these previously on other nesting turtles. She wondered if these were produced to keep the eyes free of sand particles. (She did not know that these 'tears' are emitted even under water and are a method used by turtles to get rid of excess salt taken in with the food.)

As Kay watched, Ruth completed the body pit to her satisfaction and started on the egg chamber. As soon as Kay was quite certain of the exact spot which was to be excavated she carefully sprinkled water over the area. She did this slowly, between flipper actions, and let it soak in before adding more so that the texture would not be too alien to Ruth. She then settled down as before to dig. This time the wet sand was extremely easy to remove - it was like digging into damp earth and in no time Ruth and Kay had the egg chamber half dug. Kay had been careful to make the hole wide on the right side so that the damaged flipper could not hit the rim and cause a cave-in. They were now digging into drier sand so Kay got up and went down to the sea to get more water.

As she entered the shallows several shovel-nosed rays scurried away from her feet. Smallish individuals up to about two feet have a marked penchant for lying in the shallowest water where they are constantly dragged back and forth by the waves. They are difficult to see as they lie half covered by sand beneath a water surface partly obscured by foam from the waves.

Kay walked back up the beach to Ruth with her bucket. She noticed several large ghost crabs foraging along the high-

tide mark. These scuttled off sideways with a graceful, almost dancing action as she approached, and a large land hermit crab crawling slowly back up the beach left its characteristic track on the sand as if a miniature tank had passed that way. The hermit crab was brilliant red and protected its soft abdomen by living in a large whelk shell which the crab had obtained after the death of the original owner. It had been down to the sea to wet its gill chambers. Although living on land as an adult, it still needs to have wet gills in order to breathe. This necessitated a quick trip to the sea every third or fourth day. Kay had always been fascinated by the land hermit crabs. The smaller ones were a rather drab white colour and lived in white nerite shells. As they grew they changed gradually to orange, and finally red, and nerite shells became too small for them. Although there were plenty of suitable smaller shells, large shells were at a premium unless they were prepared to inhabit the delicate tun shells which offered little protection against a determined predator. The shortage of large shells was so acute that the largest crabs often inhabited damaged shells, whereas the smaller hermits could afford to be very choosy. When frightened they retired within the shell closing the entrance with the tough keratinized limbs and one claw which was much larger than the other. Again the larger hermits were often unable to retreat fully into their shell because, due to the shortage of large shells, most inhabited shells which were on the small side, but Kay supposed these large individuals were better able to take care of themselves than the young crabs. The large red hermit had stopped and was eyeing Kay suspiciously as she stood several yards off looking down at it. However, it decided that she was not a threat and slowly continued on its way

up the beach to its home in the debris below a scaevola bush.

In her absence Ruth had made considerable progress and all that was necessary to complete the egg chamber was about a third of the water in the bucket. Having helped her dig the chamber to its full depth, Kay sat back and allowed Ruth to put the finishing touches to widening the foot to receive the eggs.

Once practically no sand was being removed Ruth stopped digging and took up a laying position. With Ruth, the left rear flipper was placed in the hole and curved slightly as it reached against the back of the chamber from left to right. The right flipper rested on the sand. This was a fairly common flipper position during egg laying.

With little prior warning an egg appeared from the cloaca and dropped into the chamber. The first five eggs were all laid singly then two eggs were laid together and soon the normal pattern of eggs being expelled in two's and three's commenced. Ruth was a fast layer and it did not seem long before Kay had counted 166 eggs and Ruth had stopped laying and almost immediately started to cover the nest site.

Kay had decided carefully to mark the exact site of the nest as she hoped to be able to keep watch over it and with luck be present when the baby turtles hatched. After all, she had played a key role in providing their incubation conditions. Without her it seemed unlikely that an egg chamber could have been successfully dug and eggs laid. Furthermore, it was a way of continuing her association with Ruth. Strange though, she thought, that she would probably be there to watch Ruth's babies emerge but that Ruth would not be present. Nor would Ruth know anything about their future for there is no parental care in turtles, instinct equipping the

babies for an independent life from the moment they emerge from the egg.

Knowing when to expect the young to hatch was not so difficult as it might seem. Kay knew that incubation took about six weeks, which would be about the time that Ruth was due to lay her fifth clutch of eggs. Kay would, of course, be present then to help Ruth and could easily keep watch over the other nest. A day or two before emergence takes place a small depression usually develops at the surface and this would provide a cue for Kay that the next evening she should be beside the nest before sunset.

While she had been thinking about this, Ruth had completed covering the nest and was now flinging sand backwards as she filled in the body chamber and made some attempt to disguise the nest site. After what appeared to Kay to be a relatively short time, Ruth stopped this activity, climbed out of the shallow pit and headed seawards. She slid down the bank, crossed the beach and was in the sea all within ten minutes. Kay stood on the beach and watched her swim out to sea. She waited after she had disappeared from sight and sure enough, in the bright moonlight saw her surface briefly to breathe, then she was gone.

CHAPTER THREE

Lying in the sun

*

SEVERAL days after Ruth's second successful nesting Kay was on a small island only a mile or two from home but rarely visited as it was seldom used by nesting turtles and no sea-birds nested there. She had rowed across soon after daybreak with no particular purpose in mind. She frankly admitted to herself that she had been restless since befriending Ruth and the next fortnight, until Ruth was due to lay again, would seem an age. She had thought that the first nesting she had witnessed was probably Ruth's first for the season and that Ruth would probably nest a total of four to six times. Hence there would be plenty of future opportunities for them to be together but the first of these would not occur for about a further ten days.

Kay was sitting on the beach near the water's edge, wearing a light green cotton micro-mini over a scarlet bikini and enjoying the early morning sun on her back. She was gazing out to sea, unlooking, deeply immersed in thought about Ruth. Her attention was attracted to a turtle swimming along parallel to the beach in the shallows. This was a common sight so Kay did not take much notice of it until it veered beachwards and seemed about to come out of the water only a few yards to her left. Kay was most surprised as she knew that green turtles only nest by night and it had now been light

LYING IN THE SUN

for three hours. However, she automatically froze and kept her eyes fixed on the spot to see what would happen. The turtle crawled beachwards until it was resting in the area of wave action. It then turned about and faced the sea and remained motionless. Kay was most surprised at this and decided to wait and see what would happen next. Idly she thought that the turtle looked rather like Ruth but she rejected the idea at once as wishful thinking. That the turtle was a female was obvious from the start. Firstly, males never left the water – had this turtle left the water? – and secondly, when it about-turned, the short stubby tail which characterizes females was clearly visible.

The tide had been full shortly after sunrise and had now started to fall fairly rapidly. Kay wondered what the turtle would do as the tide fell. At present it was still in shallow water most of the time and when an occasional largish wave came in it was half submerged. In the intervals between, however, it was almost out of the water. After half an hour the turtle was high and dry and appeared to have gone to sleep. Kay wondered if it was sick. She vaguely remembered some of her older relatives telling her that turtles sometimes sat on the beach by day but she could not remember any details. Never having seen it herself she had relegated it to the talk of the 'before times' and dismissed it as probably untrue. Yet here she appeared to be seeing just this herself.

She waited a little longer and then got up and walked over to the turtle. It was indeed asleep with eyes closed and head lying on the sand. There were no visible signs of injury. Kay stopped with an exclamation of surprise. It was Ruth! Kay's first reaction was to wake her up, but on second thoughts it occurred to her that this would probably frighten Ruth who

would swim out to sea first and 'think' secondly, if turtles did think in the way that we understand thinking. Having just found her friend she was reluctant to lose her so soon so she did nothing. The tide continued to recede and Ruth remained fast asleep. Kay decided to take a stroll to think about this strange new situation.

When she returned about two hours later Ruth was fast asleep exactly as she had left her, except that it was now almost low tide so that she was some twenty yards from the edge of the sea. Kay sat down beside her and gently rubbed her head. Nothing happened. Kay rubbed harder, still nothing happened. Clearly Ruth was either sick – very sick – or in a very deep sleep. Kay wondered what she should do. Now genuinely worried about her friend she was eager to see that she was still alive. She thought of the most sensitive area of Ruth to touch – rubbing the front flipper produced no response at all so she moved round to the sensitive tail and gave that a gentle tug. At once the rear flippers moved so Ruth was alive after all. Returning to the head, Kay saw Ruth slowly open her eyes and blink a few times. She then raised her head and drew air into her lungs, placed her head back on the sand and looked at Kay. There were so many things that Kay longed to ask Ruth. Time and close observation would provide most of the answers, she knew, but that is little consolation to a young girl!

The next morning she returned to the same spot and sure enough Ruth soon made her appearance exactly as she had done on the previous day. It was the same the following day also.

On the third day, which was extremely hot with the full tropical sun beating down out of a cloudless sky and not

even the vaguest indication of a sea breeze present, Kay noticed for the first time other turtles behaving similarly further along the beach. That afternoon she went for a walk right round the island and counted twenty-three turtles lying asleep on the beach at varying distances from the water's edge, it now being low tide.

During this walk Kay was surprised to see five turtles lying on their backs on the beach. All twenty-three sleeping ashore were females – she had checked this with each one. Yet three of the five lying on their backs were males. Kay thought that someone had turned them to take away for food. Islanders often turn a turtle and return to collect it later knowing that when it is on its back the turtle is helpless. However, Kay could readily see that some of these turtles had been there much longer than others – one male appeared about all in, was seriously desiccated, and must have been there for several days. Two others had clearly only been turned over that morning as they would be floated off by the next tide. However, there were no footprints other than Kay's on the island so that cut out a human predator. Furthermore, humans turned turtles they found on the beach, namely nesting females. Since males never left the water it was impossible for humans to turn them! Kay was quite at a loss to decide what had happened. She naturally tried to turn them right way up again. This was easy with the three males, the desiccated individual seemed extremely light and made very slow movements across the sand to the water. Kay wondered if he would reach the sea but suspected that if he did he would soon recover. It was also just possible for Kay without help to turn the smaller of the two females after a number of attempts. She was unable even to move the larger female.

She was on the point of turning back when she saw a male turtle with a large tail lying on the beach not far from the water. She went along towards it moving slowly, to see if it was all right. She had never previously seen a male basking out of the water. When it lifted its head to breathe she remained motionless. The turtle returned its head to the sand, closed its eyes and presumably went back to sleep. Kay walked straight towards it, sat down and carefully examined it. This was her first opportunity to examine closely the huge thumb claw that the male uses to hook on to the female during mating. Kay leaned forward and very gently stroked its head. Remarkable as it may seem, this was Kay's first meeting with Barry as she was later to name this enormous male who hauled out from time to time to sleep in the sun. When she stroked his neck he opened his eyes and seemed to realize that she meant him no harm for he merely lifted his head to breathe, returned it to the sand and watched her. After a few minutes he closed his eyes and went to sleep again. Kay was often to see Barry in the water, and watched him mating several times, as like all male turtles, Barry was very promiscuous. Unlike most males, however, he was always very gentle with Kay and never showed any sign of fear.

Kay noticed over the next few days that the sequence of sleeping ashore was exactly as had happened on the first day with Ruth. Turtles came right up to the shallows and turned round to face seawards in the region of wave action. As the tide had been high in the morning, soon after sunrise, and there was only one tide cycle every twenty-four hours, the tide then continued to drop all day leaving the turtles stranded, further and further from the sea. Neither then nor subsequently did Kay ever see a turtle take the trouble to crawl

any distance up the beach. The fact that turtles were later found there was purely a result of tide fall.

Kay wondered why they rested ashore. The fact that they only entered extremely shallow water was to provide her with a clue. When she was sitting ashore with Ruth by day and they were still in the shallows or right at the water's edge, Kay saw many male turtles patrolling, obviously looking for females. These turtles never noticed Ruth or others in a similar position. Furthermore, as Kay was to discover (see Chapter 5), males cannot mate with females unless the water is about eighteen inches deep. Kay decided that females came into the shallows to get away from the males though she was uncertain why they should want to do this.

The final piece of evidence which clinched this in her mind came some days later when she was on the reef flat with Ruth and the mating season was in full swing. To Kay's surprise, every mated pair was surrounded by several males and the males seemed to be continually on the look-out for mates. Once any mating was completed that female was then considered fair game and harassed by other males. Kay now felt sure that females beached by day to avoid male encounters. About a year after Kay came to this conclusion, a scientist came to the same conclusion after observing similar evidence and wrote a paper in a scientific journal on the subject.

All the beached turtles returned to the sea in the late afternoon as the sun was setting, although this usually necessitated a long crawl down the beach and sometimes across exposed sandflats. Kay wondered why they did not remain ashore all night also. She wondered if their difficulty in breathing ashore might be responsible. She knew that male activity was largely diurnal so presumably their reason for having

hauled out disappeared with daylight. However, each evening when Ruth returned to the sea Kay worried that she might be taken by a shark that night. She need not have worried; Ruth had a particularly secure retreat in which she wedged herself completely under a deep, over hanging ledge of coral.

About a week later Kay had again come across the same enigma – stranded turtles on their backs. While trying to turn them over she again wondered how this occurred. She now had a clue with regard to the males. She had seen several mating attempts in shallowish water and on one occasion the male had fallen off the female's back and had almost tipped over. Now, if this had happened in very shallow water, and a large wave had then moved him landward, and the tide had been receding . . . Well, it was an idea at least. This lead provided no clue as to why females were found upside down on the beach, and about half of those she had seen were females. She simply could not believe that something with the low centre of gravity and stable shape of a turtle could be caught and flipped over by a wave. Anyway, she had seen little strong wave action around this island during the past week.

Incidentally, Kay, of course, was not surprised that some of these stranded turtles had clearly been there for some days. Someone lacking her knowledge of the sea would have attacked her theory of their stranding by saying, 'Ah, but if they are stranded by the tide then the next tide will float them off again.' Kay knew that this need not be the case. If the tides were 'making' it would, of course, certainly be the case. But if the daily high tides were dropping, as they had been markedly this week, then the next high tide would not come sufficiently far up the beach to rescue a turtle

stranded the previous day at around the time of high tide.

Tide height variations, of course, also complicated the issue as they indicated that the observed strandings upside-down were only a fraction of those that in fact occurred. Firstly, only those happening when the tide cycle was falling would be there to observe the following day and even then only if the accident had happened at around the time of high tide. All other turtles would be floated off by the next high tide. Furthermore, one could not come along and expect to find dead turtles or turtle skeletons as a result of this since any which did die would be removed by the next (fortnightly) tide cycle.

Kay also had another problem concerning beached turtles. From time to time she came across individuals, not necessarily exceptionally large adults, dead ashore, lying the right way up and not lost in the vegetation zone but on the high beach platform in full view of the sea. What, Kay wondered, had happened to these turtles. She had examined several freshly dead turtles over a period of a couple of years and had never detected any external damage. It had not occurred to her that these were probably old turtles which had found the nesting process too arduous for them and had died of a sudden and severe heart attack.

Seeing turtles ashore on the beach by day was a completely new experience for Kay so that she spent considerable time with Ruth and Gemai, the latter another female turtle which she had befriended, and had named after her grandmother. However, it was not all that exciting as they did nothing and had it not been for her intense sense of friendship towards Ruth and Gemai, it is unlikely that Kay would have returned after the initial few days.

CHAPTER FOUR

Adventures on the Reef Flat

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RUTH introduced Kay into another world when they spent long hours together on the reef flat. Kay had often been on the reef before but usually on top of it, either at high tide fishing from a dinghy, or walking, when the water was shallow, spearing fish. The concentration involved in this meant that everything other than potential 'game' was scarcely noticed. Furthermore, in both situations she was outside looking in so to speak. Whereas now she was literally a part of that world.

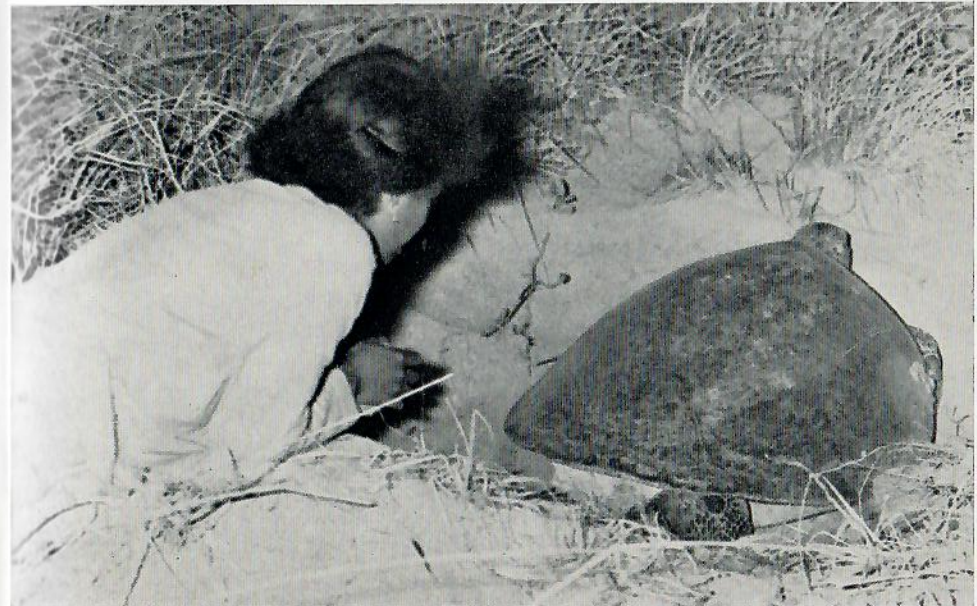
Ruth spent hours browsing on turtle grass in a shallow bay where at half tide the water was rarely more than four feet deep. It was pleasant floating in the water with Ruth, lazily watching her feed and observing the bitten off pieces of turtle grass, which eluded her jaws, float to the surface. However, it was the reef flat that held Kay's attention because of the variety of animal life there. It seemed to her every time they slowly swam over the reef together she saw strange animals and fishes which she had never noticed before.

There was such a variety of fish, most of which completely defied description, going about their business totally uninterested in what Ruth and Kay were doing. This was something which surprised Kay. When she was on the reef, spear in hand, looking down at fish from above, they were extremely



Gemai removing a flipperful of sand in her cupped rear flipper during nocturnal excavation of the egg chamber

Gemai laying eggs





Ruth about to start laying

Gemai laying eggs. Note the straight, vertical sides of the egg chamber



ADVENTURES ON THE REEF FLAT

shy and stalking and spearing them required considerable skill. Yet here under the water in the coral pools were myriad fish of many different species which, when you came towards them from under water, showed no fear at all. Kay was able to look at many of them from distances of only a few inches. Success depended on slow swimming movements and not breaking the water's surface. What one had to do, therefore, was to float head down at the surface wearing a face mask and snorkel, keep one's hands still, either folded back along one's sides or stretched out from the body for balance, and propel oneself by one's feet without breaking the water's surface during forward swimming movements.

While snorkelling over the coral pools at the edge of the reef with Ruth towards low tide, Kay sometimes came across shoals of tiny sardine-like fish. These were present in enormous numbers so as to appear in the distance like a dark cloud suspended downwards from the water's surface. As she snorkelled closer she could see that the 'cloud' consisted of many thousands of tiny fish all closely packed together and either maintaining their position, despite the push and pull of the swell breaking over the pools, or all moving slowly in the same direction with perfect co-ordination. The manner in which these huge shoals of tiny fish behaved, as if they were a single animal, fascinated Kay.

When she would have been close enough to put out a hand and touch them she could see the silvery lower surfaces and the dark grey-blue dorsal area. This colour scheme she knew from long experience made them virtually invisible both from above and below since viewed from above, the mass of the sea looks dark, and the sky viewed from below the water's surface looks silvery-white. At any closer approach the

'cloud' would part with a shimmer of iridescent silver to let her through.

While Kay slowly propelled herself forwards by slow movements of her feet below water, or hung suspended beside coral ledges, she was a constant object of enquiry for curious fish which seemed to be without end. Shoals of attractive blue pullers, either alone or intermingled with vertically-striped sergeant majors, swam around her pretending to be completely oblivious of her presence as if she was just another piece of coral shelter. However, they gave the game away when every now and then one would swim right up to her face mask and stare her in the eye. This was quite unfair, Kay thought, as fish, lacking eyelids, cannot blink so the fishy stare always outstared her! She was surprised at the complete lack of fear of these gregarious reef fish. Kay spent countless hours with them and lost all sense of time when she was with them. It was at such times that she lost contact with Ruth.

One of the fish which attracted Kay most of all was brilliantly coloured, barely two inches in length, and swam with rapid undulating movements of the posterior half of its body without apparently trying to go anywhere. It was coloured in vivid shades of blue, and blue shading into purple, with a bright orange marking on each side of the body. This species generally occurred in twos or threes.

Many of the reef fish were elongated from top to bottom and extremely thin from side to side. From above they had no appearance but viewed from the side under water they were seen to be gorgeously adorned. One such species, known as the beaked coral fish because of its elongated snout, was

pearly-white with four vertical orange-yellow bands, the first three edged with dark brown, the last with pale blue. There was a dark band at the base of the tail likewise edged with pale blue. The dorsal fin was greatly enlarged posteriorly, bright yellow edged with pale blue and then orange, and had a large black eyespot edged with pale blue. The large ventral was similar but lacked the eyespot. Many of the butterflyfish were also exotically coloured and greatly lengthened vertically.

A particularly startling fish among a sea of contenders was the Harlequin tusk-fish about eight inches long. The general body colour was blackish dorsally and posteriorly, and greenish anteriorly and ventrally, the one colour shading into the other approximately across a line joining the front of the dorsal fin to the foot of the more posteriorly situated ventral. Eight vertical scarlet bands, blue bordered, traversed the body – the first one crossed the front of the head including the jaws and eyes. The tail fin was mid-pink with an area of dark yellow near the base. The pectorals were also deep yellow except for a red basal region.

Kay was, on the whole, less impressed with the corals because they did not do anything. Most corals, of course, feed only by night so that during the day the polyps are retracted and one sees only the skeleton which, however, is often of a bizarre shape and sometimes brilliantly coloured. Kay considered the most beautiful coral on the reef was the pink staghorn. A pool of staghorn coral is attractive because of the delicately branching sections and because it usually grows quite profusely. However, the common species has a white skeleton. This rarer one had a beautiful mid-pink shading with a delicate translucent hue because of the outer

slimy covering of the living coral. It was quite exquisite, Kay thought.

Even the brightly coloured coral skeletons lose their colour when the coral is removed from the water and dies. Only a very few, notably the red organ-pipe coral, retain their colour as a dried skeleton. For this reason it seemed to Kay so strange that people wanted to collect coral and put pieces of it on their television set or bookcase. If they have seen it in life then this was an insipid memory. Worse still, many people, one must presume from ignorance, buy pieces of coral which have been artificially dyed garish colours. The promoters of this make a great deal of money too.

There are a few species of hard corals, that is, those which have a hard skeleton composed mainly of calcium carbonate whose polyps feed by day. These mainly have a compact shape, flattish or semicircular, the polyps coloured either brown or green. Kay found that when you touch some of the polyps they retract but those further away from the point of contact take longer to retract and those even further away remain out and feeding.

As they slowly progressed over the sandy bay, Ruth feeding on the green seaweed, aptly called 'turtle grass' by Europeans, Kay noted just how abundant were the *bêche-de-mer*, or sea cucumbers as they are sometimes called. They were exceptionally numerous on sandy patches on the reef flat too. The common form was about eight inches long and one and a half to two inches in cross section and a dull black colour. However, there was a really giant species which was orange coloured and measured at least eighteen inches long and about four inches in diameter. *Bêche-de-mer* have an unusual method of defence – poor things being just like a sausage there

are not many avenues of defence open to them, certainly they cannot run away – when in a tight spot they eject their intestines. These are extremely sticky and if the sea cucumber is lucky may get entangled with the enemy.

Starfish, close relatives of the *bêche-de-mer*, were everywhere and there was a frightening assortment of species. Two particularly attracted Kay. One was a traditional-looking starfish, shape-wise at least, with five arms. Its colour was its forte, however. Underwater it looked the most beautiful shade of dark blue imaginable. Once removed from the water the colouring appeared a darker shade, almost purple. The other was the cushion star, a most unlikely-looking thing, and quite different from ordinary starfish. Cushion stars lack the long limbs of ordinary starfish and the spaces between the limbs are filled in so that the starfish is a solid mass of five-sided cushion. No two were the same colour and the markings generally defied description. The ground colours varied from yellow-orange to dark brown. Cushion stars often grow quite large – eight to nine inches across – and become extremely heavy.

Kay discovered that large green turtles are not so strictly vegetarian as is often thought. On many occasions she watched Ruth eating large jellyfish floating on the surface and the first time she saw Ruth take several jaw-shaped bites out of a large one and then leave it, she remembered that she had often seen jellyfish with similarly-shaped sections removed from them when out fishing with her grandfather and had wondered what was responsible. Occasionally these jellyfish appeared in really large numbers but usually one saw only a few on any particular day.

On two occasions Kay actually saw Ruth catch and eat a

fish. Once was when they were together in a large coral pool with a sandy bottom. Kay was watching a brittle starfish make its way across the sand to shelter. She had removed it from under a rock, in the process of which it had shed part of one limb, and placed it on the sand some feet from cover. It 'snaked' its way rapidly over the sand by sideways undulating movements of its four remaining limbs, one of which was regrowing the terminal portion from a previous encounter. Kay noticed when she put it back on the sand again that it always moved with the same limb leading although there was no way of detecting which one was the leading limb from looking at the brittle star. It was while she was looking at this that she saw Ruth making a commotion at the other side of the pool and looked across just in time to see a sandy coloured bottom-dwelling fish being grabbed and quickly swallowed by Ruth. The fish appeared to be about nine inches long. Kay suspected that green turtles were predominantly vegetarian because they were not able to catch many fish – the fish were too quick for them and much more agile. However, she felt sure that any sluggish fish which attracted Ruth's attention would suffer the same fate as the one just taken. Shell turtles, as Kay knew, were largely carnivorous but they had the advantage that their beak-shaped jaws enabled them to prise shellfish and crustaceans out of crevices between rocks and amongst the coral. The rounded snout of the green turtle prevented this type of feeding.

At the other side of the pool in shallow water only just covered by the receding tide, was a large drab greenish-grey sea anemone measuring almost a foot across. It had very numerous shortish tentacles of the same colour. These were so profuse as to completely hide the mouth. By no stretch

of the imagination could it be called attractive. However, its 'friends' were extremely beautiful. Certain fish live with this anemone and are not killed by its stinging cells which would normally catch and kill much larger prey. The anemone fish, or clown fish as they are popularly called because of their antics, therefore take refuge right inside the tentacles when danger threatens and never move far from their protection. The clown fish, of which there are several species, measure about two to three inches and are brightly coloured in blackish-brown or orange with white bands. There were two anemone fish associated with this anemone, one about two inches and banded in orange and white, and a much smaller one about one inch and banded in dark brown and white. Their constant motion as they played in and out of the tentacles, pushing them aside without fear, made them fascinating to watch. That they were not killed by the anemone puzzled scientists for some time. It is now known that two stimuli are necessary before a sea anemone fires its tentacles – one is tactile, the other is chemical. Hence an anemone does not waste stinging cells by firing them at a piece of passing seaweed or stick. It is the chemical stimulus which the anemone fish exploits by having a substance on the outside of its body which prevents the tentacles being fired. Scientists found that if even a part of this slimy protective film is scraped off the anemone will kill the fish immediately. Kay looked up, her head raised out of the water, as Ruth was no longer in the pool. She saw her about a hundred yards off, cruising slowly along the surface, and set out to follow her.

The reef flat was dotted with giant clams which were embedded in the coral. The clams were beautiful because of the bright colours of their mantle. No two ever appeared

identical and the colours varied from drab browns to breathtaking shades of blue and blue-green, purple or green. The colours resulted from an algae, a tiny green seaweed which lived associated with the mantle and which turned sunlight and water into starches which were then eaten along with the algae by the clam. Here was a wonderful natural case of controlled exploitation! The clam could not live without the algae to fix its food for it. It kept the algae within its tissues so did not have to go looking for its food. It merely consumed part of the crop.

From time to time Kay saw harmless black-tipped reef sharks measuring from two to five feet in total length. Harmless, that is, as far as she was concerned but deadly to baby turtles. One, measuring about five feet, which she had caught on a hand line when fishing from the beach, had in its stomach sixteen day-old green turtles.

Kay and Ruth swam over many spider shells crawling over the coral. The body was pink coloured and the eyes, set on long stalks, very conspicuous. They also saw many cowries belonging to a number of species and varying in size from the three to four inch egg and tiger cowries to others scarcely an inch long. Cowries have an immaculate smooth shiny shell which, unfortunately for them, makes them much sought after by shell collectors. This is because when out feeding they move with the mantle almost completely covering the upper portion of the shell. When the cowrie is disturbed it retracts the mantle down each side and back into the inside of the shell. When not frightened, however, the two sides of the mantle often meet across the back. This serves to keep the shell clean although this is not the function. The mantle is used for breathing so presumably its exposure is to provide

a maximum area for exchange of oxygen and carbon dioxide.

When out on the reef together Kay and Ruth often saw other turtles, mostly greens. These varied from about fifteen inches in shell length to adults measuring about four feet. The smaller ones, up to about thirty inches, often had beautifully patterned upper shells when these were seen under water, very like the streaked carapaces of hawksbill or shell turtles. One could, of course, always tell the latter at a glance from its hooked beak and the fact that the plates of the upper shell did not meet as in the green turtle but overlapped quite conspicuously like tiles on a roof. It was surprising just how close Kay often got to these turtles. Certainly she did very much better with Ruth than she would ever have achieved by herself. When they came near she usually arranged things so that Ruth was between her and the other turtles. She assumed that from the proximity of another turtle the stranger thought all was well and perhaps did not even notice Kay's presence or if it did, thought it of no moment.

Huge manta rays, completely harmless, and coloured black above and white below, swam lazily over the reef like gigantic bats. Sometimes they would give Kay quite a fright, especially if they were close, by jumping right out of the water and belly-landing on the surface with a resounding smack. There were plenty of large dark-coloured sting rays but one seldom saw them except inshore in the early morning when they collected in groups of a dozen or more for some purpose unknown to Kay. These rays were very large, the long extremely thin spear-like tail with the poison injecting mechanism at its tip often measured at least five feet!

On the reef flat could be seen a small ray which was extremely shy but beautifully coloured. Its upper surface was

tan brown with a broad orange band around the edge of its almost circular body. The whole of the dorsal surface had large bright blue spots and a broad bright-blue stripe passed along each side of the tail. All one usually saw, unless one was exceptionally lucky, was a flash of colour as it was gone scudding over the reef flat to safety after being disturbed while hunting for prawns and marine worms.

Marine worms of many varieties were numerous, some with homes constructed deep into the coral. One could see the paired and spiral breathing and feeding heads of these projecting from the coral. These were often bright red or black with some white markings and were retracted within their coral home at once if a shadow fell upon them or they were touched.

Hermit crabs were also common. There was a large brilliant red species covered in stiff bristles, and myriads of small ones inhabiting periwinkle shells less than half an inch long.

Once when Ruth was sleeping on the surface, her front flippers lifted clear of the water and folded back along the sides of her upper shell, perhaps as a protection from shark attack, Kay saw a file shell often called 'jumping jack'. This is a kind of clam which has about a hundred long bright red tentacles which are extruded from the valves of the shell. If one touches the tentacles with bare fingers, they stick to the flesh and may break off so it is better not to try to handle them although they are completely harmless. The file shell was moving along the sandy bottom by alternately slowly opening the two valves of the shell which are hinged at the rear and hence taking in water and then, by sudden muscular contraction, pulling the valves rapidly together and using the jet of water expelled in the process to move it in the opposite

direction. The action happened so quickly that it progressed in little bounds rather like a kangaroo hopping. It then rested and Kay was able to have a good look at it. She could not remember ever having seen one before.

It is difficult to describe the feeling of well-being resulting from several hours spent on the reef with Ruth. In large measure this probably resulted from the experience of doing and seeing interesting things which you would never get around to experiencing otherwise. Of course, one could go out to look for animals on the reef flat but this is not the same. Invariably one comes across the more interesting animals when one is not out searching for them and Ruth's contribution was, therefore, to take Kay out frequently on the reef flat for no other purpose than their being together. Yet, on these expeditions, Ruth introduced Kay to a whole world that was new to her particularly from Ruth's below-water angle.

The sex life of turtles

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KAY knew next to nothing about turtle courtship which is hardly surprising since virtually nothing on the subject is known to science. There is not even a single publication dealing with this topic. From time to time in the mating season, which immediately precedes and extends into the first half of the nesting season, Kay had seen pairs of copulating turtles floating on the water's surface. This time of the year is known as 'turtlefast' to the islanders due to the secure position the male maintains on the female's back. However, whenever an island dinghy approaches, the wary female dives taking the male with her. Occasionally, when the female does not dive as soon as the male would like, he releases his hold on the female and both dive independently. Perhaps the behaviour depends on whether or not actual copulation has commenced.

One day when Kay was lazing in the water with Ruth she noticed another turtle homing in on Ruth. This was unusual because other turtles usually kept their distance and went their own way but this turtle was unmistakably swimming straight for Ruth. Kay floated motionless to watch. They were in shallow water not far from the beach, the depth being less than three feet. The strange turtle approached Ruth from behind and as it swung round Kay noticed it was a male.

As Kay watched, the male turtle swam round Ruth in a wide circle coming up to meet her face to face. An incredible thing then happened. The two turtles nuzzled each other, or rather the male nuzzled Ruth's head, for all the world like two people rubbing noses. This behaviour continued for several minutes while Kay watched fascinated. All the time it was the male who was setting the pace. Ruth seemed wholly unresponsive. Just as Kay wondered what would happen next, the male turned slowly and deliberately opened his jaws and made a biting action in the soft skin between the shoulder and the left side of Ruth's neck. He did not actually bite the flesh hard – it was more what a European would call a 'love bite', a tentative tasting action. As it did this the male raised his left front flipper and sort of placed it over Ruth's head. As it did so Kay saw the enlarged thumb claw which the male uses to maintain his position during copulation. Kay lay in the water scarcely daring to breathe. She considered herself exceptionally fortunate in witnessing this courtship behaviour from a distance of less than six feet. It was, of course, completely due to her friendship with Ruth. Male turtles, she knew, were quite promiscuous during the mating season and it was the females who were fickle. If the female had been a strange one it would never have remained in such close proximity to Kay let alone permit a male to court it under such circumstances. Kay had been told that the males had such a pronounced urge to seek out and mount females during the mating season that in certain parts of the world, such as Fiji in Melanesia and among the Carib Indians of the West Indies, this trait was used to trap them. Decoy females made from wood were anchored in the water. The males attracted to them were either netted or speared.

As Kay thought about this she saw the male swim leisurely round to the rear of Ruth where he deliberately made a bite at her right rear flipper. The response from Ruth was instantaneous. She raised her front flippers right out of the water and made the most powerful breast stroke action that Kay had ever seen, followed by two more strokes. She then cruised round in a wide arc coming back to near where she had been. The male was left behind. Clearly Ruth wanted to have nothing to do with him. However, persistently he returned and without further preamble tried to climb onto Ruth from behind. She moved just a fraction and in his ardour he applied too much power in attempting to swim up and onto her back and went right over her head and landed in the water in front of her with a resounding smack. The failed manoeuvre was ludicrous to see but, undaunted, he returned for a third attempt. This time his angle of approach was defective and, although he succeeded in landing on top of Ruth, he did this transversely, was accordingly unable to get a grip with his fore flippers which waved frantically in the air and beat the sides of Ruth's shell, and then slowly teetered on the smooth cambered sides and slid off again. Ruth had clearly had enough of this nonsense. She sped off rapidly, parallel to the beach, then made a detour out to sea and landed back in the shallows about twenty yards from Kay.

The male made a half-hearted attempt to pursue her but had not reappeared by the time Kay had swum slowly and gracefully with long strokes towards her friend.

In a sense, Kay was sorry that Ruth had not wanted to mate as she would have liked to have seen the whole procedure from such an excellent viewpoint. However, her relationship with Ruth made her feel like a confidant and she patted Ruth

on the head with the thought that together they had defeated that cheeky big male turtle out there. Ruth was restless and before long moved into extremely shallow water where she was safe from amorous males.

Kay did not see a further mating attempt for several days. The next time, Kay was with Ruth on the reef flat watching Ruth devour a large jelly-fish which Kay supposed was well equipped with stinging cells. She could understand that these might not be able to penetrate the hard scales of Ruth's face and front flippers but was amazed that Ruth took no action to protect her eyes. She literally bit into the jelly-fish sinking her head into the mass and swallowing jaw-shaped chunks at a time. The jelly-fish was only partly consumed when Ruth seemed to lose interest in it which was scarcely surprising as it had a diameter of more than eighteen inches. In view of the experiences recounted in Chapter 4 Kay was no longer surprised to see Ruth eat animal food. She now knew that green turtles, even when adult, were by no means the strict vegetarians that people thought they were.

To return to the present . . . Ruth had just decided that she had eaten enough jelly-fish and appeared to be in doubt about what to do next when a male turtle which was patrolling the beach – swimming along parallel several yards offshore looking for females – appeared to detect them for he suddenly veered seawards. His motion, like all turtles, was a joy to watch. He literally flew through the water with powerful upward-backward and forward-downward movements of his front flippers. The rear flippers took no part in the actual swimming movements but were used for steering or reversing. The upward-backward movements were the power stroke and were made with the flipper at right angles to the direction

KAY'S TURTLES

of movement to provide the greatest resistance possible to the water and so maximize the turtle's forward motion. Between the power stroke and the return the angle of the flippers was subtly altered so that during the forward-downward stroke the flipper cut the water side on so that resistance was minimal. Although Kay did not know it, the movements were remarkably similar to those of a bird's wings seen in slow motion. Their gracefulness, of course, was a result of the great resistance imposed by water compared with air so that the movements were slow enough for the human eye to follow without the aid of a slow-motion camera.

The turtle, a large pale olive green fellow with only a very few blackish spots and an enormous tail, approached Ruth and Kay saw how it used its rear flippers as a rudder so as to position itself exactly in front of Ruth. This achieved, it nuzzled Ruth just as had happened with the other male several days previously. The nuzzling continued for some minutes, the turtle made a biting action in the soft flesh near the neck and then moved round to the rear – exactly as Kay had observed in the previous mating attempt.

The turtle made a gentle biting action at Ruth's right rear flipper and nuzzled the area for several minutes. He then backed away a few feet and with two powerful strokes of the front flippers, shot forwards and upwards coming to rest squarely on Ruth's back with his front flippers drooping down her sides somewhat behind her flippers so that her swimming action would not be impeded by them. Kay noticed that his flippers were positioned so that the thumb claws were just over the sides of the upper shell, clinging to the shell margins and digging into Ruth's soft flesh. His head lay flat on the front of her upper shell and the rear flippers



Which turtle is Ruth?

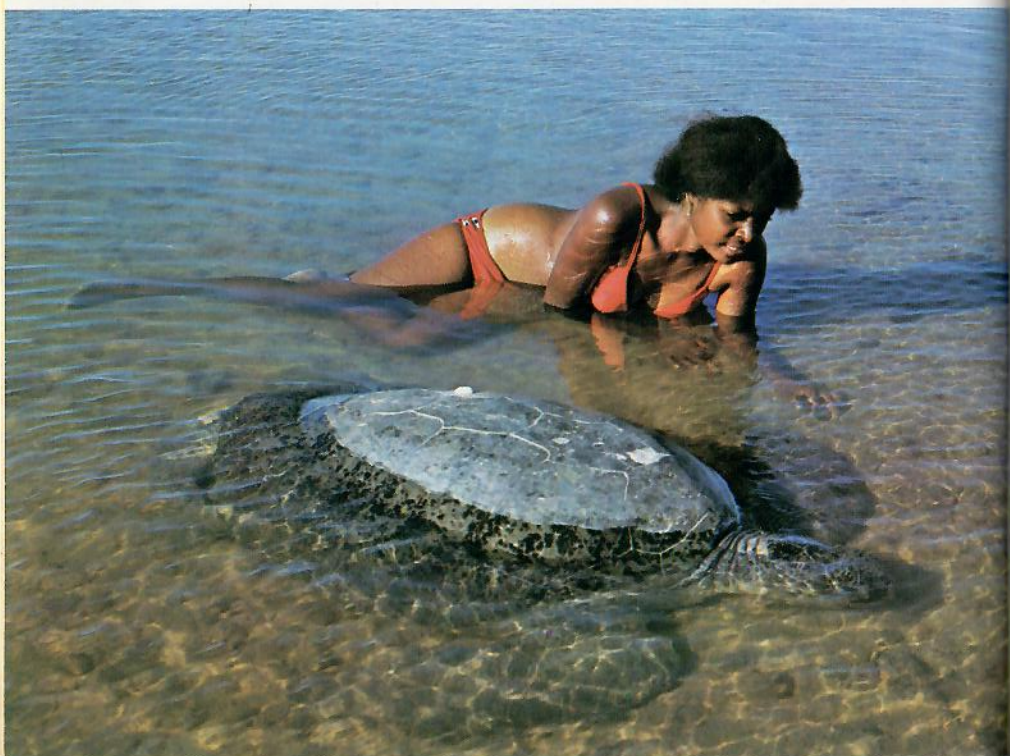
Kay stroking Gemai's head





Kay and Barry in the late afternoon

Kay and Barry lying in the shallows



THE SEX LIFE OF TURTLES

dangled over the edge on either side. To Kay's surprise, Ruth showed no signs of any response. She was floating, head down, just below the surface with a small area of her upper shell out of the water. The male turtle was completely out of the water except for the distal portions of his front flippers and his hind flippers.

Occasionally the male raised his head and breathed with a slow rasping noise, and a couple of times while Kay watched, Ruth did the same. Following breathing, she made a few slow swimming movements with her front flippers which seemed to make the male extremely alert. Perhaps he feared she was about to try to dislodge him. As she watched, Kay reflected that there could be no such thing as rape among sea turtles. No male could ever position himself in the mating position without the tacit approval of the female and even when there, at least until copulation was achieved, his position did seem extremely precarious should the fickle female invoke her female prerogative and change her mind.

Kay slowly moved round towards the rear of the paired turtles. She had been watching from the side but they had drifted slightly so that they were not face on. Looking at them from underwater she at once realized just how functional the male's long tail was. It ended in a claw-like extension and this was firmly wrapped under the edge of Ruth's upper shell. The tail tip was prehensile and was able to secure the rear of the male's body firmly to the female. This would be particularly important prior to commencement of copulation. Kay saw the male's tail was rubbing slowly from side to side, probably in an attempt to stimulate Ruth to permit copulation to begin. Kay surfaced. For several minutes Kay floated on the surface and then had another look. This time

she could see that the turtles were in copulation. She also noticed that two other male turtles had appeared and were circling the mated pair as if waiting their turn. As she watched Ruth and her mate, she felt a rough rubbing feeling and turned round to find one of the males actually inspecting her. She struck its head under water with her knee and it moved off a short distance but continued to inspect her in a most pointed manner. To her amazement, it made a second attempt to make contact with her and Kay decided that she would be better away from the scene. Moving slowly, so as not to disturb the copulating pair, she swam shorewards and looking back she was amused and surprised to see that the male turtle was following her, albeit at a distance. She floated in to the edge of the sea and turned round to watch the turtles. She supposed that they had now been mated for something like half an hour but had no real idea of the time that had elapsed. Copulation continued for perhaps an hour longer and then the male slowly slid backwards off Ruth and was lost to view as he swam seawards. From the commotion that ensued several minutes later, one of the other attendant males must have made a bid for Ruth because she shot off rapidly and that was the last Kay saw of her that day.

The next day when Kay was in the shallows with Ruth, she saw a male mount a female about a hundred and fifty yards away. She decided to see if she could approach them slowly in the water without their taking fright. Floating on the surface, she gently propelled herself in their direction taking care not to break the water's surface with her legs and so warn them of her approach. Most of the time she floated motionless. After about ten minutes she had more than halved the distance between herself and the turtle pair and

she now took special care. As she lay floating watching them, the female poked her head above water to breathe – the manoeuvre required considerable effort due to the weight of the male on her back – and Kay reflected that were it not for their tremendous strength, the females would run the risk of drowning during the prolonged mating sequence. Shortly thereafter the male breathed. He was not alert and did not look around. Clearly he had no idea of Kay's proximity. Soon Kay was only about fifteen feet from the mated pair and she stopped swimming and drifted while watching the turtles. She had discovered a way to approach close to mating turtles without frightening them. Clearly to walk towards them in the shallows where some pairs drifted would at once cause them to take fright. Similarly the approach of a dinghy on the surface was also a cause for immediate alarm. So would she have been had she struck out towards them in active swimming movements, but by floating on the surface and judiciously propelling herself cautiously towards them, she was able to approach closely without their apparently being aware of her presence. Kay reflected that with any wild animals it was essential not to make sudden movements. How typical it would be for a European having fortuitously got this close to lift an arm suddenly out of the water to scratch his or her nose and so give the whole show away! One had to really live the piece, not just act it.

Looking around Kay could see several other turtles floating on the surface and from the ripples around most of these, it appeared that they were females and that males were in attendance. The mating season seemed to be moving into top gear now that most of the females had arrived off the nesting beaches. It was now past mid-afternoon and the

tropical sun was slowly turning to yellow as it started to sink in the western sky. This gave the mated pair a beautiful appearance. The yellowish-green markings turned to gold and the sun's reflection in the unruffled surface of the sea added to the beauty of the scene. Kay knew that she would always be able to recall it but she wished she had a waterproof camera so that she could capture it on film to show to others.

Two days later when Kay arrived she was flabbergasted. There were between fifty and one hundred turtles in the shallow waters of the bay. She had never seen such an aggregation of turtles before. A flock of pelicans was riding the gentle breakers towards the left of the beach. She counted eleven of the great black and white birds with their enormous comic bills. All faced the same direction and appeared like a bevy of cavalry as they slowly swam towards deeper water distrustful of her presence on the beach. Immediately in front of her eight turtles were drawn up at the water's edge but since all faced seawards, she was able to approach them quite easily and she checked to see if Ruth was among them. Kay sat down behind them for a few minutes and, as she watched, three males one after the other cruised up the beach clearly looking for prospective mates. None of them noticed the females drawn up at the water's edge, nor could they have done anything about it if they had since they required at least eighteen inches of water in order to swim onto the females. A five foot shark, a harmless black-tipped reef shark, swam along right beside the edge and actually swam round one of the female turtles before continuing its patrol along the beach. Kay admired its extremely graceful, apparently effortless, swimming motion. Sharks, hateful though they were because of the danger which several species imposed on

swimmers, commanded one's admiration. They seemed so efficient, so beautifully adapted to their role of aquatic hunter.

Ruth was not among the eight turtles lined up at the water's edge and Kay wondered if they would take fright if she appeared in full view. So accustomed was she to Ruth that she rather thought they would not. Anyway, she was keen to enter the water and cool off. The full glare of the noonday sun was burning. As she started to undo the lace-up neck of her sailor dress, Kay peeped gingerly forwards and saw that the three nearest ones at least had their eyes open although their heads were resting on the sand. She slowly moved alongside them. Before she could sit down again, however, the nearest female which was right out of the water, raised its head and literally galloped into the surf closely followed by the other two. On hitting the water they did not wait to reach swimming depth but at once started a frantic breast-stroke and disappeared towards deeper water amid a wake of foam and bubbles. To Kay's surprise, the other five females were only a little way behind. However, their departure was less spectacular since resting in the shallows they only had to push themselves forward a couple of times to be able to swim off with powerful strokes of their front flippers. Kay noticed that all eight turtles continued to make for deeper water towards the edge of the reef. So much for that experiment! She had learned that all basking turtles were not like Ruth and that their reaction to being suddenly confronted with a human was fear, leading to immediate flight.

Kay entered the water and slowly progressed towards the largest aggregation of turtles consisting of eleven females and four attendant males. The latter, however, were having no success. The females tolerated the preliminaries, or at any

rate showed no response either way, but as soon as the males moved round to the rear, the females shot forwards through the water and then came to rest after swimming in a wide arc just as Kay had seen Ruth do several days previously.

The pelicans appeared well aware that some strange beast was in the water and had retreated to a rocky headland at the far end of the beach where they continued to patrol.

As she slowly swam towards the turtle aggregation in deeper water Kay kept a careful look-out for the tell-tale fins of sharks. The shark hazard very definitely had to be taken into account when in the water with the turtles. Large sharks were common off the beach especially during the turtle nesting season and Kay did her best to avoid them. On the way towards the turtles several large males swam up alongside her and gave Kay some very nasty moments. Kay was always apprehensive lest they bump their several hundred pound weight into her or damage her with their massive front flippers. As it happened, Kay was hit a glancing blow from a flipper that afternoon. She knew this was a pure accident as the males had excellent steering control. Whenever any of the males showed amorous intentions, on the other hand, she gave them a sharp rap on the snout with her hand or knee and they usually got the message right away. When she got close to a mating pair, she found that they were surrounded by hopeful males and that to get really close she had to swim between these and the pair. Once there she knew she would be pestered by males continuously.

At that moment an exceptionally large male swam right across her path. Kay knew that there was nothing to worry about provided she did not frighten him by any sudden movements. He did not notice her until the very last moment

but swerved beautifully and continued on past Kay. However, had he been badly frightened Kay might have been struck by several hundred pounds of turtle. That would be no joke.

Another large male slowly swam past and was obviously making for the same aggregation of turtles as Kay. Kay decided to swim along behind him as he would give her cover right up to the group of turtles.

As Kay continued to approach the turtles, one male succeeded in mounting a female and after taking up the approved position the pair settled down to float at the surface. The attendant males remained, however, and as Kay approached the mated pair she was faced by a virtual ring of alert males all looking for a mate. There were no less than five beside the pair, some faced inwards, others slowly cruising around looking for a way in. Kay suddenly noticed Barry among the attendant males but decided that this might not be the moment to claim him as a friend.

Kay made her way through the males towards the mated pair keeping somewhat behind so that the male could not see her when he raised his head to breathe. The female as usual floated below the water's surface due to the weight of the male on her back. When she wanted to breathe she had to swim upwards at the same time angling the front of her body up. Whenever either turtle raised its head Kay kept motionless sinking as low in the water as possible.

About this time Kay was annoyed by a particularly persistent male turtle which was convinced she was a mateable proposition and kept coming towards her repeatedly and as he cruised round, thumped her body with his front flippers. Kay kept warding him off but had to give him top marks for persistence. Eventually, after a particularly effective blow on

the nose from Kay's knee, he took the hint and turned his attentions back to the mated pair. Although no other male actually touched her, a succession swam up to directly in front of her and inspected her rather pointedly and thoroughly.

Now and again the mated pair were disturbed by especially active males who actually tried to climb onto them. All such attempts of course failed, and presumably the pair were not much put out by this sort of activity, being accustomed to it.

After she had been with the pair for what must have been about half an hour, Kay noticed the start of courtship over on her left. She slowly moved in that direction taking care to keep the other mated pair between her and the courting turtles because early in courtship turtles are very shy and it was very unlikely that she could get at all close unless she remained undetected.

She floated across with occasional propulsion from her legs and soon was watching an incredible sight, although by now she was starting to become used to it. There were two large turtles literally rubbing noses. Every now and then their heads banged together or they were separated when a particularly large wave came in, for the turtles and Kay were now in an area facing directly onto the open ocean. However, these breakers did not seem to disturb them and they soon came together again. As Kay watched, the male, which was on the right, nosed the female between the shoulder and the neck region and opened his jaws to bite her.

After several such actions repeated over a period of some minutes the turtle moved round to the side of the female. Unfortunately he had now been joined by several other males. Another soon took up his former position in front of the female and the courting male had to swim round a rival to

reach the rear of his intended. Kay decided that nothing that had happened so far indicated that she would have anything to do with him. This was all just preliminaries which most females tolerated anyway.

Kay floated round a bit in order to see what was happening behind the female. The male, which she had first seen courting the female by rubbing noses, was now nuzzling a rear flipper and then suddenly, as Kay watched, he made a bite at that too just as he had done at her neck. Without warning, the female took off and was soon fifty yards away. The male which had initiated the courtship made a half-hearted attempt to follow her but Kay noticed that the other males made no attempt at all but turned their attentions to her instead!

Kay casually bumped off a male while she reflected that since most males are refused it was easy to understand why there were about four males round every potentially willing female. In view of the small number of successful matings that resulted from the incessant courtship behaviour Kay realized how lucky she was to have had a grandstand view on several occasions - with Ruth, Gemai and Barry as well as several turtles which she did not know.

Kay passed most of the afternoon among this group of turtles watching their behaviour and was several times mildly molested by males who perhaps hopefully thought she might be an obliging female turtle. Disturbance of the females was more or less continuous and Kay now appreciated why Ruth and many other females spent the day ashore at this time of year. Apparently courtship activity was greatest by day since the females returned and spent the night in the water.

Later that afternoon Kay found Ruth asleep ashore on the beach of the next bay and, sitting down to gently waken her

up by patting her head, she noticed two raw areas of flesh and remembered that this was exactly where the male's thumb claws had been during copulation. She also noticed that the edges of the upper shell adjacent to these spots were slightly eroded, presumably as a result of cumulative matings. Kay had often noticed these raw areas on nesting turtles, indeed some emerged from the sea to lie with slight bleeding occurring there. Kay had wondered what caused them but would never have guessed that these wounds resulted from mating. Now, however, she knew for certain.

She sat with Ruth on the beach until the sun dropped towards the horizon. She was just starting to feel cold and thinking it was time she left when Ruth stretched, breathed, and started slowly down the beach towards the water. Another day had passed, night would soon come, and the male turtles would have to wait for another day. Leisurely Ruth dragged herself towards the sea, paused for a moment at the water's edge, and turned to look at Kay. Kay fancied she actually winked at her but she might merely have been removing sand from her eye. Ruth swam out towards the edge of the reef.

As Kay walked home many questions filtered through her mind. How old was Ruth? At what age do turtles start breeding? What is their lifespan? Little did she know that even the scientists cannot answer these questions. What a pity, Kay thought, that Ruth could not talk. There was so much that she could have told her about a turtle's life at sea.

Further meetings with Ruth ashore

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KAY knew that Ruth was likely to nest several more times that season and kept a note of the date of the second nesting in the hope that she could be present again next time. It so happened that Kay went around to the other side of the island after only twelve days. It had been an exceptionally hot day and towards nightfall the slight breeze had disappeared making conditions intolerable for sleeping indoors. She had risen around midnight, sat on the step and then, attracted by the coolness outside compared to the temperature in her room, had decided to see what the turtles were doing.

She reached the beach where Ruth usually nested about 1 a.m. but of course did not expect to see her friend for several days yet. The tide was still not quite full but a number of turtles had beached and she wandered slowly along the edge of the vegetation looking at each turtle in turn. One was exceptionally large, she could not recall ever having seen one so big. Kay judged it must have measured all of four feet from the front to the rear of the upper shell. The upper shell was also extremely steeply arched making the turtle even larger. Undoubtedly it would have weighed in excess of four hundred pounds.

The next turtle had failed at its first nesting attempt and moved inland. Kay automatically followed the tracks which