

## Chapter 1

# The first mud crab

The blue bowl of the sky stretched from horizon to horizon. Where it touched the desert, a haze shimmered and shone promising lakes that didn't exist. The sun was relentless, scorching everything below. The sand reflected the heat, there was no escaping it. The string of camels and horses plodded on seemingly unaffected. They had been walking for days and would have to walk for many more. The men riding on the horses did not talk, their thoughts were of the evening when the sun would disappear and the air would cool. That was hours away. Some of the camels had small barrels strapped to their sides and there was something sloshing around inside them. But it was not water, they were filled with alcohol. Inside the barrels were birds, rodents, fish, snakes, lizards, insects and shell fish – a miniature Noah's Ark of dead animals. In one of the barrels was a preserved crab – the subject of our story. It was 1762.

Two years previously, King Frederick V of Denmark had decided to send an expedition to Arabia with the aim of '*making the Old Testament more easy to understand through further knowledge of the country, its people, plants, animals, towns and villages*' (ref. Burckhardt). A team of six was assembled under the leadership of a surveyor, Carsten Niebuhr. The biologist chosen for the expedition was a 25 year old botanist, Petrus Forsskål. He had been born and educated in Sweden but had to leave the country after upsetting the government by publishing a pamphlet called 'Thoughts on Civil Liberty'. He must have had friends in high places because he was recommended to the King by the famous Swedish biologist Linnaeus. We don't know how Forsskål reacted to being appointed to the expedition but we can assume he would have been excited – he was young with a lifetime ahead of him and this was an opportunity to visit strange places and collect unknown plants and animals. He did not know that he would become immortalized in biological science as a result of his work on the expedition but it would cost him his life.

The expedition left Denmark in January 1761 and sailed via Malta and Constantinople to Alexandria and Cairo (Niebuhr, 1792). They spent a year there recording information about the Arab culture – their clothes, implements, musical instruments, language, houses as well as descriptions of the general area and collecting manuscripts and specimens. Forsskål discovered 120 species of plants that were unknown in Europe. Niebuhr surveyed the Nile delta – his data would be used a century later in planning the Suez Canal. The expedition then crossed to the Red Sea where they chartered a ship. They sailed south to Jidda (also spelt Jiddah, Djiddar and Jeddah) which is about half way along the length of the Red Sea. Jidda is on a bay protected by a series of offshore coral reefs. Although the land is desert, the sea is rich and Jidda was originally a fishing village. By the time the expedition visited it, Jidda was a trading port and entry point for Mecca.

Forsskål could dry his plant specimens but animals were more difficult to preserve and so the expedition had brought barrels containing alcohol as a preservative. Forsskål probably had considerable trouble with his specimens. It is difficult to prevent alcohol from evaporating at high temperatures and his containers had to be properly sealed. There were problems from another quarter as well. The Arabs would not handle barrels containing alcohol. In one place they demanded to inspect his specimens. Many were thrown away but when they found a preserved snake they decided that the specimens were actually medicines and the rest were left intact.

In addition to his scientific descriptions of the specimens he collected, Forsskål wrote detailed notes about some of the plants and insects but little about the fish and crustaceans. We only have the rather sparse observation that: '*We observed a great many crabs, some of which were species peculiar to the Arabic gulph.*' Nevertheless fortunately for us he did collect crabs. His records show that at Jidda he collected the first mud crab to be recorded scientifically. We don't know where he found the crab, one source might have been from the local markets. Seafood markets are fascinating places for biologists because of the variety of animals offered for sale. The locals have learnt over generations where and how to catch edible animals. We can imagine Forsskål wandering through the market of Jidda, wearing Arab dress as usual to make himself less conspicuous. The market is bustling with people, traders shouting about their wares selling earthenware and copper pots, clothing, food, drinks and household goods. It's dusty and hot. Near the seaward end of the market Forsskål finds what he is seeking. On the ground and on tables are brightly coloured tropical fish, baskets of tiny silvery fish, large predatory fish with razor sharp teeth in their gaping mouths. Bivalve and gastropod shells appear like delicate porcelain. Then suddenly he sees the crab. Tied up but with its stalked eyes periodically emerging to survey its surroundings with a look of menace common to mudcrabs. The crab is in a basket. Sensing Forsskål's interest the trader picks it up and tries to persuade him to buy it. Forsskål would have instantly recognized that this was a special crab, definitely a new species and what a find. The colours were a subtle mix of brown and green trending to blue, and those claws! Forsskål would not have been able to resist buying it.

Although this story is appealing, it is almost certainly not true for one key reason and that is found in Forsskål's description of the crab (Fig 1). The description, which is written in Latin, is brief – only 11 lines with no drawing. The second last sentence reads *Chelas non vidi*. That is, '*I did not see the claws*'.

This is remarkable, his crab had no claws. Why didn't he obtain one with claws? If he had seen the crab at the market was it the only one there? The expedition spent six weeks in Jidda so he could have gone back to the market for an intact specimen. This suggests it is unlikely that he obtained his specimen from the market.

An alternative is that the crab was collected from the shore. Although Forsskål or one of the assistants may have found the crab, he might have bought it – Niebuhr wrote that in one town '*The children, observing that we gathered insects, brought great numbers,*

which they asked us to buy.' It's easy to imagine some resourceful boy bringing a basket of small crabs to these strange foreigners and hoping to be paid.

**41. CANCER SERRATUS; brachyurus, thorace laevi, semi-orbiculato, utrinque novem-dentato, fronte sexdentata.**

**DESCR.** Oculi globosi, pedicello latiores: dens latus exiit e fronte sub quo-vis oculo. Antennae setaceae, nigrae, vix pollicares. Color animalis cinereo-fuscus, subtus albidus. Thorax convexiusculus, antrosum rotundato-serratus, latitudine trium poll. longitudine duorum. Serraturae tibiae paria media femoribus glabris, compressiusculis: tibiis & plantis utroque margine hirsutis, pollice nullo. Postici binis articulis ultimis membranaceis, ovatis, ciliaris. Chelae non vidi.

**Djidda in Mari rubra.**

Fig 1. Copy of the original description (in Latin) by Forsskål of the mud crab collected at Jiddah in the Red Sea in 1762. The description was published in 1775. The species is given as *Cancer serratus*, no size or sex is indicated.

Juvenile mud crabs along with a variety of other mangrove crabs live in the intertidal zone and can be found under roots, sticks or stones (Fig 2). I suspect that this was the source of his crab and it's the lack of claws that gives us an important clue. If you have ever tried to pick up a small mud crab you might have discovered their ability to instantly pinch at fingers and hands with their claws which they promptly shed leaving a clawless crab with the claws firmly attached to whatever they have grasped – a painful experience for the unwary. This defensive behaviour is characteristic of small mud crabs – although adults can do it, they are more reluctant to shed their claws. If a small mud crab is put into a basket with other crabs, it will probably end up with no claws. The resulting specimen would not have been very striking – a small brown crab with no claws. If this was the source of the specimen that Forsskål described, he would not have had any idea that this insignificant crab was in fact an important species, widespread over a vast area and capable of reaching a very large size with massive claws. His description certainly does not give any indication that he was dealing with a large impressive crab.

### **INSERT PICTURE JUVENILE IN MANGROVES**

Forsskål thought the crab was related to a crab named *Cancer* which is found in the North Sea and so he named it *Cancer serratus*. The species name probably refers to the spines around the edge of the carapace (shell) which he recorded in his description.

The expedition left Jidda and went by sea and across the desert to Yemen. On land the barrels containing the animal specimens were transported on donkeys or camels. The locals traveled overland mainly at night as did some of the expedition to avoid the heat. Forsskål and a few members of the party however traveled during the day so that they could collect plants and animals they would otherwise not see at night.

In May 1763, the language expert, Von Haven died, apparently from malaria. While traveling overland in Yemen, Forsskål became sick, possibly with the plague. When they arrived at Jerimin in July he became worse and, after a short illness, he died. He was 27 years old.

Forsskål was buried in Christian style in a coffin, not wrapped in cloth like the Arabs. Niebuhr found out later that the Arabs had suspected there was treasure in the coffin – why bury a wooden box - and they dug up the body. The Dola – the governor of the town – arranged for the body to be re-buried.

Niebuhr decided to leave Arabia for India which he thought would provide a healthier climate. The collection had to be preserved at all costs and if more members of the expedition died it would not get back to Denmark and all their work might be lost. Unfortunately, a further three did die, two at sea and one in India leaving Niebuhr as the sole survivor to look after the specimens. He managed to send the material back to Copenhagen and so despite the loss of nearly all its members, the expedition did achieve what it had set out to do. When Niebuhr returned to Denmark, the King asked him to publish the findings from the expedition and he did so including the scientific descriptions of Forsskål's specimens. Mysteriously the *Cancer serratus* collected in Jidda did not make it back to Denmark. Like the missing claws, we don't know what happened to the specimen so all that we have is Forsskål's brief description.

The first specimen of any species that is described is kept, usually in a museum, and is known as the type specimen. The type specimen is important because it can be used as a reference and also for checking details that might have been missed in the original description. In the case of *Cancer serratus* there is no type specimen. As we shall see in a later chapter, this would cause difficulty in the future in deciding whether there is more than one species of mud crab.

The seventeenth and eighteenth centuries were an exciting time for biologists. Strange and wonderful new plants and animals were being found in the Americas. The opening of the sea route to Asia round the Cape of Good Hope meant that discoveries were being made in the east at the same time. Cataloguing all this material was a nightmare. The Swede Carl Linnaeus was the person who brought order into the system with a simple but elegant solution by introducing the concept of the species and a way of classifying each one. Under natural conditions, species do not interbreed with each other or if they do, they do not have viable offspring or the offspring are sterile. Linnaeus decided that each species should have two names – a species name and additionally a genus that would be used for grouping species that appeared similar even though they did not interbreed. The names are in Latin which has the advantage that they are the same everywhere; they are not translated into other languages. Scientists write the genus and species name in italics, note also that the species name does not start with a capital letter. The scientific name is followed by the name of the person who described the species. Forsskål's discoveries and descriptions are recognized by his name being added to the scientific names of the species that he collected. There are hundreds of animals and plants carrying his name in

this way – a reminder of his major contribution to describing the life that he encountered. Since many of the marine animals such as fish, shell fish and crustaceans that he found in the Red Sea are distributed across the Indian and western Pacific Oceans, his name appears in the lists of the marine fauna of nearly every country in the region.

In 1833 a Dutchman, De Haan decided that Forsskål's new crab was not a species of *Cancer* but belonged to a new genus. He called it *Scylla serrata* (Forsskål). Forsskål's name is in brackets to indicate that although he was the first person to describe the species, the scientific name is not the one he gave. De Haan was obviously impressed with this crab judging by the name he chose for the genus. In Greek mythology, Scylla was a sea monster who lived in a cave. In the Odyssey she is described in the following passage: "*And therein dwelleth Scylla, yelping terribly. Her voice indeed is no greater than the voice of a new-born whelp, but a dreadful monster is she, nor would any look on her gladly, not if it were a god that met her. Verily she hath twelve feet all dangling down; and six necks exceeding long, and on each a hideous head, and therein three rows of teeth set thick and close, full of black death. Up to her middle is she sunk far down in the hollow cave, but forth she holds her heads from the dreadful gulf, and there she fishes, swooping round the rock, for dolphins or sea-dogs, or whatso greater beast she may anywhere take, whereof the deep-voiced Amphitrite feeds countless flocks.*"

We have to wonder at De Haan's choice of name since the description given by Forsskål certainly does not suggest an impressive animal. Why would he have given it an imposing name like *Scylla*? It's an unlikely name for a small brown crab. De Haan worked in Holland and there are no mud crabs around there. However De Haan did have access to specimens of mud crabs and these had been obtained in an unusual manner. It was part of an enormous collection of plants and animals made in Japan by Philipp von Siebold. He was born in Germany and trained as a physician. Like many young people he wanted to travel and so he applied for a position as a military physician in Holland with the hope of being posted to one of the Dutch colonies. He was successful and was appointed ship's doctor on a frigate traveling to Batavia in the Dutch East Indies (present-day Indonesia) where he arrived in 1823. Later in the year he was appointed as physician and scientist on an island near Nagasaki. The island was run by the Dutch as a trading post but the Japanese restricted travel off the island by foreigners. Von Siebold was not a person who respected authority when it conflicted with his interests and his career is marked by the breaking of laws. He treated and cured a high Japanese official and through him obtained permission to visit Japan. This gave him the opportunity to collect animal and plant specimens. These included live plants and he introduced many garden plants to Europe. The Japanese had a tea industry and jealously protected the plants, it was strictly forbidden to export them. Von Siebold managed to smuggle young plants to Batavia where they formed the basis of a tea industry. Foreigners were not allowed to marry Japanese but that did not stop him from having a Japanese mistress. They had a daughter who became the first modern woman physician in Japan. He lived in Japan for eight years but was finally expelled when the authorities discovered he had obtained secret maps of Japan and Korea. Von Siebold returned to Europe with a collection of about 12,000 plants and animals. He settled in Leyden in Holland. The animals were sent to various specialists to be identified and described. The results were published in the

*Fauna Japonica*, a series of five monographs published between 1833 and 1850, which made the Japanese fauna the best described outside Europe. This also ironically made Von Siebold a famous name in Japan.

Von Siebold's crustaceans went to de Haan who was Curator of Invertebrates at the Leyden Museum. Specimens of mud crabs were included and De Haan must have been impressed by the size of the crabs and their immense claws. We would be unlikely to agree that the mud crab really lives up to the description of the mythological Scylla but there is little doubt that this is an unusually large and powerful crab that can be very threatening close up – or running around loose in the bottom of a boat. Definitely an animal to be taken seriously. Disappointingly, de Haan did not give a drawing of *Scylla serrata*. Fortunately another collector had and Fig 3 shows Rüppell's magnificent drawing of a very large male collected in the Red Sea. The drawing was published in 1830. The crab had a carapace width of 20 cm and the original drawing was about life size. The detail is impressive and the crab is instantly recognizable as *Scylla serrata*.

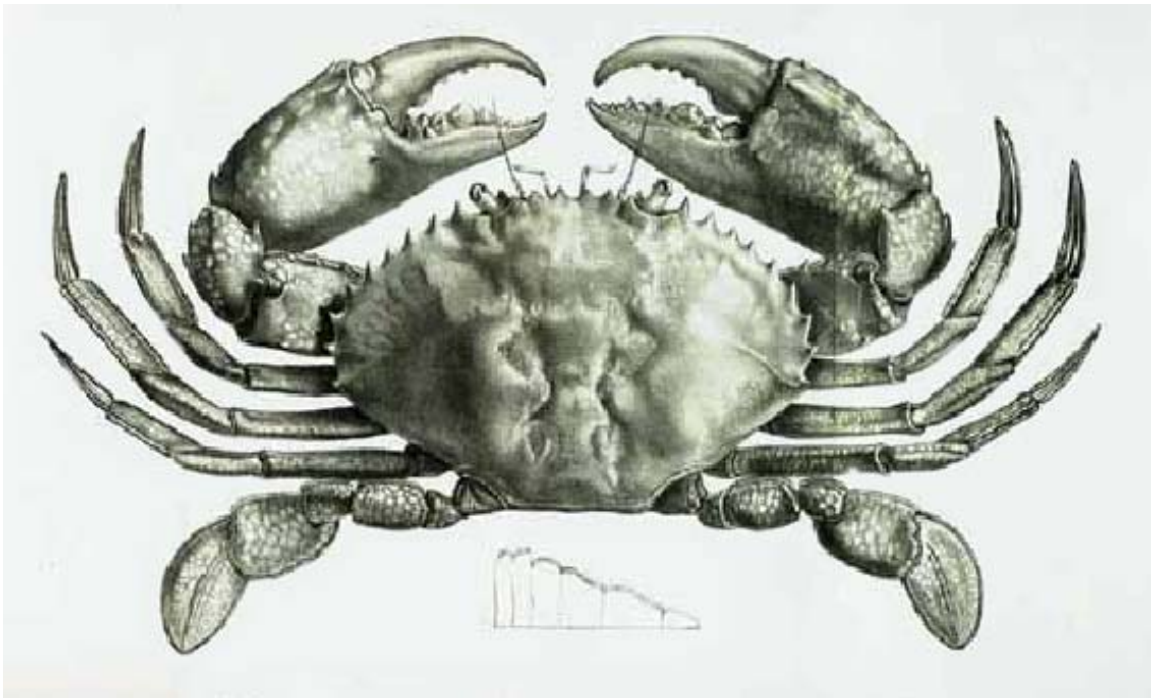


Fig 3. Drawing of a large male *Scylla serrata* from the Red Sea (Rüppell, 1830).

Although the mud crab collected by Forsskål was the first one to be recorded and described by science, it was a well known animal to the people living on the shores of much of the Indian and western Pacific Oceans. It was also certainly not the first to be seen by westerners. Explorers and traders from Europe had visited countries around the Indian and Pacific Oceans hundreds of years before Forsskål's discovery and they would have found mud crabs as a commonly eaten animal. In the sixteenth centuries the Portuguese were trading in India and Indonesia while the Spanish were in the Philippines. Mud crabs had been caught and eaten by the peoples of these regions for many thousands of years. Evidence for this comes from studies of coastal middens – essentially waste

dumps made by people living near the shore. Early shore-dwellers who ate seafood, tended to have tidy habits. They discarded fish bones and shells in piles we call middens. There was good sense in this – stepping on a discarded fish bone could be fatal in a time of no antibiotics for infected wounds. Over the years these middens became very large piles and many have survived for extremely long periods. The animal remains in a midden give a good idea of the diet of the people who lived in the area. They can also show if diets changed – possibly because of changes in the availability of some animals. Middens showing mud crab remains have been found throughout the Indo-West Pacific region. An example of the information that can be obtained from them is the work of two paleontologists, Beech and Hogarth (2002) who recorded the animals found in middens on the shore of the Arabian Gulf and the Gulf of Oman. They found that 98% of crab remains from two to three thousand year old deposits in the Arabian Gulf were of *Scylla serrata*. They also found that mud crabs gradually disappeared from the Arabian Gulf – apparently because of the over exploitation of mangroves and eventually they became extinct in the area. In 2001 *Scylla* was rediscovered in the Gulf in an unusual way. Peter Hogarth and Mark Beech (2001) published the following report of their discovery:

*‘A recent meal in Ra’s al-Khaimah [restaurant] led to an addition to the list of crab species recorded from the United Arab Emirates. This was a female of the mangrove or mud crab Scylla serrata. The specimen ... was badly damaged by preparation for the table.’*

When they inquired about its origin they were told it had been caught in the lagoon behind the restaurant. Hogarth and Beech suggest that the extensive replanting of mangroves in the region in recent years has recreated habitat suitable for mud crabs and this has enabled them to recolonise the area.

This record brings out the important relationship between mud crabs and habitat. Despite their wide distribution, they are found only in specific habitats – generally they require sheltered shallow waters and a muddy substrate. They are adapted to this environment – they have to find food, cope with changes in tides, salinities and temperatures, breed, protect themselves from enemies and move around in sticky mud. In the following chapters we will explore these and other adaptations of this interesting and impressive crab.

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