

# ASIAN LAND TORTOISES

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Myths and legends in India are replete with references to turtles, as can be seen from this stone carving from a 16th century temple in south India depicting Lord Vishnu's turtle incarnation

**A**bout six million years ago, an enormous land tortoise dwelt in what is now north-western India and parts of south-east Asia. Appropriately named *Colossochelys* (now *Geochelone*) *atlas*, the tortoise was roughly comparable to a modern-day Volkswagen 'Beetle' car in size and shape, with a shell length of about two metres. When alive, 'atlas' tipped the scales at 1,000 kg, one-fifth the weight of an adult Indian elephant!

Testudinides, as land tortoises are also known, actually date from the early Eocene, some 50 million years ago. The family is represented today by some 40 species found worldwide on all continental land masses except Australia and Antarctica. Of these, nine are found in Asia and palaeontological studies indicate that at least 40 species existed on this continent alone in prehistoric times. Similar gigantic tortoises existed in North America at about the same time, but by the middle of the Quaternary, these colossal mainland tortoises died out, presumably as a result of the drastic climatic changes (severe cold and droughts), during the last glacial period. Giant tortoises however, do survive to this day on two widely separated clusters of oceanic islands -- Galapagos in the Pacific and Aldabra in the Indian Ocean.

### Adaptive features

Land tortoises are typically characterised by hard-domed upper shells or carapaces, heavily scaled columnar legs that bear strong-nailed, webless digits and four-digitated hind limbs. Most of these features are adaptations for what tortoises are particularly good at, living on dry land.

These are the true Methuselahs among higher animals. In 1766, the French explorer, Chevalier Marion de Fresne, presented to the army garrison at Port Louis, Mauritius, as a gift of goodwill, five 'Marion's' tortoises (*Geochelone sumeiri*) a species now extinct from the Seychelles. In 1918, the last one among these, a male, died in a fall through a gun emplacement after 152 years in confinement. Similar anecdotes abound, the main problem in documenting the longevity of tortoises being, given the chance, they tend to outlive researchers!

Sexual differentiation (or dimorphism) is marked in tortoises, with males generally the larger of the sexes, possessing concave plastrons (under-shells) and longer tails, whereas females have flattened plastrons and short tails. The reason for a larger

body mass in male tortoises of most species is not hard to guess: larger size is selected for when males forcibly inseminate females or when combat occurs between males during the breeding season, when size is related to winning, and subsequently, mating with females. Aggressive male-male encounters have been documented for many tortoise species, when each tries to intimidate its rival by a display of strength. Most try to tip others over by butting and shoving, and in the absence of competitors, male tortoises are known to tap anything remotely resembling themselves, such as rocks.

### The star tortoise

Perhaps the most familiar and certainly the most striking of all tortoises in the region is the Indian star tortoise (*Geochelone elegans*), found in arid and semi-arid regions in two widely separated zones; one in eastern Pakistan and north-western India, the other in southern India and Sri Lanka. A small species, the 'star' rarely attains six kg. in body weight, with a corresponding curved carapace length of about 43 cm. The southern population is much smaller and lighter. The distinct star patterns in many tortoises that dwell in scrub habitats of Africa and Asia, as well as in certain 'fresh-water' turtles elsewhere, are thought to have evolved for camouflage. A cryptic function of these markings is obvious, since the striking patterns help these animals to blend with the spiky shrubs and tussocks of dry grass in the natural habitat. While generally considered to be herbivorous, feeding on grasses, fallen fruit and flowers, their acceptance of animal flesh, such as rats, lizards and mussels in captivity suggests that star tortoises scavenge on dead animals in the wild. Confined animals have also displayed interest in the bands of lime used to mark tennis courts!

Zoos and private hobbyists throughout the world, even in temperate regions, have been successful in breeding the 'star', and a considerable amount of knowledge concerning the species' breeding biology is at hand. Mating takes place during the summer and early monsoon, with males uttering distinct grunts while mounted to intimidate the much larger females into submission. Eggs are laid a few weeks later. Upto 10 eggs have been known to be laid by the star tortoise, which hatch between 47 to 223 days later, depending on the external temperature.

A sister species, the Burmese star tortoise (*Geochelone platynota*), of whose biology virtually nothing

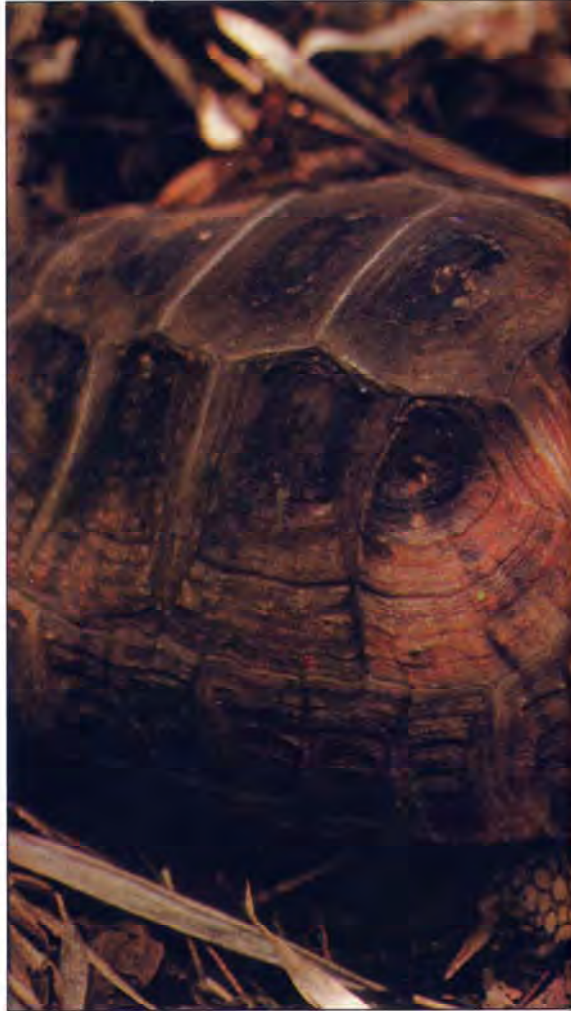
is known since it was first described in the middle of the last century, inhabits Upper Burma, extending south to Moulmein. It supposedly differs from the Indian animal in being slightly bigger, with a less elongated and unhumped shell. The Burmese enjoy eating its flesh, while the empty shells are used to bale oil in the markets of Rangoon. Except for one or two captives at the Rangoon Zoo in the recent past, there are no records of the tortoise.

### Curious history

Two rather closely related forest-dwelling tortoises are found in the moist forests of India and parts of south-east Asia. Both species are characterised by narrow shells, possibly to facilitate tunnelling through leaf litter on the forest floor and tail hooks, prominent in males, that presumably aid in maintaining a mounted posture during mating. The first, the Travancore tortoise (*Indotestudo forstenii*) has a rather restricted natural distribution -- the Western Ghat forests in Kerala, Tamil Nadu and Karnataka, in India. This species has a curious scientific history. First discovered and described from the Indonesian islands of Sulawesi and Halmahera in 1844, based on what now look like introduced animals, they were found in south-western India, their actual home, only in 1907, and till as recently as 1984, were thought to be separate species. It is not known who introduced the Travancore tortoise into Indonesia and when, but the species seems to be holding its own at least in central Sulawesi.

Male Travancore tortoises attain slightly over 33 cm. in shell length, while females are a good four cm. shorter. Both have a brownish-olive shell, with black blotches, lacking the cervical, a small scale on the nape region. In Kerala, Karnataka and south-western Tamil Nadu, the tortoise is found on hilly evergreen and semi-evergreen forests, at elevations of 300 metres and above. The Kadar tribals of Kerala eat the animal by following the characteristic trail it leaves while tunnelling through the leaf litter and catching it. They also keep it as a pet, boring a hole through its shell and tying it to a post. Bamboo shoots, grasses, flowers, fruits, mushrooms and even insects and frogs have been known to be eaten by the tortoise. Mating takes place twice during the monsoon and in winter. The male immobilises the female by sending the tip of his plastron crashing against the sides or back of her shell, prior to copulation. In captivity, the species is known to lay one to three large eggs in the months of October and March. An extremely large gap at the posterior of the shell enables the female to lay these large eggs.

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Separated by over a 1,000 kilometres, the elongated tortoise (*Indotestudo elongata*) has a much wider distribution, from Uttar Pradesh in India, through Nepal and Bangladesh, south-eastwards to Viet Nam and China. While common in the southern parts of its range, its distribution and status in India is unclear, as its primary habitat, sal forests, are under assault. The species is known in Uttar Pradesh, Bihar, northern Orissa, northern West Bengal, from old literature records from Tura in the Garo hills of Meghalaya.

Males of the species grow to about 32 cm. while females attain 29.5 cm. Both the sexes have a greenish-yellow shell with irregular black blotches. The cervical scale is present in the nape region of the shell, differentiating it from the Travancore tortoise. The Burmese call it the 'red-nosed tor-



toise' since the nostrils of both the sexes seasonally become bright red as in the males of its sister species from the Western Ghats. A shy species, the elongated tortoise has bred in captivity, laying one to four eggs twice a year, that take 96-151 days to hatch. Tribals in many parts of its range eat the elongated tortoise whenever found.

### **Roaring forties**

The most primitive of all living land tortoises exist in the damp forests of tropical Asia. 'Primitive-ness' in tortoises is indicated by the possession of one or several morphological features which typically characterise the freshwater hardshell turtles, the group from which the tortoises are thought to have evolved. Both these tortoises are large in size, often considered to be giants among the mainland

*Found in the forests of the Western Ghats, the Travancore tortoise (Indotestudo forstenii) feeds on fallen fruit and flowers, as well as mushrooms, insects and frogs. During the breeding season, males sport an extravagant red colouration around the eyes and nostrils.*

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tortoises, have spurs on the thigh and are secretive in nature, inhabiting the densest of hill forests. The Asian giant tortoise (*Manouria emys*) is found in Burma, Thailand, Malaysia and Indonesia. From India, there are records from the Cachar hills of Assam, the Naga hills of Nagaland and the Khasi hills of Meghalaya. The species also exists in the Chittagong hill tracts and the Moulvi Bazar regions of Bangladesh. Vegetation, in addition to invertebrates and frogs, is taken as food by the tortoise,

which attains 31 kilos in weight and 47 cm. in shell length. The shell is broad, high-domed, blackish in the northern race, brown in the southern. Scales on the outside of the forelimbs are heavy and overlapping, and each thigh has two prominent spurs, which have given rise to the name 'six-footed tortoise'. Malays claim that the species can roar as loud as a tiger and this seems to have been confirmed in animals kept in captivity!

Most tortoises lay only a few eggs at a time. The giant tortoise is very different in this regard, laying upto 51 eggs in a clutch! Another unusual feature of the reproductive biology of the tortoise is that it constructs a large leaf litter mound, using the forelimbs to back-sweep the litter. The same limbs are used to excavate a cavity in the mound for the eggs -- all other turtles and tortoises whose nesting habits are known, dig with the hind limbs. Once egg-laying has been completed, the tortoise covers the nest, this time using the hind limbs. Perhaps the most fascinating aspect of its biology is nest-guarding: upon completion of nesting, females are known to guard the nest aggressively for two to three days and when threatened, move to a position on top of the mound or advance directly and attempt to push the antagonist. The large clutch size, coupled with the nest-guarding behaviour indicate that a large effort is expended by the female tortoise.

Wild populations of this species are threatened by the loss of forest cover and subject to heavy predation by humans, throughout their range. The Chakma tribals in the Chittagong hill tracts region of Bangladesh eat the flesh and use the large carapaces as cradles for their babies or as door-steps for their houses. Throughout north-eastern India, the giant tortoise is eaten by the tribals as well as settlers and the carapace is also used as a feeding trough for chickens, pigs and dogs. Local trade in the species has been reported in west Malaysia and Thailand.

Of the biology of the allied species, the impressed tortoise (*Manouria impressa*), little is known. Reaching 28 cm in length, the tortoise is brown above, each shield has yellow borders and dark radiating marks, yellowish-brown on the plastron, with dark brown marks. This species has a much more restricted range -- the highland forests of Burma, Thailand, west Malaysia and Viet Nam and is nowhere common. It is difficult to maintain in captivity, succumbing when kept with other turtles and tortoises. In the wild, this attractive species feeds on bamboo and possibly, fallen fruits.

The discovery of fossilised remains of tortoises

similar to these large forest tortoises in the now arid north-western areas of India suggests that these regions were once cloaked with dense tropical vegetation. Hence, tortoise fossils are palaeoecological indicators, and can complement other data sources in helping us understand the earth's changing climates and vegetation.

At the other end of Asia dwell a group of testudinids that extend into north Africa and southern Europe. This is the Palearctic genus *Testudo*, represented by five living species, of which three inhabit western Asia. Most widespread among these is the central Asian or Afghan tortoise (*Testudo horsfieldii*), distributed from the north-eastern shores of the Caspian sea, eastwards to Baluchistan, in Pakistan. It has a rounded, depressed shell, light brown in colour, commonly with black blotches both above and below. A unique feature of this diminutive (20 cm.) animal is the possession of four claws, instead of the usual five in related forms, on each forelimb, for which it is sometimes referred to as the 'four-toed tortoise'. An inhabitant of the sandy or loamy steppes, in grasslands or near streams in rocky terrain, it is capable of climbing steep hillsides, moving with their shells carried well over the ground. When disturbed, the tortoise hisses and while eating or drinking, it may emit a frog-like croak.

Severe winters characterise the home of the central Asian tortoise, and one wonders how the little animal avoids being frozen solid. Proteinaceous compounds, possibly present in the blood plasma, appear to act as 'anti-freeze' when the temperature drops! The species, in addition, is active for only a few months in a year, retreating into self-excavated burrows during the summers and winters. Flowers, fruit and the fleshy leaves of various plants are preferred as food. Females lay three to five eggs at a time, several times a year. The albumin of the egg of the tortoise has been shown to have antibiotic properties, for antimicrobial defence. In captivity, the species is known to cross with the Hermann's tortoise (*Testudo hermanni*), a tortoise found in southern Europe.

Status data on the species, so widely distributed, is not adequate, which is not surprising considering the political instability of the region. In Pakistan, habitat destruction is one of the main threats, as Afghan refugees have been settled in tortoise habitats where livestock competes with the tortoise for the scarce forage. In addition, farmers in the country deliberately kill the tortoises as they are considered destructive to cultivated crops. The

principal religion of all but one West Asian country being Islam, the tortoise is generally not consumed by humans. However, remains of the species in Bronze Age excavation sites in Pakistan indicate that the central Asian tortoise was a food item of prehistoric man.

The spur-thighed tortoise (*Testudo graeca*) reminded its describer, Linnaeus, of Greek mosaic. Once familiar as a pet in Europe, the tortoise is found in northern Africa and southern Europe, extending into West Asia in Israel, Syria, Jordan, Lebanon, northern Iraq and western and east-central Iran. As many as three of the four races are found in the near east. Growing to 25 cm. the tortoise has an olive or yellow, black-edged carapace that is fairly domed. The posterior part of the plastron of mature females is slightly moveable, as this allows larger eggs to be deposited. Males of at least some of the races court females in spring, immobilising them by butting with their shells and also biting the head and limbs, emitting a whistling cry. Eggs, numbering three to five per nest, are laid in June or July in Israel by one race, while another lays two to three eggs at a time in May and June in northern Africa.

A herbivorous species, the tortoise inhabits a variety of biotopes -- scrubland, sand dunes and coastal heathland, and hibernates during winter, emerging temporarily during warm days. The spur-thighed tortoise is known to disperse seeds of 34 plant species, one of which showed increased germination, after passing out of its gut.

The Egyptian tortoise (*Testudo kleinmanni*) is distributed over northern Africa, along the coastal zone of the Mediterranean, in Libya and Egypt and extends into south-western Israel. A very small species, males attain 10 cm. while females are 13 cm. The tortoise is characterised by a highly domed carapace, yellowish-green in colour, each shield usually black-edged. Of its breeding biology, little is known, apart from observations in captivity. In Tel Aviv, they mate between October and March, while eggs are deposited between April and July.

An interesting aspect of the natural history of the Egyptian tortoise is that it is active during the winter. This is thought to be an adaptation to avoid reptilian predators, that become active from early spring. Overgrazing by livestock and modifications of its scrub habitat by humans are considered to be the main threats to the survival of the species. It is, however thought that predation by various

birds, such as the brown-necked raven (*Corvus ruficollis*) is the direct reason for the low population density of the tortoise.

The reinforced shell and heavily-scaled limbs virtually ensure tortoises an adulthood free of natural predators, though eggs and hatchlings are destroyed by a wide spectrum of enemies. Hyenas are one of the few animals that have jaws powerful enough to crack open the shell of an adult tortoise, and hyena predations of the central Asian tortoise are known from Pakistan and Palestine. The lammergeyer or bearded vultures (*Gypaetus barbatus*) which reportedly carry bones that are hard to break open, and drop them on rocks, seem to be another, and may have been responsible for the death of the bald Greek dramatist, Aeschylus (Circa 525-456 B.C.), who was killed when a large bird dropped a tortoise on his pate, presumably mistaking it for a rock!

### Wonder drugs

However, most often it is man who turns the tables on the tortoise. *Unani*, the Greco-Arabian system of medicine that is part of the Indian materia medica, prescribes use of the burnt shell of land tortoises as a cure for infantile diarrhoea. Almost throughout their ranges, tortoises serve as occasional food items for the locals and several body parts reportedly have medicinal qualities. The crude drug guiban, sold in China, is made by heating the plastron into a paste, for use as a cure for a variety of unrelated ailments, including malaria, piles, tuberculosis and leukorrhoea. The elongated and impressed tortoises, besides several freshwater turtles, are imported to Hong Kong from Thailand to meet the demands for this 'wonder drug'.

Another threat faced by the smaller species is collection from the wild for the pet trade. The Indian star tortoise is one such example, which, because of its strikingly patterned shell, is popular as a pet throughout the world. Upto a decade ago, pet shops at Calcutta's New Market sold over 10,000 of these animals annually and levels of trade in several other Indian cities were not insignificant. With the promulgation of the Indian Wildlife (Protection) Act, this trade has been restricted. Past trade figures for the Mediterranean species are even more alarming. Animals were indiscriminately gathered like 'potatoes ready for harvesting' for supply to the markets in western Europe, principally from west Asia, southern Europe and northern Africa. In 1971 alone, Great Britain (which eventually banned tortoise import) was recorded to have imported over a million tortoises, including some 38,000





Though it looks like a tortoise, *Geoclemys hamiltonii* (above) is in fact a turtle. Tortoises are closely related to hard-shelled turtles and are thought to have evolved from this group some 50 million years ago. The distinctive markings which, unfortunately, make the Indian star tortoise (facing page) a favourite victim of the pet trades are an evolutionary adaptation to help it survive in the scrub habitats in which it is found.

central Asian tortoises.

The rapidly shrinking tortoise habitats present special concern. Insularisation, or the creation of ecological islands by the fragmentation of an original homogenous habitat as a result of man's enthusiastic developmental processes, is known to hasten the extinction of several species. Forest-dwelling tortoises in particular are badly hit by insularisation, while direct, albeit short-term, economic gains are made by slash-and-burn agriculture and logging operations. Pocketed into tiny, ever-shrinking reserves, tortoises seldom receive adequate protection from marauding humans. Forest-inhabiting aboriginals of Asia have for ages subsisted on and yet co-exist with tortoises, as their traditional capture and limited utilisation patterns exert little stress on wild populations and utilisation of this food resource by the locals may perhaps be permitted.

### Myths and beliefs

Besides providing protein-rich food to the local people, the Asian tortoises and turtles feature prominently in local cultures. *Kwei*, a turtle in Chinese mythology, was responsible for the creation of the universe. Similar beliefs, connecting the cosmos with this group of animals are to be found among the Hindus (for whom the turtle is also an incarna-

tion of the god *Vishnu*) as well as among some of the tribes of North American Indians. The tortoise, in Korean myths, is the guardian of graves, and not surprisingly, the symbol of longevity. The *Shang* in China, believed that their dead kings continued to exercise power and could be consulted by divination. They applied hot brands to the plastrons of tortoises and turtles and interpreted the significance of the single or branching cracks caused by the heat. A more practical and traditional use for the shells are the various stringed musical instruments that are made in several countries, using the shell as a sound-box.

Predominantly vegetarian, and too slow to catch anything fleet-footed, tortoises can flourish on poor quality forage, usually unsuitable for man's livestock, thereby converting useless weeds into proteinaceous food, in the form of its flesh, that can be subject to limited exploitation. Many species of tortoises, in addition, are known to scavenge on dead animals, helping in the release of locked-up nutrients. It is thus appropriate that the official symbol of the Viet Nam National Conservation Strategy shows a large tortoise, symbolising the strength and endurance of the country, that supports on its back the territory of Viet Nam, a dragon (the country's ancient traditions) and the entire biosphere, a fitting tribute to a timeless animal.

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