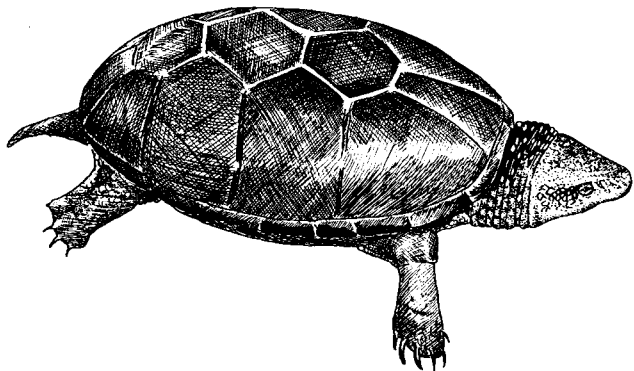


# Turtles

By E. LAURENCE PALMER

Illustrations by Hope Sawyer and E. M. Reilly, Jr.

This is the ninety-ninth of NATURE  
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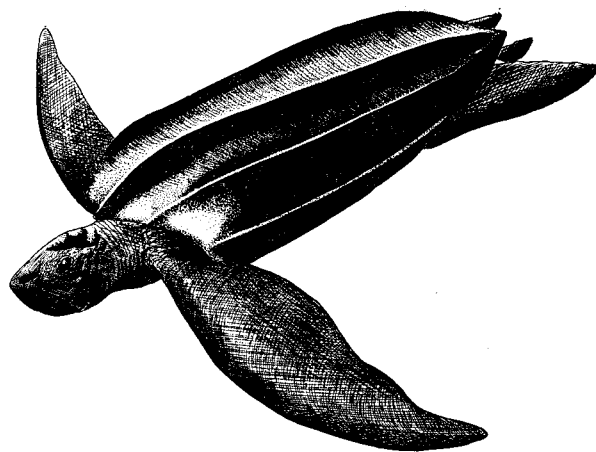


Common Mud Turtle

THERE is a story to the effect that a desperate rural postmaster, faced with determining the postal rate on a box of turtles, finally exclaimed in frustration, "Turtles is insects!" and determined the necessary postage accordingly. Of course, his rating as a zoologist in this case would have been rather poor. Turtles, like snakes, lizards, and alligators, are reptiles. Their body temperature approximates that of their environment and, like the fishes, amphibians and their fellow reptiles, they are considered as being cold-blooded vertebrates.

To some of us, probably, turtles are little shell-protected animals sold in pet shops and sometimes inhumanely painted for sale as souvenirs. To others, they are surprise catches by fishermen, or creatures like armored tanks resting in the sun on a log, close to a pool of water. To a few, a turtle may be a fearsome creature in a farm garbage barrel being fattened to serve as the basis of a delicious soup. In our modern travel, turtles commonly appear momentarily as our car flashes by them on the pavement, and it is quite possible that we can measure our own character by our decision to run them down, avoid them, or to remove them from danger whenever possible.

Some turtles seem to be active in the brightest weather. Others may be nocturnal, while still others favor the transition periods of dusk and dawn. Some spend practically their whole lives at sea or in the water, coming ashore only in the dead of night to lay their eggs, usually at high tide. Others thrive in moist woods and grasslands, or even in the garden. A few have demonstrated an ability to live in deserts and other dry environments. With all these differences of habitat and behavior, it is

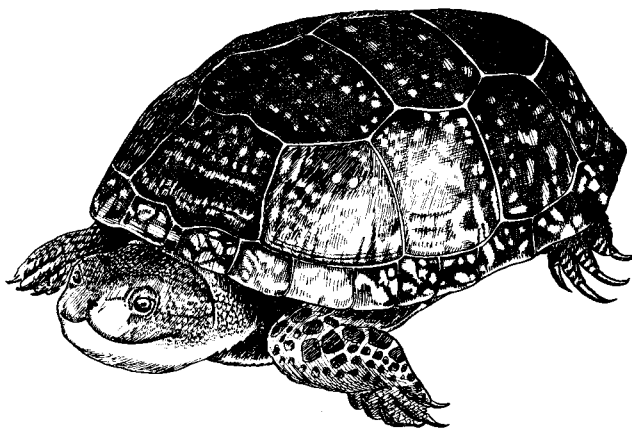


Leatherback Turtle

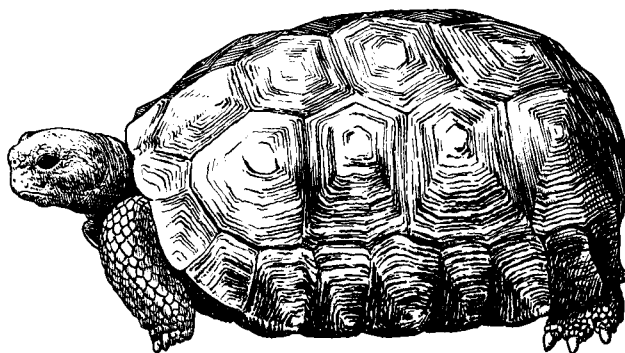
natural that turtles should vary considerably in structure. They do, although relatively little.

In the average turtle, the body is encased in a shell. The upper shell is known as the *carapace*; the lower as the *plastron*. The ribs are usually consolidated with the bony part of the carapace. In soft-shelled turtles, there is a leathery, flexible covering.

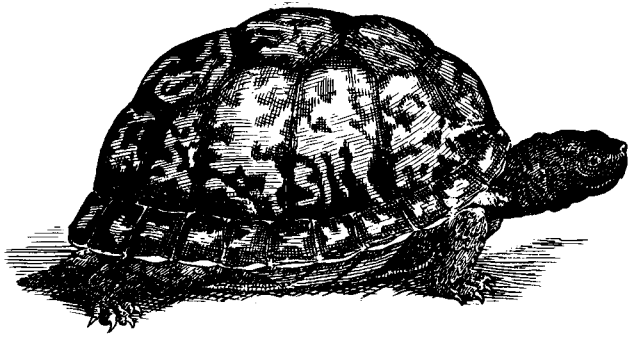
In many turtles, the hard covering serves as a means of protection against enemies. In some cases, the shell is hinged and can be closed tightly. In other species it provides relatively little protection. Generally, the turtles with the soft parts well protected are docile, while those not well protected are likely to be belligerent.



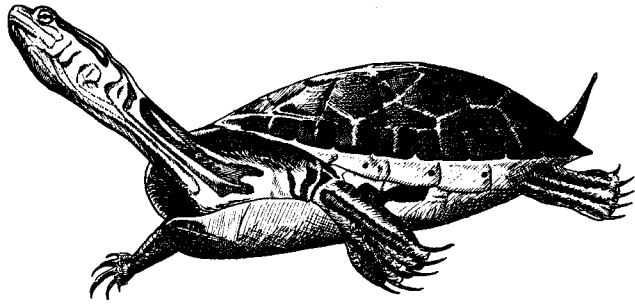
Blanding's Turtle



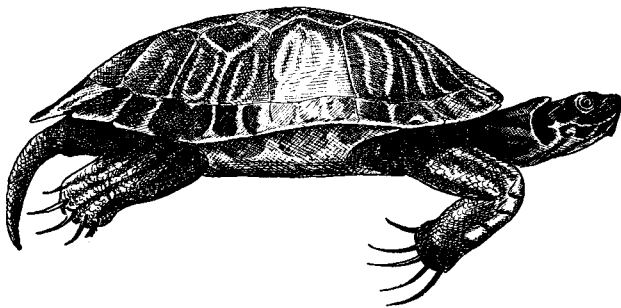
Desert Tortoise



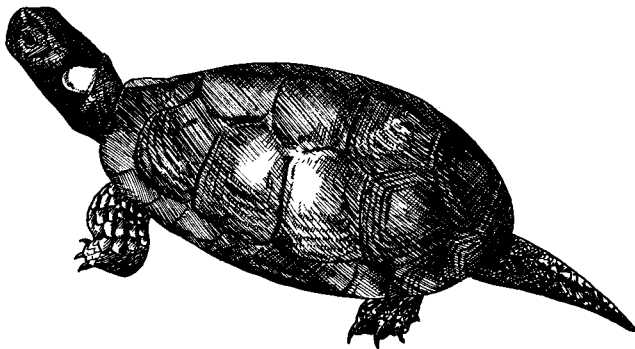
Box Turtle



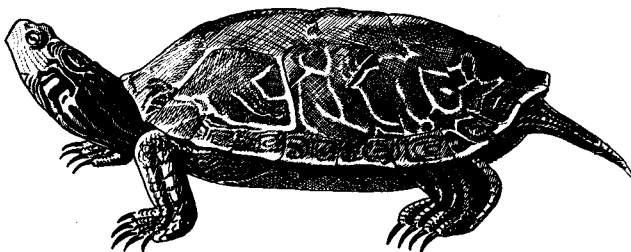
Chicken Turtle



Hieroglyphic Turtle



Muhlenberg's Turtle



Common Map Turtle

Turtles can safely remain under water for long periods of time. Some remain submerged all winter. In some species, this prolonged submergence is possible because of the presence of thin-walled sacs that serve as "cloacal gills." In many, however, submergence is possible because of the slow respiration and the reduced need for a fresh air supply. Turtles do not have teeth, but their jaws have horny sheaths. While some snakes and some lizards may lay eggs, others apparently may give birth to living young. All turtles are involved in the laying of fertile eggs which, unlike the eggs of more primitive fishes, have shells, and thus are prevented from drying out and being destroyed. Like lizards, and unlike snakes, turtles can close their eyes with the help of lids. Many turtles can effect further protection for their soft parts by withdrawing into the protection of the "shell."

Except in the Arctic and Antarctic, there are few places on earth that can not and do not support some sort of turtle. More than 4000 species of living turtles are known to science, and fossil forms are known back to Permian time. While turtles may seem for the most part to be rather low on the scale of intelligence, there are those who believe that box turtles may have the intelligence of rats in solving the problems of mazes.

As is the case with most animals, there seems to be a relationship between the structure and function of the parts of turtles. Turtles, like the soft-shelled turtles that lie flat in mud in the shallows, do not have high shells like the land turtles. Their flatness makes it possible for them to operate unseen in extremely shallow water. Turtles that lie in wait for their prey frequently have an exceptional ability to strike their prey without moving their bodies. This requires a neck that is extensible, as in the chicken turtles and snapping turtles. Many of the reptiles feed on hard-shelled mollusks, and find the possession of strong crushing jaws advantageous.

Turtles that normally take their prey from beneath may have eyes located at the tops of their heads, in contrast to the many whose eyes are on the sides of the heads.

The legs of these animals vary from enormous strong flippers, like those of the sea turtles, to stump-like legs such as are found in the desert tortoise. The reason for such differences is evident when we examine the environment in which each of the animals lives.

The presence of claws on the feet of turtles tells several stories. Animals that must dig in the earth to build nests, or that must hide under ground in hibernation or for protection must have claws suitable for digging. Male turtles that must hold the females during the mating act find that the possession of long claws on the front feet are most convenient. Sometimes there is significance in the number of claws on the feet of the species, and on those of the different sexes. The length of the tail in the two sexes also is significant, as is the length of the lower shell and the concavity and rear margin of the shell. Once the reasons for these variations are recognized, their significance frequently becomes obvious even to the most casual of observers.

Coloration also is frequently of importance to these reptiles. In general, the under sides of turtles are much lighter than the upper sides. Enemies looking from beneath a turtle towards a bright sky are less likely to see the animal if the under side is light-colored. Similarly, the upper side may be dark, as is the bottom over which the animals move. If the water is likely to be rippled above a turtle, species may have mottled backs, as in some of the soft-shelled turtles; and not a few turtles that live over bottoms where algae abound commonly have their backs overgrown with algae similar to that on the bottoms. It is not natural for a turtle to have on its back a sign reading "Souvenir of Sandy Beach," and where such a sign is painted on the turtle it should be removed, if possible, since it may interfere with the normal functions of the back.

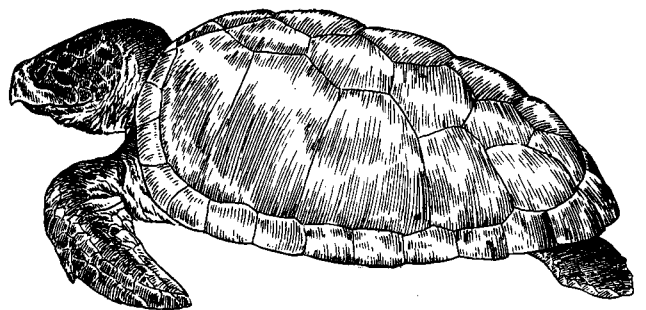
These reptiles may appear to lack emotion, but some of them, like the leatherbacks, are noted for the sounds they make when injured or disturbed. Some other turtles give off gentle sounds during the courtship period, and many will make hissing sounds when they are suddenly disturbed. The common expression "the song of the turtle" found in *The Bible*—and as the name of a successful play—has nothing to do with the subject of this insert, since it refers not to turtles but to turtle doves, and to the songs of these birds in spring during the period of courtship.

Turtles yield a number of substances of value to man, and play an important part in the biological balance of their environment. They serve as food for man both as adults and as eggs. The eggs are cooked, preserved, candied and otherwise treated for human consumption. In general, it seems to be wasteful of a resource to use the eggs of useful animals, and it would seem that where a species is not abundant the use of turtle eggs as human food should certainly be discontinued. The flesh of many turtles is good either in soups or eaten as such. Formerly, it was the custom of some ships—especially whaling vessels—to carry turtles for use as fresh meat. The animals could be kept alive with less care than required by most animals. Many of the huge turtles found on the Galapagos Islands found use in this way, and their numbers were accordingly reduced.

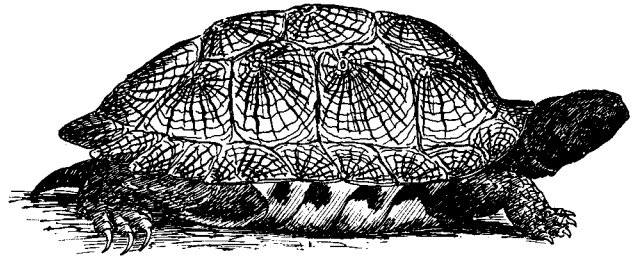
Men frequently have been inexcusably cruel in their treatment of these animals. Probably the most inexcusable act in this connection was the custom of building fires on the backs of living hawksbill turtles to make it easier to remove the scales for use as "tortoise shells." Fortunately, the value of this product has been greatly reduced not only by a change in styles but by the synthetic production of substitutes of equal beauty and in some respects of greater usefulness.

When their interests or freedom are interfered with, some turtles can defend themselves effectively by biting or by flailing with their free-swinging flippers. Others are practically helpless in the face of their enemies.

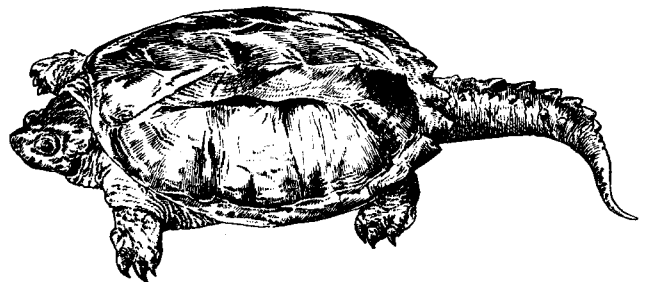
The animals have many enemies from the time they are eggs until they reach maturity. Mammals like skunks, hogs, raccoons and men (Continued on page 32)



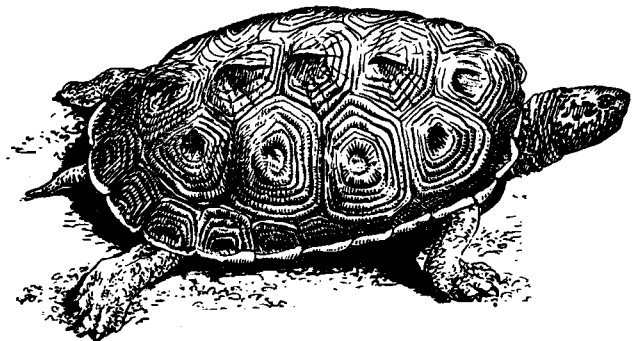
Loggerhead Turtle



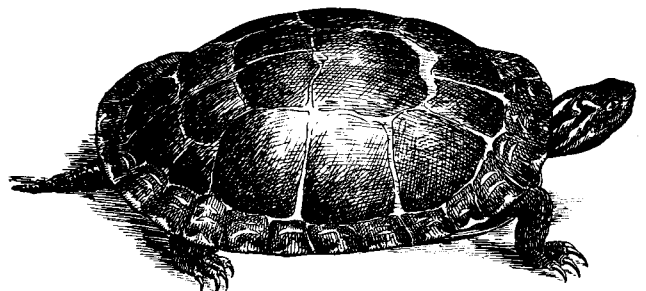
Wood Turtle



Snapping Turtle



Diamond-backed Terrapin



Painted Turtle

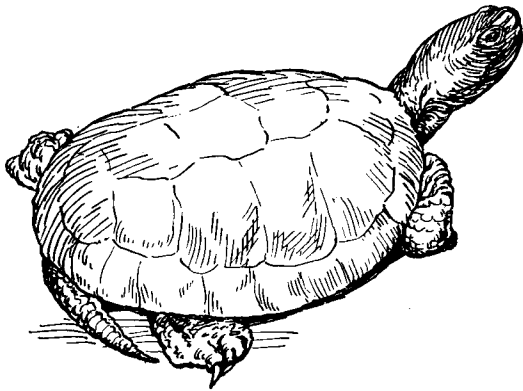
COMMON NAME SCIENTIFIC NAME	SNAPPING TURTLE <i>Chelydra serpentina</i>	COMMON MUD TURTLE <i>Kinosternum subrurum</i>	WOOD TURTLE <i>Clemmys insculpta</i>	PACIFIC POND TURTLE <i>Clemmys marmorata</i>
DESCRIPTION	Total length to more than 3 feet. Average upper shell, 1 foot; lower shell, 8 inches. Under parts not well protected by shell. Back with 3 broken ridges of coarse scales and border row, giving notched appearance to rear. Turtle fattened in swill barrel reached weight of 86 pounds. Related alligator snapper may exceed 200 pounds in wild state.	Length, to 4.8 inches. Shell, yellow to olive to brown or black, in adult without keel. Head, medium. Male usually with larger head and jaws, heavier tail with blunt nail on tip, and with rear notch on under shell deeper than in female. Under shell covers soft parts; front and rear sections hinged to central stiff bridge and may be used to close shell.	Shell, to 9 inches long. Upper shell keeled, rough, with concentric ridges on scales. Lower shell basically yellow, with dark blotches. Upper jaw usually notched. Throat and lower limbs, usually yellow to orange. Head, medium. In male, tail in front of anus twice that of female. Male, with concave lower shell and longer claws.	Upper shell, to 7 inches by 5¼ inches; lower shell, 6½ x 4½ inches. In male, vent is beyond outer margin of the shell; female, inside that limit. May weigh to 2 pounds. Upper shell, low, wide, almost smooth, olive to black, with each shield with many yellow-brown to black dots and dashes. Under shell yellow, and in male, concave. Young, with keel on back.
RANGE AND RELATIONSHIP	Family Chelydridae. From southern Canada to Ecuador, but east of the Rockies. Alligator snapper from northeast Florida to central Illinois and Missouri and south to southeastern Texas and the Gulf Coast. Common or Loggerhead Snapper, throughout United States east of Rockies. In lakes and streams, mostly over muddy bottoms or on nearby land.	Louisiana to Illinois and east along Gulf and Atlantic coasts to Connecticut but not in western Virginia, Ohio or northern Pennsylvania or New York. A western relative, <i>K. sonoriense</i> , is found along Mexican border and adjacent territory in California, Arizona, New Mexico and western Texas. Common in ponds and slow mud-bottomed streams, April to November.	Ranges from Nova Scotia to Virginia, west to Wisconsin, central Iowa but not found in Ohio, Indiana or southern Michigan. Found in almost any environment, wet or dry, from dense woodlands to quiet pools, lakes and streams. Closely related to Muhlenberg's turtle, Pacific pond turtle, and to spotted turtle described in fourth insert.	Pacific Coast from southwestern British Columbia to northwestern Lower California with two subspecies overlapping in San Francisco area; not east of California or central Washington-Oregon area. Highly aquatic in preferences and known to live in brackish and even in salt water. It is probably the commonest turtle to be found in its range.
REPRODUCTION	Males may fight prior to mating. Breeds April to November. Eggs laid May to October, in to 2 or more clutches in South, laying to 80 eggs, white, to 1¼-inch spheres. Known to lay 52 eggs at 2 per minute in nest in dry earth or sand, usually within 75 feet of water. Hatch in about 81 days but may delay until spring if eggs laid in late season. Young, to 1.1-inch shells.	Mates under water, in early May, with 2-5 eggs, each 1.4 inches in diameter, laid in earthen nest to 5 or more inches deep, May through July. Young may hatch in September or October and may winter in the nest. The three subspecies differ considerably in disposition and to some extent in habits, the Florida form having a larger head for the male and being more vicious.	Courtship begins with elaborate dance and whistling by both sexes and ends with mating under water, perhaps at end of a number of days of effort. To a dozen or more eggs are laid in a nest under ground, usually in June and in afternoon; hatch in September to October into young with 1¼-inch shells, usually without yellow under-markings.	Eggs may be laid from April to August but mostly in June-July, in clutches of to 11, hard shelled, elliptic, to 1-2/5 inches long, in nest in open field, sandy bank or hillside, exposed to sun but eggs buried. Hatch by sun's heat into nearly round young whose scales may have concentric ridges. In 10 years, may develop shell length of to 5½ inches.
ECOLOGY	Food about 50% plant matter. May eat to 1 small game fish a day. About 30% of food, fish; and 20% carrion, mostly eaten under water and captured by sudden lightning-like strike with head. May lie buried in mud except for head. Usually calm in water but vicious when out of element. May hibernate October to May and wander to ½ mile, and may live to 20 years.	Feeds largely on underwater animals, probably largely snails. A Florida specimen kept 51 hours at 38°C., and at 37% humidity lost 22.2% of its weight. Gives off a most offensive musky odor but this is hardly as bad as that of the musk turtle. Probably serve essentially as scavengers but are kept frequently as aquarium pets in spite of odor.	Food is highly varied, including plants, their leaves or fruits, and insects of land or water, large or small; may include fish but not abundantly. Turtles may hibernate in mud at bottom of waterway or may aestivate in mud at approach of season of drought. Animals usually solitary except at mating time or when forced by weather to limited suitable areas.	Shy turtles that escape quickly into water when disturbed, most active in evening or early morning. May hibernate during winter months, particularly in northern part of range. Food may be aquatic plants such as lily-pads, and insects and other animal life, living or dead, found under water. Must be submerged to swallow.
ECONOMY	May destroy ducks and game fish but probably not to reputed extent. Pond may support 2 per acre, often concentrated during hibernation. Common scavenger which has been used, by attached floats, to locate drowned persons. Skunks and man are greatest enemies. Men use traps to capture them. Two Michigan trappers, with 60 traps, averaged \$1000 a year for 3 years.	In the mud turtles <i>Kinosternon</i> the forward and rear portions of the under shell are hinged and movable. In the musk turtles <i>Sternotherus</i> , the forward free portion of undershell is shorter than the rear portion and not movable, or only slightly so. Both are commonly taken on hooks baited for catching fish. Mud turtle lacks paired whitish lines on sides of head of musk turtle.	Probably are the most intelligent of our turtles, may learn to come at feeding time if kept in house, to sleep in definite place and, by actions, to ask for food. Are active in daytime and usually inactive at night. May learn to follow a definite route to satisfy wants. Have been considered to have intelligence equal to that of a rat. Harmless to man's interests.	Have a commercial value as food, and because of this have been extensively and probably unwisely trapped by turtle-hunters. Since animals may congregate in great numbers, their destruction in an area is sometimes too simple and harvest should be regulated if survival is expected. May serve as scavengers.

MUHLENBERG'S TURTLE <i>Clemmys muhlenbergi</i>	BLANDING'S TURTLE <i>Emys blandingii</i>	BOX TURTLE <i>Terrapene carolina</i>	DIAMOND-BACKED TERRAPIN <i>Malaclemys terrapin</i>	COMMON MAP TURTLE <i>Graptemys geographica</i>
Shell to 4½ inches long with side margins more or less parallel or spreading to the rear. Rough and mottled, but not spotted. Usually distinguished readily by large orange blotch on side of head to the rear. Shell is feebly keeled, dark brown to black. Scales show concentric markings on back but turtle is a rather ordinary looking animal except for orange on head.	Shell, to nearly 10 inches long, flattened oblong. Upper shell black, with hundreds of small, pale yellow, round or oblong dots. Lower shell, flexible at middle, permitting closing to hide soft parts, notched to rear and with each large shield with a dark blotch at center or to the rear. Lower jaw and throat, bright yellow. Upper jaw, beakless and notched in front.	Upper shell, normally to 5 inches long but may be to 8 inches, to 2½ inches high. Lower shell covers under side of body and is hinged permitting closing to front and rear. Back, with inconspicuous ridge. Thick bony scales, dark brown to black, with yellow spots, streaks or blotches. Head, small, with small overhanging notched or unnotched beak.	Upper shell of female, to 7½ inches; of male, to 4-4/5 inches. Conspicuous because of raised concentric ridges on each scale. Shell sides, about parallel. Head and neck, without yellow stripes. Head, relatively large, that of female being large, with more rounded snout; also female has shorter tail and a deeper shell. Suggestion of a ridge down the back.	Upper shell, to 11 x 8 inches; the lower, to 10 x 8½ inches. Adult with keel down back. Height, to nearly 2 inches. Back olive, with network of light lines. Under shell, yellow to white and for most part unmarked. Head is large particularly in female and jaws are strong. Head has elongated spot on side not attached to other markings.
Found from Rhode Island through southern New England to western New York and western Pennsylvania and south through New Jersey and western Virginia and North Carolina, being found at elevations of to 4200 feet in North Carolina. Commonly associated with tamarack-sphagnum type of territory.	Through New England except Maine, south to New Jersey and west to eastern edge of Nebraska. There are two species in the genus, the other being found in eastern Europe, western Asia and northern Africa. This species is largely terrestrial but is usually found near streams or other waterways. Not normally too abundant in any area.	Eastern United States from Maine to Georgia and west to Tennessee and Illinois, but with closely related species extending range to Yucatan and Mexico, occasionally found at elevations of 4000 feet. In South, there are usually 3 toes on hind feet; in North, 4. Related ornate box turtle found in arid Texas, New Mexico, Arizona and northern Mexico.	Found in salty or brackish bays along Atlantic Coast, from Buzzard's Bay to Florida and represented by two subspecies, the southern coming north to Cape Hatteras and the northern south to North Carolina, Delaware and Chesapeake Bay. There is also a related species, with 3 subspecies. Found in marshy tracts over mud bottoms. Shell length is legal length.	Western border of New England south to eastern Virginia, to western West Virginia southwest to southern Arkansas, eastern Oklahoma and Kansas, eastern Iowa and Minnesota but not in northern Michigan or Wisconsin. Three related species in limited areas in Louisiana ( <i>oculifera</i> ), southern Alabama ( <i>pulchra</i> ), and northern Florida and Georgia ( <i>barbouri</i> ).
Males have heads that are deeper and wider, tails that are longer and thicker, undershells that are more concave and with narrower rear notch than do the females. The claws of the front are also heavier and the snout longer in the males. Eggs to at least 4 may be laid in June, but not necessarily all at once. Young are proportionately wider than the adults.	No obvious sex differences. Breeding is preceded by courtship pursuit of female by male, usually in water, and it may take place from March to October. Nest is built in form of hole, to 7 inches deep, in earth, and to 11 eggs are deposited there. Eggs, 1.5 x .86 inches. Nest built in about an hour and egg laying lasts about ½ hour. Young 1.3 by 1-2/5 inches, dark.	Males may have concave lower shells and pink or bright red irises while females have dull brown or dull red irises. Breeds from spring to fall. Fertile eggs may be laid 4 years after breeding. Eggs to 8, with thin, white, flexible shells, 1-2/5 x 4/5 inches, laid June-July or late autumn, in nest. Hatch, spring to November, to 1¼-inch young, mature at 5 years.	Female lays fertile eggs for years after 1 mating but only 4% are fertile after 4 years, may lay 1 to 5 times a season. Eggs white, 1-2/5 x 4/5 inch, hatch in 90 days into young with 1-1/10 inch shells. Males mature in 4-9 years, with 3-3½-inch shells; females in 4-9 years with 5-inch shells. Young individuals resemble the females in many characters.	Females larger and more aggressive, with shorter tail, larger head, with upper shell more rounded to rear. Females mature with shell to 7½ inches long. Courtship from April to October. Laying mostly in June in early morning. Hatching in August to September. Eggs laid in 2 layers in nest, to ¼ mile from water, numbering, per clutch, to 16.
Food may be swallowed under water or on land and consists of plants and animals. Readily adjust to confinement and learn to eat variety of foods including large berries and insects, so probably may be considered as omnivorous. If confined, should have ample dry area available. Are highly sensitive to climatic extremes, favoring temperature of 68-75°F.	May be active even under ice as early as January. Usually hibernates on land in mud, under trash. Is a timid turtle, with a pleasant disposition and does not seem to resent handling. It was undoubtedly more abundant in prairie country before settlement and agricultural practices interfered with its activities. Food is largely animal matter like insects and crustaceans.	Gentle, retiring animals that are wholly harmless. Build nest in late afternoon or early evening in 3-5 hours. May live more than 40 years and may stay in radius of few hundred yards. Feed on plant material, including mushrooms; also insects, slugs, worms and snails. Protected by shell from enemies such as skunks, rats, flies, but suffer in fires.	Food of wild animals both plant and animal, the latter including crabs, snails and worms. In captivity, are fed chopped fish, clams and insects, feeding preferably under water. In experimental farms, young are usually freed at 8 months of age because of expense of procuring food. Hibernation in bottoms of streams begins with advent of cold weather.	Food is largely molluscs which are crushed by strong jaws or may include crayfish and large insects. May be annoyed by insects when basking and may be parasitized by leeches attached to soft parts. Highly gregarious in basking areas and whole mass may drop into water when one becomes disturbed. Favorite habitat is in sloughs attached to rivers, lakes.
Of no great economic importance and with low reproductive capacity, cannot be important except to turtle fanciers. May make excellent pets but the long periods of hibernation and aestivation may make them highly seasonal in their activities and may make their captors feel that they are not doing well.	Considered to be good food for man and has been sold in Ohio markets to such an extent that its abundance in natural habitat has been greatly reduced. It is probably of no damage to fish hatcheries except that its food is approximately the same as that of many game fishes and so it may be considered as a competitor.	May hibernate a few inches under soil surface below frost line and may aestivate in hot weather in mud. Make excellent pets requiring little care but should be fed and watered adequately. Drink with head under water. Are edible but in many States are protected by law because of use as insect and slug destroyers. May injure some crops like tomatoes.	Possibly the most expensive of all world turtles and one of the most popular as food for man. While we know how to raise these animals in captivity and they have a high market value, it seems unlikely important in the near future for many reasons including the slow reproductive capacity, the disease situation, the ability of young to escape confinement.	Because of nervous nature do not make good captives and if confined may try endlessly to escape. Flesh is considered palatable but not superior and the animals are found for sale in markets. Possibly may serve as intermediate hosts for parasites of other animals but they do destroy many molluscs that are known reservoirs for parasites that are harmful to man.

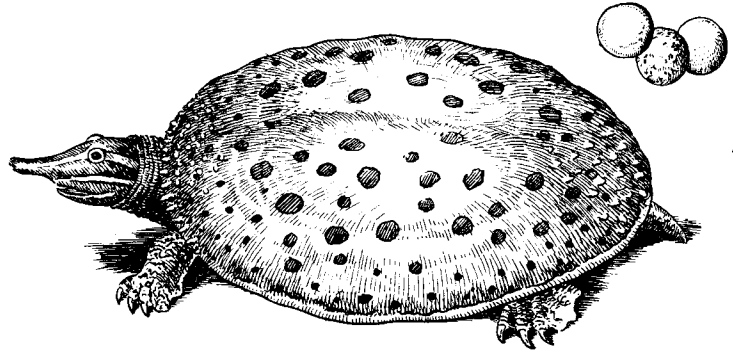
COMMON NAME SCIENTIFIC NAME	PAINTED TURTLE <i>Chrysemys picta</i>	HIEROGLYPHIC TURTLE <i>Pseudemys floridana</i>	CHICKEN TURTLE <i>Deirochelys reticularia</i>	DESERT TORTOISE <i>Gopherus agassizii</i>
DESCRIPTION	Shell low, broad, to 7 inches long and 5½ inches wide. Lower shell, to 6¼ x 5½ inches, not hinged. Neck, not too long. Back smooth, without keel or notched rear margin, shows no longitudinal wrinkles. Tubercles on upper jaw parallel to margin. Lower shell yellow, marked variously in the subspecies.	Upper shell, to 11½ inches long, and lower nearly same length. Along middle of crushing surface of upper jaw is a high, strongly toothed ridge. Lines on top of head are usually unbroken. Lower shell is yellow or orange, but marginal shields show blotches enclosing light areas on lower margins. Claws on forefeet long.	Length of shell, to about 10 inches but relatively narrow and depressed, about twice as long as wide, although closer estimate would give width as 65% of the length, and height 40%, with head and neck to 80%. Upper shell, with narrow longitudinal wrinkles, not notched behind and only a suggestion sometimes of a keel. Olive brown, with large light net pattern.	Upper shell more than twice as long as the shell is high, with upper and lower shells about equal in length. Scales, with conspicuous concentric markings. Hind legs are cylindrical and commonly held erect. Forelegs, with thick bony scales on front surface. Toenails of front feet are short and heavy. Top of head is scaled conspicuously. Upper shell, about 9½ inches long.
RANGE AND RELATIONSHIP	Found from coast to coast through southern Canada, south through eastern Washington and Oregon, Idaho and eastern Colorado and Wyoming, to central New Mexico and southeastern Arizona, northeastern Oklahoma, southern Kansas and Missouri, down the Mississippi to the Gulf, through Tennessee and eastern Georgia and northeastern Florida and between.	Eight subspecies range from Virginia to central Nebraska, eastern Oklahoma and central Texas, into Mexico and in territory on to the Atlantic and Gulf Coasts. Hieroglyphic subspecies found in northeastern Louisiana through most of Mississippi, western Alabama, western Tennessee, western Kentucky and southern Illinois and Indiana.	Ranges from eastern Texas into southeastern Arkansas and along Gulf and Atlantic coasts to southeastern Virginia. Found throughout Florida and touches on extreme southeastern Oklahoma. Most closely related to the genus <i>Chrysemys</i> . Is in the same family, the Emydidae. There is but one species in the genus and apparently no recognized subspecies.	<i>G. agassizii</i> is found in desert of southeastern California, southern Nevada, southwestern Arizona and northwestern Mexico. Related Berlandier's turtle is found in southern Texas and adjacent Mexico and the gopher turtle, <i>G. polyphemus</i> , ranges along the coast from eastern Texas to southern South Carolina.
REPRODUCTION	Mates in April or later. Eggs, 6-8, smooth, white, glazed, soft-shelled, blunt, egg-shaped, laid May to July, in nest in soft soil, in woods or open country and covered with soil. Some believe incubation may last 1 year but young are found before normal egg-laying time. Young to 1x1 inch when hatched, to 2½ inches at 1½ years, to 3½-inch breeders in 4½ years.	Nests in May and June but particularly in June. Eggs, to 20, elliptic-ovate, pinkish white, with softish shells, with granular surfaces, 1½ by 1-1/3 inches on average, sought as food by snakes, bears and raccoons. Nails of the males are much longer than those of the female on the forefeet, and tail is thicker and with vent farther to rear.	Males commonly have smaller, narrower shells than females and longer tails. Breeding and egg laying may take place at almost any time of the year. Nests are made frequently in ploughed soils near waterways but little seems to be known specifically about the building of the nest, the incubation of the eggs or growth. There may be to 15 eggs, about 1½ by 1 inch in size.	Male has longer tail, more concave under shell and somewhat larger head. Mate in May, with males fighting each other for mates. Males grunt. Nest built in June and to 6 eggs laid. Eggs, about 1-3/5 x 1-2/5 x 1½ inches, white, with thick hard shells, buried in sand, hatch in about 17 weeks into young, 1¾ x 1-4/5 inches reaching length of 2-4/5 inches first year.
ECOLOGY	Docile animals that make popular pets. Feed on a variety of plants and animals. May feed on land but prefer to feed submerged. Thrive on beef, earthworms, lettuce or fish. Food habits apparently have not been studied exhaustively in the wild state but it may serve as a scavenger at times like many other kinds of turtles.	Seen commonly sunning on logs in sloughs of streams particularly in warm sunny weather. Young animals eat almost anything but adults feed mostly on water plants or other available plant food. May be kept well fed in captivity with little trouble. It may become active during short relatively warm spells even in winter.	Has a highly varied diet and in captivity will eat almost anything, but in free state probably eats more animal than plant matter. It is known to eat crayfish and tadpoles. It is probably active at night. It favors temperature of 70-77°F. In captivity it may be fed mussels, snails, fish, earthworms, raw meat, and should have a float on to which it may crawl.	Food, largely plant material, fruits and vegetables. Do little to protect selves except withdraw into shell; harmless, favor temperature of 85-95°F. Have been known to move 20 feet in a minute or to 5 miles in one day. Can be taught to accept food from the hand. Some relatives known to have lived for 152 years. Man is probably worst enemy.
ECONOMY	Flesh is considered as palatable but the edible portion is too small to justify effort to get it except in emergencies. They have been sold to markets at \$1 per dozen which obviously does not suggest high finance in connection with marketing them but even this may have been a purchase by an uninformed buyer who did not recognize inferior food value.	Has been sold regularly in markets within its range and is rather famous for use in making excellent soups. Being a plant eater, it does not figure too prominently in the biological balance of the area in which it lives.	Has been sold in local markets and is considered to be a highly edible species. It is probably eaten by natives throughout its range. It does not make a good pet because it may bite readily and hisses in an unfriendly way when first approached. Once adjusted to captivity it may not be unduly offensive.	Useful as food but too interesting to be exterminated and ordinarily should not be destroyed. Must have dry environment to survive and prosper. Some huge relatives in parks are known to be able to carry children on their backs. Have long ancestral history.



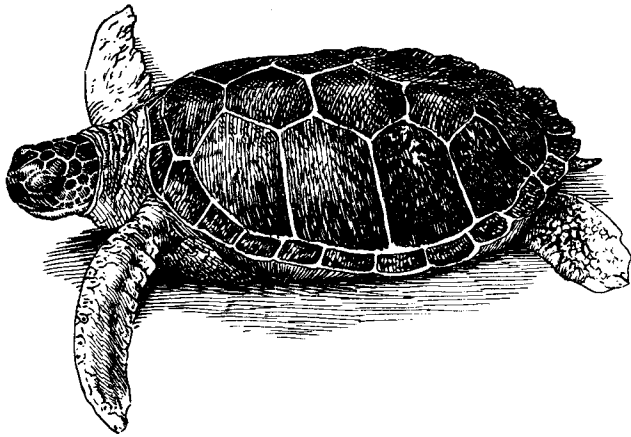
GREEN TURTLE <i>Chelonia mydas</i>	HAWKSBILL TURTLE <i>Eretmochelys imbricata</i>	LOGGERHEAD TURTLE <i>Caretta caretta</i>	LEATHERBACK TURTLE <i>Dermochelys coriacea</i>	SOFT-SHELLED TURTLE <i>Amyda ferox</i>
<p>Shell covered with large, bony shields. Back, with no longitudinal ridges. 4 pairs of side shields and shields of back overlapping only in young. Single pair of shields on front of head. Color, mostly brown or shaded with olive. White or yellowish beneath. Back shell, to 40 inches long. Weight, to 850 pounds. Strong vertical ridges on inner side of upper jaw.</p>	<p>Upper shell, to 32 inches long, somewhat heart-shaped, with coarse scales, with scales forming the margin almost sharp enough to cut. Scales have beautiful tortoise shell coloring when seen with transmitted light. Head chestnut brown. Under shell yellow, often with black markings. Legs brown above; yellow beneath, and powerful.</p>	<p>Shell, long heart-shaped, being in outline somewhat concave in front and uniformly oval to rear. Length, to 7 feet and width to 4 feet. Weight, to 1600 pounds. One measured 12 feet from fin tip to fin tip. Limbs two-clawed in Atlantic species and 1-2 clawed in the Pacific subspecies. Two pairs of large shields between the eyes. Five pairs of scales on side of back.</p>	<p>Total length to 8 feet or more, possibly more than 10 feet; total width, to more than 6 feet; total weight to 1600 pounds. A 1000-pound leatherback had a width from flipper tip to flipper tip of 10 feet. Usual size much smaller than above. Back is smooth, scaleless, with black skin, with 7 narrow longitudinal ridges and 5 ridges down the under side.</p>	<p>Length of back shell to more than 17 inches. Back shell leathery and flexible, with bluish tubercles along the front edge; surface, with various indentations and elevations. Nostrils crescent-shaped, as contrasted with round in spineless soft-shelled turtle. Snout long and drawn out. Basically gray to brown, often with dark spots. Under surface, uniformly white.</p>
<p>Found on shore or in seas along Atlantic from Massachusetts through West Indies being commonest marine turtle of Bermuda. On West Coast, known from San Diego to southern Lower California. Usually is within 35° of the Equator. Two subspecies recognized; the Atlantic <i>C. mydas mydas</i> and the Pacific <i>C. mydas agassizii</i>.</p>	<p>Two subspecies, one in Atlantic from Massachusetts to southern Brazil and the other in the Indian and Pacific Oceans from Japan and Baja California south to Madagascar to Peru. Not known south to Cape of Good Hope so the two are kept separated. Are strictly marine animals and their habitat is the open sea except at breeding time.</p>	<p>Atlantic subspecies <i>caretta</i> known from Nova Scotia to Rio de la Plata in Argentine and from Scotland to Rio de Oro in West Africa. In South Africa, this form is replaced by the Pacific subspecies <i>gigas</i>. Pacific subspecies known from southern California to Chile and south to South Africa. There seems to be an overlapping of characters in meeting area.</p>	<p>Two recognized subspecies; <i>coriacea</i>, the Atlantic, and <i>schlegelii</i>, the Pacific, with differences that cannot be adequately presented here. The Atlantic ranges from Nova Scotia and the British Isles south to Mar del Plata, Argentine and the Cape of Good Hope; the Pacific, from Japan and British Columbia to New Zealand and Chile. Obviously favors warm seas.</p>	<p>In 6 subspecies; <i>A. ferox</i> in all States except Oregon, Washington, Idaho, Utah, Virginia, Delaware, New Jersey and the New England States. The related spineless species <i>mutica</i> is found in South Dakota, Nebraska, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Tennessee, Ky., W. Va., Pa., Ohio, Ind., Ill., Mich., Wis., Iowa, Mo. and Ark.</p>
<p>Breeds any time of year, nesting on sandy shore, but may vary at different times of year, in different places. Nest built at night usually on spring tide, to 10 feet wide and to 2 feet deep. To 200 or more 1.9-inch eggs laid, possibly 2 to 5 times a season; hatch in 47-52 days. Young add ½ inch to shell and to 1 pound a month first year. Female matures at about 10 years.</p>	<p>Mate near shore, presumably near the beach where the nest is built. In Florida area, breeding and egg laying take place from April through July. Believed that three clutches of eggs may be laid by a female in a season. About 150 eggs laid, each about 1½ inches in diameter. Incubation period apparently is not known.</p>	<p>Along Atlantic Coast of America from Virginia to Florida. Breeding takes place from April to August with greatest activity in June. Usually most egg laying is done during latter half of a flood tide. Nest is above high water mark, is dug with hind flippers in sand to a depth of more than 2 feet. Eggs are laid to 12 per minute to total of about 150, more than 1½" in diameter.</p>	<p>Male more slender to rear and with longer tail than female. In Florida, egg laying takes place from December through January, according to some, but there are records as late as June. Female comes ashore, builds nest to 150 feet back from water, lays to 80 eggs at 3-foot depth. Eggs about 2½ inches in diameter, but vary in size, with thin, brittle shells.</p>	<p>Females larger than males. Mating takes place in water and has not been carefully observed. Eggs are laid in nests opened in sandy shores from March to July, with to more than 20 eggs in a clutch, each about 1 inch in diameter and spherical. Nest may be 4 inches in diameter and 5 inches deep. Young 1 inch, circular; to 7 inches in 5th year and breeds first in 6th.</p>
<p>Food almost exclusively marine algae, particularly those that are succulent. Young may eat more animal food than do the adults. May sleep at sea. Captive turtles known to have added 50 pounds weight in 9 years. Tail of males extends beyond tip of extended flippers but in the female only to edge of upper shell.</p>	<p>Food is both plant and animal matter, including the poisonous Portuguese man-of-war. In captivity, may feed on fish and meat and do well. Meat is by some reported to be poisonous but to others it may be a delicacy. Eggs are eaten freely by man either dried, smoked, fried or otherwise prepared.</p>	<p>Incubation is for 1-2 months. Food of young is largely animal matter including clams, conchs, oysters, sponges, jellyfish and sometimes turtle grass, <i>Zostera</i>. Animals of course are harmless to man and do not compete with him for a common food supply. Conservation practices could save the animals if they were applied.</p>	<p>Food probably is both plant and animal matter judging from stomach contents. May be dangerous with flailing flippers and with bites. When caught, may give cries of pain or rage if hurt, giving groans, roars, bellows and wails according to different interpretations. Pacific animals may be larger than Atlantic animals, one reaching weight of 1902 pounds.</p>	<p>Food probably largely animal matter, such as molluscs, crayfish, minnows, frogs and earthworms. Food is swallowed whole. Jaws powerful, particularly suited for crushing in the males. Can strike accurately and suddenly but if held by tail cannot strike effectively. Animals are essentially aquatic but sun themselves on shores, escaping into water as necessary.</p>
<p>Of great economic importance as food for human consumption. Supply becoming limited largely because of overharvest and destruction of nests and eggs. This turtle is a renewable natural resource that could be restored by reasonable behavior, since the reproductive capacity is tremendous. Females less than 40 pounds should be left to mature.</p>	<p>May be of value as food but greatest value came from the scales that had wide use in the arts. They were often removed from the live animals by building fires on the backs of the turtles, but this must have been tremendously cruel and unjustified. Fortunately plastics and chemistry have given us superior substitutes and the value of tortoise shell has dropped.</p>	<p>Flesh is inferior as food for man. The shells are inferior to those of hawksbill turtle and yet the flesh and eggs are eaten. Eggs are made into a strange candy or into a sausage-like food. Sometimes the animals are made into an oil that is used as a varnish. Shells have been used as small buoys for boats.</p>	<p>Oil extracted from skin is used as varnish. Eggs are eaten by man and flesh is considered everything from delicious to poisonous and tough. These turtles are so few in number the world over that it would seem that they should not be destroyed and their eggs should be allowed to develop. Incubation of eggs in Ceylon reported to be 55-65 days.</p>	<p>These turtles are edible and are found for sale in markets. They may injure humans by their bites and may destroy some useful and rough fish and compete for food with useful fishes. Their food value probably exceeds the damage they do. May be caught in traps, nets, or on baited lines. Body temperature may vary from 33.6 to 84°F, slightly above that of environment.</p>



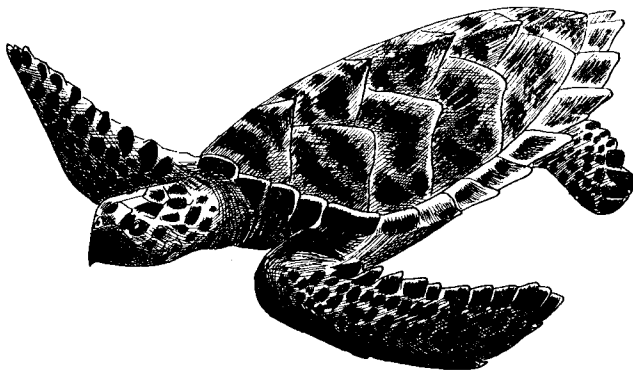
Pacific Pond Turtle



Soft-shelled Turtle



Green Turtle



Hawksbill Turtle

(Continued from page 27)

spoil many turtle nests by digging up the eggs and eating them. Against this the turtles have little defense. The larger carnivores like bears are known to kill and eat adult turtles. The reptiles have numerous external and internal parasites that interfere with their freedom of action. Leeches attach themselves to the soft parts of their bodies where there is no protective shell, and some flies whose larvae are carnivorous are known to lay eggs on the exposed soft parts of some of our land turtles.

Turtles may turn the tables, of course, and become effective enemies of other animals. With some justice, wildlife managers find it important to trap snapping turtles from ponds where fish and ducks are to be raised.

When we measure the food value of the turtles themselves, they are perhaps justified in eating some valuable animals in order that they may themselves survive.

Turtles and their relatives play some part in the lore and mores of some groups of human beings. For example, the shells of turtles are used frequently by Indians in making rattles used in rituals.

I have failed to find any reference to turtles in *The Bible*, which seems strange because the animals must have been known to those who contributed to the production of the book. In Aesop's Fables, we find two stories dealing with turtles or tortoises. One, dealing with the tortoise and the eagle, preaches a moral against using an enemy for self-advancement. The other is the better-known story of the hare and the tortoise, and the celebrated race that was won by the slower animal.

*Alice in Wonderland* tells us of the Mock Turtle that is used in mock turtle soup, but does so in a frivolous manner. The turtle that danced on the shore also comes from the story of the adventures of Alice.

Shakespeare, in *Romeo and Juliet*, uses a turtle shell hung on a wall in an apothecary shop to give an appropriate atmosphere. In other literature, turtles are associated with virtuous women who carry their houses on their heads, their "chappel" in their heart, danger in their eye, their souls in their hands, and God in all of their activities. It requires some imagination to recognize the full meaning of this pearl of wisdom. Similarly, a statue of Venus, by Phidias, shows the lady with one foot on the shell of a tortoise to signify the two great duties of virtuous women—to keep house, and to be silent. It is possible that with the passage of time this significance may have been lost, and that virtue can nowadays find expression through other media.

As for me, I prefer to read Joel Chandler Harris and his Uncle Remus stories to build up a whimsical appreciation of turtles. Better yet, I like to read about Gilbert White's turtle in his *Natural History of Selbourne*. Still better is Dallas Lore Sharp's classic experience of getting *Turtle Eggs For Agassiz*, in his essay by that name. This essay was chosen as one of the best to appear in *The Atlantic Monthly* in the first fifty years of its publication. It should be read by everyone interested in natural history, in good writing, or in Louis Agassiz. If you have not read it, take time off and do so. ❀ ❀ ❀