

CHAPTER XIV.



**The Terrarium, Aqua-terrarium, Inmates
and Maintenance**

TERRARIA AND AQUA-TERRARIA

Various forms of terraria have been devised to fulfill special purposes. These may be classed as Dry terraria for reptiles and for plants which best thrive in a dry atmosphere; Moist terraria for amphibia and for plants which require a moist atmosphere; Heated dry terraria for tropical reptiles and for plants requiring a warm, dry atmosphere; Heated moist terraria for tropical amphibia and for plants which thrive best in a warm and moist atmosphere; and the Aqua-terraria which combine many of the features of both the terrarium and aquarium. These will be treated of separately, as their respective purposes must be kept in mind in their construction, arrangement and maintenance.

DRY TERRARIA. The simplest form consists of a box with a glass front, the right hand side either a hinged frame or one fitted into grooves, and covered with cotton gauze, Brussell's netting or fine wire screening. The left hand side is also a frame covered with netting and having a central sliding door. The back is of wood covered with cork slabs; and the top a wooden frame fitted with glass, for the observation of the contents and with netting, and arranged for ready removal. The bottom is furnished with a neatly fitting zinc tray having a 3 or 4 inch raised edge to contain soil. The most approved form has a zinc or iron frame with the sides hinged to facilitate planting and cleaning. The uprights are tee irons with angle iron upper and lower frames. The sides may have either wooden or angle iron frames to fasten into the uprights by turn-buckles or other simple device. The top may be made with slanting sides either as a mansard or gable roof. A shallow water basin for the inmates must also be provided either of metal or made in cement of irregular outline with a mirror to form the bottom of the pool.

MOIST TERRARIA. The construction of the moist terraria may be similar to the above, but control of the ventilation must be kept in mind so as to maintain a moist atmosphere necessary to the animals and plants. The approved form consists of either a wooden or metal-framed box, two or three of the sides of which are of glass in grooved or hinged frames, and one of glass with a netting ventilator below, provided with a sliding door. The top may be of netting, over which a glass plate is arranged to be raised or lowered as required for ventilation. The zinc tray should have a small outlet pipe through the sides of the terrarium to permit of drainage of the excess of water. As the animals in this form of terrarium are usually amphibious a larger water basin is required.

HEATED DRY TERRARIA. The same arrangement as the above may be used, but heating appliances must be provided. For this purpose a second or false bottom should be constructed about 3 inches above the bottom of the terrarium on which the planting tray may rest. Wood is best for this false bottom as it is a better insulator and will allow of a more even distribution of the heat than metal surfaces. The space between the two bottoms may be arranged as a drawer lined with sheet iron for heated sand, or fitted with a flat zinc flask for hot water, the latter being preferable. The flask may also be permanently inserted, in which case an outer tube should be soldered into the planting tray through which the tube communicating with the flask may be brought above the surface of the soil in the tray, that the cooled water may be removed with a siphon and hot water introduced with a hose; or a tube let through the side closed with a pet-cock. This need be done but once or twice a day. The water basin for the inhabitants is usually arranged in one corner.

HEATED MOIST TERRARIA. These are similar to the heated dry terraria in construction, but contain a larger and deeper basin for the amphibious animals; and should be arranged to permit of control of the ventilation to maintain a heated moist atmosphere. The water basin is usually constructed to occupy one side or a corner and has one of its sides at an angle to permit of a shallow approach to the water.

With all forms of terraria the main consideration must be the reproduction, as nearly as possible, of the natural conditions and surroundings of the animals and of the plants, and the establishment of good and ample ventilation.

PLANTING THE TERRARIA. The plantings should be directly into the trays and in flower pots. A lower drainage layer of large pebbles and a thin leveling layer of fine grit should be first put into the trays. For the Dry terraria these should be covered with rich garden soil, of which the lower layer has been mixed with fertilizer; and for the Moist terraria with clean lawn turf to which a little fertilizer has been added. Upon the pebble foundation a background or central mound of rocks may be constructed, to form caves and hollows in which the animals may secrete themselves, and pockets in which to set plants; or the rocks may be arranged to screen the receptacles of potted plants. In arrangement and planting the natural home of reptiles should be simulated and the Dry terraria arranged to resemble sunny, arid and rocky localities, and in the Moist terraria miniature woodland landscapes natural to amphibious animals. The former should also not have too considerable vegetation, with spots devoid of soil and covered with fine gravel and a few scattered stones, while the

latter should have an ample growth of small vegetation, sod, moss, lichens and ferns, and an abundance of larger foliage and flowering plants.

In the Dry terrarium the water basin may be treated as incidental, but in the Moist terrarium it should be one of the principal features. The best form has three vertical sides covered with a thin coating of hydraulic cement into which small pieces of stone, pomice, tuftstone, etc., have been pressed to resemble rough stone walls, and one partly sloping side to permit of a gradual approach to the water level, in the foreground, arranged to resemble a pebbly beach. The water may be siphoned out or a drainage pipe led through the side. In large terraria the water tank is often utilized for semi-aquatic plants in concealed pots.

In terraria miniature bridges, castles, fountains, cascades and other landscape features are introduced with pleasing effect. Backgrounds are made of rocks cemented at different levels to the back of the terraria and in the pockets so formed ferns and other plants are grown. Pomice is well adapted to this use, its pores absorbing large quantities of water. The general appearance will be improved if the raised sides of the soil tray are concealed by painting the glass to that level.

Reptiles require heat and strong sunlight, as they delight to sun themselves for hours; but amphibious animals generally should be sheltered from strong light, as it is objectionable to them, and a temperature of about 75° to 80° F. by daylight and not below 55° F. at night is best suited for the indigenous forms; but for tropical species temperatures from 15 to 20 degrees higher are required.

PLANTS FOR TERRARIA. For the Dry terrarium cacti, aloes and agaves are best suited for direct planting in the soil, and houseleeks for the pots; also hardy ferns and a number of other plants which will thrive in pots in a dry atmosphere. For the Moist terrarium a much larger number of plants are available and almost all that thrive in the greenhouse may be successfully introduced. The plants should be frequently sprayed with water. For this purpose either a small sprinkling can or a florist's aspirator is best.

ANIMALS FOR TERRARIA. Almost any of the lower forms of small land animals may be introduced. For the Dry terrarium, butterflies, beetles and other insects, land snails, slugs, hop toads, tree toads, horned toads, lizards, snakes and small tortoises; and for the Moist terrarium aquatic insects, snails, tadpoles, frogs, newts, salamanders, water snakes and turtles. Most interesting collections can be made of animals which live in harmony with each other and such added which will serve them as food.

TERRARIA AND AQUA-TERRARIA

AQUA-TERRARIA. These receptacles combine the aquarium and the terrarium, their purpose being the growing of aquatic and semi-aquatic plants and the maintenance of aquatic and amphibious animals in surroundings nearest to those of their natural habitats, that the adults as well as the larvæ and young may be kept for observation and study. The



FIG. 238. Swamp Aquarium.

effect produced is far more handsome than that of the aquarium alone, and when the aqua-terrarium is of large size, it permits of most beautiful and interesting arrangement, as may be seen by the illustration at the end of this volume. The upper part is arranged to set upon the lower aquarium, and of this latter the two sides and a part of the back are built

of or screened with slate to conceal the back of the rockwork and earth in which the plants are grown.

Another form consists of a shallow open tank or aquarium having a layer of soil covered with pebbles arranged to slope from a depth of 2 inches to within a half inch of the surface, screened by paint on the glass to just above the soil level so that only the clean surface of pebbles is exposed. In these varying depths of water a great variety of aquatic and semi-aquatic plants may be grown, sagittaria, ludwigia, fontinalis, anacharis and cabomba to grow submerged; parrot's feather, water-hyacinth, salvinia, triana and frog-bit on the surface, and semi-aquatic plants to grow one to four feet above the surface.

Fig. 238 gives a good idea of the beauty and the arrangement of a receptacle of this kind, the plants shown being Maidenhair, *Scirpus gracilis*, in the pot, Water-hyacinth and Parrot's feather on the surface and Chinese and Montevidean Arrowheads and Umbrella plants growing above the surface. This receptacle offers opportunities for tasteful and artistic arrangement of plants and for keeping the lower forms of animal life, and is usually installed in conservatories and greenhouses.

Under proper conditions any of the following animals can be kept in Terraria and Aqua-terraria.

BATRACHIA. Frogs and Toads belong to the order Salientia or tail-less Leapers, the Ranidæ or frogs, the Bufonidæ or toads and the Hylidæ or tree toads. All are closely related, differing only in structural features and habit. They have bony skeletons with projections on each side of the vertebræ but no ribs, respiration being made by the throat and consists of a continuous gulping to force air to the lungs. Almost the entire cranium is taken up by the orbits, the brain cavity being very small. The hind-legs are long and have webbed toes, the fore-legs are short and the toes are without webs. In repose they sit nearly upright, a position admitting of instant movement which consists of long leaps, short jumps and a crawling movement. They are oviparous and deposit spawn in the spring and early summer months, which is fertilized by the male as it is extruded by the female, the size of the ova being 1.75 to 2.6 millimeters, varying with the different species. The frog spawn receives a coating of albuminous substance as it passes down the oviduct, which rapidly swells when the eggs enter the water and forms clusters of gelatinous globules enclosing the eggs, also keeping them well apart and serving as a protection. The spawn of the toad is enclosed in long strings or ropes of the gelatinous substance, usually attached to aquatic plants. The eggs develop as soon as fertilized, appearing as partly white and black spheres, but as the embryo develops the entire egg enlarges, become black and

assumes either an ovoid or a lozenge form. Dependent upon the temperature of the water and the different species, the period of incubation may be from 6 to 30 days. When the tadpole wriggles out of the gelatinous cover, which serves as its first food consumed by absorption, the mouth and anus soon become functionary, the alimentary canal elongates, and the tadpole begins to feed on macerated vegetal and animal matter. At first respiration takes place by external gills, but these are soon replaced by internal structures covered by operculæ. The rapidity of development depends upon natural conditions and in the different species may be in 3 months to 2 years. The first indication of the metamorphosis is in the development of the hind legs, then the fore-legs develop under the gill membranes, and finally the tail is absorbed, at which period the gills are replaced by lungs and the young frog or toad becomes amphibious. The food is no longer organic matter but living organisms, and its usefulness as an aquarium scavenger ceases.

Tadpoles of the toad may be distinguished from those of the frog by their blacker color, the latter being preferable in the aquarium, as they are better scavengers and remain longer in the tadpole stage.

FROGS. These have long and tapering tongues fastened to the front of the mouth, free behind, and the tip pointing down the throat. Their prey is taken by its quick protrusion, and the adhesion to its viscid covering. Maturity is reached by the toad in one season, but with some of the frogs it is delayed for 2 or 3 years; while tadpoles in aquaria sometimes never undergo the final metamorphosis, probably due to the enforced aquatic conditions. In the United States there are 13 recognized species and 6 sub-species of frogs; those most generally distributed being the Spring or Leopard Frog, the Green Frog, the Common Bullfrog, the Western Frog and the Western Bullfrog.

Rana virescens, (Shaw), the Spring or Leopard Frog, is found from the Atlantic Coast to the Sierra Nevada Mountains and from Lake Athabasca to Central America, but is most abundant in the Eastern States. It grows to a length of $3\frac{1}{2}$ inches, exclusive of the legs; has a rather pointed snout, and the tympanum of the male is nearly as large as the eye. The color is bright green marked with olive, with dark-brown and black blotches in two irregular rows on the back, and one or more indefinite rows on the sides. The yellow glandular fold, which is a distinguishing characteristic in the different species, reaches from the orbit to the posterior end of the body. This frog passes through the tadpole stages in one season and its cry may be defined by the syllables *cluck cluck*; *cluck cluck* in guttural tones.

Rana clamatans, (Shaw), the Green Frog, is distributed throughout the Eastern and Central States and a part of Canada. The head is rounder than the above, the body and limbs shorter and more massive, the tympanum of the male larger than the eye and smaller in the female. The glandular fold runs from the eye to the hip with a shorter one to the shoulders. The color is dark-olive on the back, brilliant green on the head and shoulders, and usually white or greenish-white below with citron-yellow throat. At some seasons it may be greenish-brown on the back and the sides marked with brown spots. It is aquatic in its habit and emits a shrill cry when disturbed, the usual note being a nasal *chung*, and its call is *chock, chock chock*.

Rana catesbeana, (Shaw), the Common Bullfrog, is distributed over the entire country east of the Rocky Mountains and is the largest of the North American frogs, often reaching a body length of 8 inches. It has a broad head, bulky body and thick legs. A fold of the skin extends from the eye to the tympanum around the forearm socket to the breast. The tympanum of the male is larger than the eye. The complete webbing of the fourth toe and the absence of the dorsal or back fold are other distinguishing characteristics of this species. Its cry is the deep guttural oft-repeated croak, *wuūm, wuūm, wuūm, wuūm*.

Rana pretiosa (Cope), the Western Frog, and the Western Bullfrog, *Rana aurora*, are not found in the Eastern States, the distribution of the former being from Montana west to Puget Sound and south to Lower California. Its head is obtuse, rounded and broader than long, the body stout, the eyes smaller than the Eastern Frogs, and the indistinctly outlined tympanum often smaller than the eye. A depressed ridge extends from the eye to the flank; and the color is yellowish-brown above, darker on the side, circular brown blotches on the back, and transverse markings on the legs. The Western Bullfrog is distributed on the Western Coast regions of the United States. Its head is broad, acute and rounded anteriorly, the body depressed and elongated, the eye moderately large, and the tympanum smaller than the eye. The glandular fold reaches from the eye to the hind leg. The color is greenish-yellow with golden reflections spotted with black, and the sides and abdomen reddish-brown. The under side is dull, spotted greenish-yellow.

The sexes of the frogs may be determined by the size of the tympanum, that of the female being the smaller.

TOADS. There are several varieties of the common or hop-toad which will not be mentioned here. Toads are terrestrial in habit, of dull, inconspicuous color and usually considered of uncouth repulsive form.



FIG. 239

10,000 insects and worms in a single summer. The illustration of the metamorphosis of the common American Hoptoad, *Bufo lentiginosus*, (Shaw), Fig. 239, is taken from the Nature Study leaflets of the Cornell University College of Agriculture and shows the life history of the toad and the devastation wrought by its enemies, as of probably 1000 eggs and tadpoles but one or two toads survive to the adult stage.

The toad is common to almost all parts of the United States. It rapidly passes through all the stages of development from tadpole to maturity, and its usefulness to the agriculturist should afford it better protection. A rarer form, the Burrowing Toad or Spade Foot, *Sacphiopus holbrooki* (Har.) is a smaller extremely noisy toad, which burrows in the ground.

In the aquarium toad tadpoles are less beneficial than those of the frog as their change to the adult form is briefer.

TREE TOADS. The most generally distributed tree toads and tree frogs are the Common Tree Toad or Tree Squeak, *Hyla versicolor* (Le Conte), inhabiting the Eastern part of the United States, and having a body length of 2 inches; the smaller Pickering's Tree Frog, *Hyla pickeringii* (Hol.) about 1 inch in length; the Common or Swamp Tree Frog, *Chorophilis nigritus* (Le Conte); the Savannah Cricket Frog, *Acris gryllus* (Hol.), the Green Tree Frog, *Hyla arborea* (Hol.); and the Changeable or Chameleon Tree Frog, *Hyla chameleonis*, (Hol.), which possesses the capacity of changing its tints to such extent that its color cannot be definitely described.

They exhude pungent acrid secretions as a method of defense. They are extremely useful creatures devouring all kinds of insect vermin, snails and worms, their food being every creeping and flying thing small enough to swallow. One observer notes that a single toad ate 24 caterpillars in 10 minutes and another 35 celery worms in three hours, and estimated that a good sized toad will destroy

Tree toads are most interesting pets. They are so sensitive to atmospheric changes that they serve as barometers, and are kept in aquaria furnished with a small ladder which they either ascend or return to the water according to the atmospheric conditions.

URODELA. Salamanders and Newts belong to the order of Urodela, cold-blooded animals having a naked body, teeth in both jaws, four limbs, a tail persistent through life, and no external gills in the adult. In the larval form all are aquatic and some retain an aquatic or semi-aquatic existence through life. The common Eastern and Middle States species are:

Amblystoma punctatum (Linn.), or Spotted Salamander, a common form, has a moderate-sized head with rounded, blunt snout; broad, depressed and full body, and thick, rather long tail. The skin is punctured with small pores, and clusters of larger ones are on the head. The back is marked with a strong dorsal groove, and the legs have short digits and nails. The color is black above with a series of round yellow spots on each side of the back, head and tail, and the under side is greyish-black. Length 6 inches. Common from Nova Scotia to Nebraska and south. Frequents shady localities near water.

Plethodon cinereus (Green,) or Ashy Salamander, a small form, has a short head and rather pointed snout, very slender body and cylindrical acuminate tail. The fore-legs are short with four digits, and the hind-legs longer with five digits. The colors are reddish-brown on the head, the body plumbeous, lead- or ash-colored, with usually a broad brownish-red dorsal stripe, the limbs yellowish-grey above, and the entire lower surface dusky-white. Length $3\frac{1}{2}$ inches. It is active and may be found under logs, etc., ranging over the entire Eastern United States. It is nocturnal in habit.

Spelerpes bilineatus (Green), or Striped Salamander, another small form, has a small head, with somewhat rounded snout, cylindrical body, and long cylindrical tail, thick at the base and tapering to a point. The upper surface is brownish-yellow with a dark line on each side of the back, and the lower surface bright yellow with a faint brown dotted marking. Length 3 inches. Found from Maine to Florida. It is a land form inhabiting damp places in concealment under rocks, decayed wood, moss, lichens, etc.

Spelerpes ruber (Daud.), or Red Salamander, has a rather large wide head, rounded snout, short limbs, small digits, and a rather short tail, thick at its base and bluntly pointed. The colors of the entire upper surface are vermilion-red with numerous crowded faint dark spots; and the lower side salmon-pink. Length 5 inches. A land form, common from Maine to Nebraska and South.

Desmognathus fusca (Raf.) or Common Triton, Water Salamander, has a rather large head, obtuse and rounded snout, rather long cylindrical body, moderately long compressed and keeled tail. The limbs are rather short with small digits. The colors are brown above, sometimes black, with faint grey or purplish spots or shades, which become darker with age. The lower side is marbled in dull greys and blackish tints. Length 4 inches. A very common and active form in springs and cold water streams. Other species, are *D. nigra*, (Green,) having a stouter body and is uniformly black in color, length 6 inches, found in mountain streams and springs from Pennsylvania to Illinois and south, and *D. ochrophaea* (Cope,) brownish-yellow, 3 inches long and may sometimes be found under the moss on the banks of mountain streams and other cold water.

Diemictylus viridescens (Raf.) or Common Newt, Evet, Eft, has a short and broad head, rather slender body, slender delicate limbs, and a long, compressed tail. Three large pores are located behind the eye. The colors of the upper surface of the adult are olive-green, sometimes reddish of varying shades, with a number of scarlet spots on the sides, and the lower side yellow with small blackish spots. Length 3½ inches. Abundant over the entire eastern section of the United States in ponds and streams.

Diemictylus viridescens, (var. *miniatus*) (Raf.) or Red Eft, is similar to the above, but of bright vermilion red, with a rougher skin. The larvæ of both species are similar in appearance and markings, and the difference in color of the adult may be largely due to its life out of the water. Found in the same localities but away from water under moss and stones.

The two forms of salamander-like animals found in the eastern section of the United States are:

Necturus maculosus (Raf.), or Mud Puppy, another of the Batrachia, has a large flattened head with abrupt truncated snout, large bushy bright-red gills forming three tufts on each side of the head; very short, weak limbs, and a depressed and keeled tail. The colors are brownish or ashy-grey with scattered darker spots, and the lower surface dusky-white. Found over the eastern range of States, most numerous north and west of the Alleghanies and the Great Lakes. It is sluggish in movement and usually inhabits the greater depths, or is concealed in the mud and silt.

Cryptobranchs alleganiensis (Daud.), or Hellbender, has a large broad and flat head, with a short rounded snout, short neck, and a thick sub-cylindrical body with thick folds of skin on the sides. The limbs are short and weak, having short digits without nails. The tail is keeled and very much compressed. The colors above are blackish, with darker indistinct markings, and paler below. Reaches a length of 18 inches.

Found in warmer streams and lakes on the western border of the Middle States, the Ohio Valley, and South. A repulsive-looking but harmless large salamander, which during life retains many of the larval characteristics.

SQUAMATA. Lizards and Snakes belong to the order Squamata, cold-blooded animals with the body covered with imbricated scales, the vent a cross slit. There are many other individual anatomical differences which mark them as distinct from the Urodela and Reptilia.

LACERTILIA. The Lizards have no carapace, the body is covered with overlapping scales. There are four limbs, the feet generally have five digits, and the tail is usually long and brittle. The Eastern and Middle States have but few species, which will be described; but some of the common Southern and Western forms are to be had of dealers, and will also be briefly mentioned.

Eumeces fasciatus (Linn.), or Blue-tailed Lizard, has a short, broad head with pointed snout, an elongated cylindrical body covered with scales. The cylindrical tail is very long, covered above with small scales and below with a central row of larger plates. The fore-legs are short and the hind legs longer, both covered with scales and having long delicate digits with very long curved nails. The colors of the head and body above are bluish-black with five longitudinal yellow lines on the back, and yellow veinings on the head. The lower surface is white, except the tail, which is rich ultra-marine blue above and a little paler below. Length 8 to 11 inches. Found throughout the eastern section of the United States, from the Rocky Mountains to the coast; in shady places and under the bark of decaying trees. Its food is principally insectivorous.

Sceloporus undulatus (Daud.), or Pine Tree Lizard, Swift, Fence Lizard, has a short, sub-triangular, rounded head with obtusely pointed snout, a short body, fuller than the foregoing, and the long tail cylindrical and tapering to a fine point. The legs are moderately long, and the digits delicate, furnished with long curved nails. The colors of the head and neck above are dark dusky-brown with black, the back mottled brownish-grey, with 5 or 6 transverse black bands having white borders, and similar markings are on the limbs and tail. The throat and lower surface of the limbs and tail are silvery-grey, marked with small and large black bands. On each side of the abdomen is a bright green stripe surrounded with black, but in the females and the young the green is usually absent. Length 7 inches. Very common in forests, and along fences in the Eastern and Middle States.

Eumeces anthracinus (Baird), or Black-lined Lizard, is a rarer eastern species found from Pennsylvania to Texas. The colors are bronze with

four yellow stripes, and between and below these are the coal-black lines for which the name anthracite has been applied. Length 6 to 8 inches.

Other Lizards sometimes offered by Eastern dealers are *Anolis principalis* (Linn.), the Green Lizard or Chamaeleon, and *Leiolopisma laterale* (Say), the Ground Lizard, both southern forms, 5 inches long; *Phrynosoma cornutus* (Gir.), the Common Horned Toad of the southwest, 5 inches long; and *Ophisaurus ventralis* (Linn.), the so-called Glass Snake, or Joint Snake which reaches a length of 25 inches, also a southern form.

OPHIDIA. The Serpents have elongated bodies, obsolete limbs, imbricated scales, bones of both jaws movable, no eyelids, forked tongues, and other anatomical characteristics, which separate them from other Vertebrates, except the snakelike lizard *Ophisaurus*, above mentioned. The common species of the Eastern and Middle States are:

Carphophiops amœnus (Say), or Ground Snake, has a small flat head, broad snout, robust body for the size of the animal, rounded above, flattened below, and covered with small, sub-hexagonal scales above and larger plates below. The colors of the upper surface are light, glossy chestnut-brown, lower surface salmon-red. Length 12 inches. Common from Massachusetts to Illinois south, mostly found under rocks and the bark of old trees, feeding on insects.

Storeria occipitomaculata (Stor.), or Red-bellied Snake, has a rather large narrow head and pointed snout; rather stout elongated body covered above with carinated hexagonal scales and broad plates below. The colors of the upper surface are greyish- or chestnut-brown with paler ventral bands, bordered with black dots, also obscure dots on the sides and back of the head, with three pale blotches. The lower surface is bright salmon-red. Length 12 inches. Found from Massachusetts to Minnesota, south to Georgia, and very abundant in the Middle States.

Storeria dekayi (Hol.), or De Kay's Snake, is another form very similar to the foregoing. The colors are greyish-brown with a clay colored dorsal band, bordered with dotted lines, and a dark patch on each side of the occiput. The lower surface is greyish-white. Found in the same localities as the above, abundant in the Eastern section to the Rocky Mountains and south.

Thamnophis sauritus (Linn.), or Riband snake, Swift Garter, has a long ovoid head with a prolonged snout rounded at the apex; long and slender body covered with rather long carinate scales, notched behind, and moderately large plates below. The tail is very long, thin, and terminates on a point. The colors above are light olive-brown or chocolate, with three yellow stripes, and light brown or milky-white below with a

greenish tinge. Length 36 inches. Found about streams in the entire Eastern section, most abundant east of the Alleghanies.

Thamnophis sirtalis (Linn.), or Common Garter Snake, Striped Snake, is very similar to the foregoing. The colors are olivaceous with a narrow yellow dorsal stripe, three series of small dark spots on each side, and a paler stripe on the lower side. The under surface is pale straw-color with a greenish tinge. The most generally distributed snake, common to almost entire North America, in high grass and shady places.

Natrix sipedon (Linn.), or Common Water Snake, False-Moccasin, has a large sub-oval flattened head with rounded snout; long robust body covered above with small sub-hexagonal strongly carinate scales, and broad plates on the lower side. The tail is large and triangular in form. The colors are dusky-brown with bands of dull-yellow, bordered with dark brown or black; and dirty-white or pale reddish-brown on the lower surface; somewhat variable in color. Length 30 to 50 inches. Found abundantly about streams, feeding on frogs and fishes. Ranging from New England to Kansas and south. It is ill tempered but harmless. This snake should not be confused with the Water Moccasin or Black Moccasin, a southern and western form, *Agkistrodon piscivorous* (Hol.) which is also aquatic, often resting on bushes overhanging streams and is the most dangerous and treacherous of the United States snakes.

Ophedrys aestivus (Linn.), or Green Snake, has an elongated narrow conical head, a long and slender body, with carinate scales above, rather narrow plates below, and a very long and slender tail. The color above is a bright clear golden-green and clear yellowish-white on the under surface. Length 30 inches. This beautiful, harmless and gentle snake feeds upon insects, inhabits trees, and is often found on bushes over the water. Common from southern New Jersey to Indiana and south.

Liopeltis vernalis (De Kay) or Grass Snake, is similar to the foregoing but smaller. Its color is a uniformly darker grass-green above, and less yellow, nearer to the white, below. Length 20 inches. It is harmless and is found in high grass and meadows, living on grasshoppers and crickets, and occurs in the Eastern and Middle States north of the Carolinas.

Bascanion constrictor (Linn.), or Black Snake, Blue Racer, has an elongated oval head with rather pointed prolonged snout; a long and slender body covered with smooth, large hexagonal scales above and broad plates below. The whole upper surface is lustrous pitch-or blue-black, with the throat white, the abdomen and the lower surface of the tail greenish-or bluish slate-color. The young are olivate in color with rhomboid black blotches. Length 50 to 60 inches. It is an active snake, running and climbing with facility, hence the popular name of

“Racer”. Found in shady places or near streams and ponds, sometimes basking in the sun. Common in the Eastern and Middle States, and south. It is a harmless constrictor, living on small animals and fishes.

Pituophis melanoleucus (Daud.), or Pine Snake, Bull Snake, has a small oval head with projecting elongated snout, long and somewhat robust body covered with large hexagonal strongly carinate scales above, and very large and broad plates below. The abrupt slender tail terminates in a horny point. The color of the head is dusky-white with black mottlings, that of the back and tail milky-white, more or less clouded and covered with brown blotches margined with black, and the lower surface cream-white. There are three series of lateral blotches on the side. Length 60 inches. It feeds on small animals and is common in pine woods from New Jersey to Michigan and south.

Diadophis punctatus (Linn.), or Ring-necked Snake, has a rather small, flattened head and rounded snout, a slender body covered with evenly imbricated carinated scales above, and rather broad plates on the under surface. The tail is rather short, slender and pointed. The color of the head is greyish-black with a conspicuous yellow ring about the neck. The back and tail above are blue-black, each plate usually having a black spot on each side and sometimes a fainter median one. The lower surface is reddish-yellow, sometimes mottled with a darker color on the sides. Length 15 inches. A timid, harmless, beautiful snake, living concealed under the bark of trees, logs and stones, feeding upon insects, and found along almost the entire eastern tier of States, west to Kansas.

Lampropeltis getulus (Linn.), or Chain Snake, Thunder Snake, has a small short head rounded at the snout, a robust elongated body covered above with smooth large hexagonal scales, and large plates below. The tail is short and tapering, and ends in a horny point. This finely marked snake has a shining raven-black color with yellow lines forking on the flanks, and is marked with about twenty transverse bars, which form white blotches below, where the black color assumes a somewhat violet tone. Found in the Eastern and Middle States, from the Alleghany to the Rocky Mountains, in moist and shady places, feeding on small animals.

*Lampropeltis doliatu*s (Linn.), or Red Snake, Corn Snake, has a rather short head and rounded snout, an elongated moderately robust body covered with small smooth hexagonal scales above and broad plates below. The tail is rather short and tapering with a horny point. The upper surface is red, with about twenty pairs of black rings about smaller yellowish-white ones, and the head is red with a white band about the neck. The lower surface is dull white, marked with broad black lines and blotches. A most beautiful red, black and white snake.

broad plates below. The tail is short, slightly conical and bears a number of rattles. The color of the head above is ashy-brown or yellowish, and the body and tail yellowish-brown, overlaid with three rows of confluent irregular brown spots and cross-blotches, darker at the tail. Length 60 inches. Inhabits rocky places from New England to the Rocky Mountains and south. This is the most common once abundant species, but now nearly exterminated except in wild and uninhabited localities. Another more western form is *C. adamanteus* (Beau.), the Diamond Rattlesnake, and *Sistrurus catenatus* (Raf.), the Prairie Rattlesnake.

LORICATA. Alligators and Crocodiles belong to this order. They are cold-blooded animals, body elongated and rounded, covered with plates, scales or granulations, limbs four and tail elongated, mouth large, armed with teeth. Of this order only the Alligator is found in the United States. *Alligator mississippiensis* (Daud.), the one species of American giant reptile, is a native of southern waters, living in stagnant ponds and deep morasses. Its range at one time extended along the Atlantic border from the Neus river in North Carolina south, and west as far as New Orleans, and up the Mississippi as far as the Red river. The persecutions of the last half century have restricted it to localities difficult of access, although the very young are sometimes to be had of northern dealers.

TESTUDINATA. Turtles belong to the order Testudinata, cold-blooded animals, body enclosed between two bony shells, the *carapace* and *plastron*; neck and tail only flexible parts of the spinal column, these and the legs usually retractile within the shields; no teeth, but jaws armed with horny sheaths with cutting edges; respiration by swallowing air. There are a considerable number of Eastern and Middle States species which will be briefly described:

Terrapene carolina (Linn.), or Box Turtle, has a nearly hemispherical carapace and somewhat smaller plastron, a narrow elongated head, the upper jaw emarginate with a broad hook, and the lower jaw with a smaller one. The fore-legs short with five digits and short thick nails, the hind-legs short and flattened at the tarsus, with five digits and four nails. The tail is short and thick with blunt point. Usually the carapace is yellowish-brown with spots and stripes of bright yellow, sometimes radiating or disposed without order, to appear like tortoise-shell. Length of carapace $6\frac{1}{2}$ in., breadth $4\frac{1}{2}$ in., elevation $2\frac{3}{4}$ in., length of plastron $5\frac{1}{2}$ in. It is entirely a land animal, found generally in the New England and Middle States and south.

Gopherus polyphemus (Daud.), or Gopher Turtle, has a depressed, flattened carapace and thick plastron prolonged beyond the shell in front; a short, thick and obtuse head, serrated jaws with horny plates, short neck

and granular skin. The fore-legs are large and thick, with five digits and thick strong nails; the hind-legs are short, thick and clavate, with four digits and strong nails. The tail varies somewhat in length. The general color of the carapace is brownish-yellow clouded with dark brown, and the plastron a dirty yellow. Length of shell $14\frac{3}{4}$ in. and plastron $12\frac{1}{2}$ in. Found in the pine woods as far north as the Carolinas and lives in burrows like the Woodchuck or Ground Hog; feeding on plants, vegetable matter, worms and grubs.

Clemmys insculptus (Le Conte), or Wood Tortoise, has an oval emarginate carapace and an oblong smaller plastron. The head is large and elongated; the upper jaw emarginate in front and notched to form two cutting teeth; the lower jaw having a strong hook. The fore-legs are the larger and have five digits with short, strong and slightly curved nails, the hind-legs broad with five digits and four nails. The tail is long, thick at the base and slender at the end. The color of the carapace is brown, marked with radiating black lines and concentric striæ of yellowish color. The head and limbs are dull cinnibar-red and the plastron yellow with large black blotches at the margins. Length of carapace 8 in., breadth 5 in., elevation $2\frac{3}{4}$ in. Found throughout entire States east of Ohio, in woods and fields, sometimes in or near water. It is very restless and constantly in motion.

Clemmys muhlenbergi (Schw.), or Muhlenberg's Tortoise, has an oblong arched and slightly carinate carapace and oblong plastron. The head is short and broad with pointed snout, the jaws strong, the upper notched with a short hook and the lower with a nearly straight cutting edge. The limbs are like those of the Box Turtle, and the tail large, nearly conical, thick at the base and pointed at the end. The color of the smooth carapace is dark brown, with the plates relieved with dull yellow and pale brown, and the plastron is almost black at the margins and yellow in the middle. Its principal character is the large orange spot at each side of the head, encircling the eyes. Found in small brooks and running water of Pennsylvania and New Jersey and adjoining States.

Clemmys guttatus (Schn.), or Speckled Tortoise, has an ovoid, more or less flattened, smooth carapace and large oval plastron. The head is short, smooth and rather pointed; the upper jaw emarginate in front, and the lower jaw notched to form a rounded hook. The forelegs are short and the five digits slightly webbed with long slender nails; the hind-legs short with five digits and four nails. The tail is long and slightly compressed, tapering to a point. The color of the carapace, head and limbs is black, dotted with orange spots, and the upper surface of the tail reddish, spotted with brown. This Tortoise may be found in ponds, brooks

and rivers, where it lives on smaller animals, tadpoles, young frogs, fishes, etc., and sometimes on land, when it lives on earthworms, snails, grasshoppers, crickets, etc. It is abundant in the eastern section of the United States, and west to Indiana.

Chrysemys picta (Herm.), or Painted Turtle, Checkered Turtle, has a sub-oval, smooth, flattened carapace and broad, oblong plastron, nearly equal in length with the shell. The head is small and rounded in front with an obtuse snout. The upper jaw is entire at the sides, notched in front, and the lower jaw is slightly hooked and turned upward in front. The fore-legs are long and the five digits have short nails; the hind-legs are flattened at the tarsus with five digits and four nails. The tail is moderately long and narrow. The fine markings of the carapace are greenish-black with the plates outlined in yellow, the marginal plates lighter and marked with bright red. The plastron is bright yellow, and the head and neck above are almost black, with yellow lines, and veined below in black and yellow. Length of carapace $6\frac{1}{2}$ in., breadth $4\frac{1}{2}$ in., elevation $2\frac{1}{2}$ in. Found in ditches, ponds and rivers of almost the entire United States; one of the most common turtles, usually to be had of dealers.

Kinosternon pennsylvanicum (Bosc.), or Mud Turtle, has a slightly flattened, oval and smooth carapace, with an oval, rounded shorter plastron. The head is large, rather pointed at the snout, and the jaws very strong, both furnished with a hook on the front of the cutting edges. The neck is long and slender and the fore-legs short, rounded and covered with a warty skin, and having five digits with short nails; the hind-legs short, flattened at the tarsus, and having five digits with four nails. The tail is short, thick at the base, pointed, and horny at the end. The color of the carapace is dusky-brown and that of the plastron variable, usually of a yellowish color. The head is dark, flecked with yellowish spots. Length of carapace 4 in., breadth $2\frac{3}{4}$ in., elevation $1\frac{3}{4}$ in. Found from New York to Florida.

Aromochelys odoratus (Latr.), or Stink-pot, Musk Turtle, is very similar to the foregoing, but may be distinguished by the carapace having more distinct plates with sharper edges and traces of a keel. It has a repulsive, strong and musky odor. Length of carapace 6 in., breadth $4\frac{3}{4}$ in., elevation $1\frac{3}{4}$ to 2 in. Found abundantly in the waters of the Eastern States and west to Illinois.

Aspionectes spinifer (Le S.), or Common Soft-shelled Turtle, has a very much flattened, leathery, smooth sub-oval carapace and flat plastron. The head is large, broad and rounded behind and so much pointed in front as to form a prolonged cylindrical snout. The carapace is marked front and back with a number of raised tubercles and the plastron is larger

than the carapace. The jaws have strong cutting margins, the lower fitting within the upper. The fore-legs are somewhat long, with five digits and long nails, and the hind-legs broad with five digits and four nails. The tail is short and blunt. The color of the carapace is umber-brown with dark spots and patches, and the translucent plastron white marked with waving blood-vessels. The head and neck are striped, and the legs and digits mottled. Length of carapace 12 in., breadth $10\frac{1}{2}$ in., elevation $2\frac{3}{4}$ in., and occasionally larger. Found in the Great Lakes and Mississippi Valley and has been introduced into the Delaware River. It is voracious and feeds upon fishes and other animals.

Chelydra serpentina (Linn.), or Common Snapping Turtle, has a sub-quadrilateral, deeply emarginate and serrated carapace, and an anteriorly rounded posteriorly pointed plastron. The head is very large, broad behind, flattened above with a short pointed snout, and strong jaws with sharp cutting edges and both upper and lower hooks. The neck is long, and the legs large, with five digits and strong nails. The tail is very long, thick at the base and tapering to a pointed tip. The color of the carapace is dusky brown, the plastron yellowish-grey, and the head and limbs dark brown with black spots. Length 25 inches. Found abundantly in streams and ponds everywhere from Maine to Florida.

Malaclemmys centrata (Latr.), or Diamond-back Terrapin, Salt-marsh Turtle, has a smooth oval, almost entire carapace, sub-oval plastron, and a very large head posteriorly broad with a pointed snout. The jaws are strong, with the upper slightly emarginate and the lower curved in front with a slight hook. The neck is short and thick; the fore-legs moderately long and the hind-legs short, both having short and strong nails. The tail is short, thick at the base, pointed at the tip and has a sharp ridge. The colors of the carapace are variable, generally a dusky brown, sometimes greenish or dark olive, rarely black. The plates are usually yellowish-brown, each with concentric dark stripes and lines to form a pattern, the name being derived from these markings. Length of carapace 9 inches, plastron $8\frac{1}{4}$ inches, elevation 3 inches. Found in saltwater and salt and brackish marshes from New York to Texas; once plentifully, now almost exterminated. It is valued as food and is considered a delicacy.

Pseudemys rubriventris (Lec.), or Red-bellied Terrapin, has an elongated oval, smooth carapace, an oblong plastron, and a moderate sized head, enlarged posteriorly with a slightly pointed snout. The jaws are strong, with the upper cutting edge so deeply emarginated as to appear to have two teeth, the lower serrated at the sides with three emarginated processes like teeth in front, the central a hook. The fore-legs are rather long, the hind-legs shorter, both having strong digits with short, slightly

curved nails. The tail is short, thick at the base and suddenly pointed. The color of the carapace is dusky brown with irregular red markings on and around the plates, the plastron red, clouded with a dusky shade. The head and neck are dark brown above with obscured red lines, and the legs and tail dusky brown and black, also marked with red. Length of carapace 11 in., breadth 7 in., elevation $4\frac{3}{4}$ in. Found in brackish and fresh-water from New Jersey to Virginia. Under the name of "Slider," it is largely used as a substitute for the Diamond-back Terrapin. Another form of the same genus, *P. troosti* (Hol.), or Yellow-bellied Terrapin, of the Mississippi Valley, does not occur in the Eastern or Middle States, but may be sometimes found in the markets, as it is also used as food.

Sea Turtles. These Turtles are all of very large size and are occasionally taken in the more northern latitudes, coming in the Gulf Stream from the South. They are *Dermochelys coriacea* (Vand.) or Leather-Turtle, one of the largest Sea Turtles, reaching a length of 6 to 8 feet and a weight of 1200 pounds; *Thalassochelys caretta* (Linn.), or Logger-head Turtle, 3 to 6 feet in length and weighing 350 to 450 pounds; *Eretmochelys imbricata* (Linn.), or Hawks-bill Turtle, the carapace of which is the valued turtle-shell of commerce; and *Chelonia mydas* (Linn.), or Green Turtle, valued as food, with a carapace of 3 to 4 feet and a weight of 850 pounds. These may occasionally be seen in the larger public aquaria.

FEEDING IN THE TERRARIUM. A variety of food is necessary for the requirements of reptiles and amphibia. Frogs, Toads and Tree Toads require insects, worms, grubs, particles of meat and fish; Salamanders and Newts, snails, minced mussels or oysters, meat, fish and fish eggs; Lizards and Snakes, insects, worms, grubs and small live animals; Alligators and Snapping Turtles, tadpoles, crayfish, minnows, other small animals, and worms and grubs, and when these cannot be obtained, minced fish, oysters, meat, etc.; and Land Turtles should also receive snails, mussels, insects and garden vegetables, lettuce, celery, tomato, berries and mushrooms.

Feeding should be carefully done and anything not eaten should be removed before it decays.