





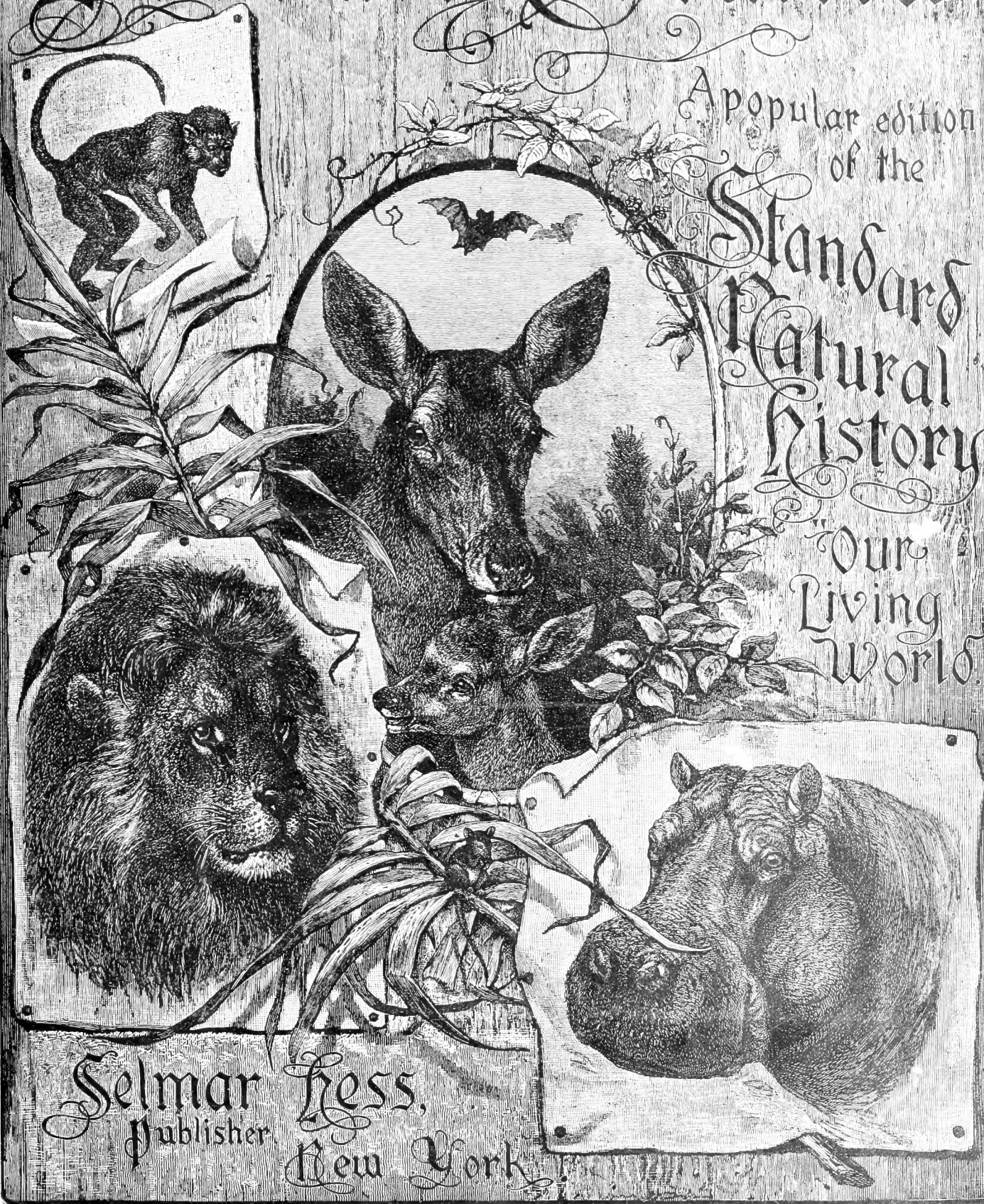
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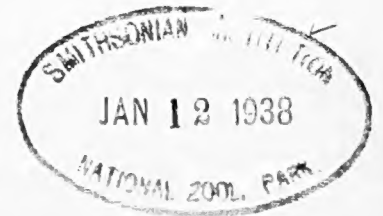
POPULAR EDITION OF

“OUR LIVING WORLD.”

A NATURAL HISTORY

BY

THE REV. J. G. WOOD.



REVISED AND ADAPTED TO

AMERICAN ZOOLOGY,

BY

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FULLY ILLUSTRATED WITH SCIENTIFIC ACCURACY.

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PREFATORY NOTE.



THE Reptilia and Batrachia form the subjects of this volume. The published Reports of the United States Commission of Fish and Fisheries, and the various Bulletins and Papers of the National Museum and Smithsonian Institution, have been of equal importance in affording the most recent facts and views touching American Zoology.

For the use of the contents of these works we acknowledge the courtesy of the Secretary of the Smithsonian Institution.

The Fishes and Invertebrates are catalogued and described very fully in the above-mentioned publications, all of which are accessible to students or those desiring further technical knowledge, but their contents are too voluminous to be fairly utilized in this volume.

J. B. H.

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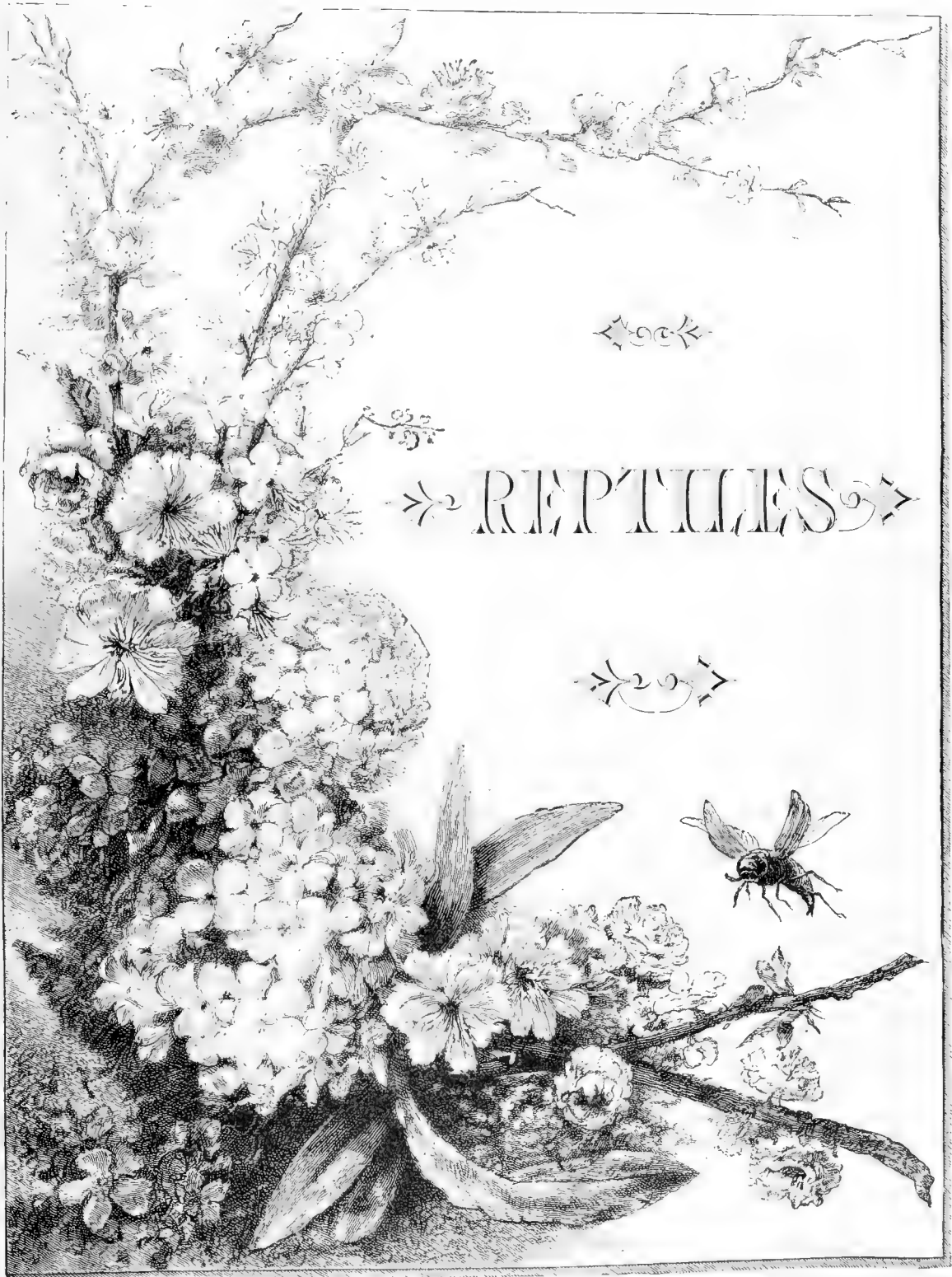
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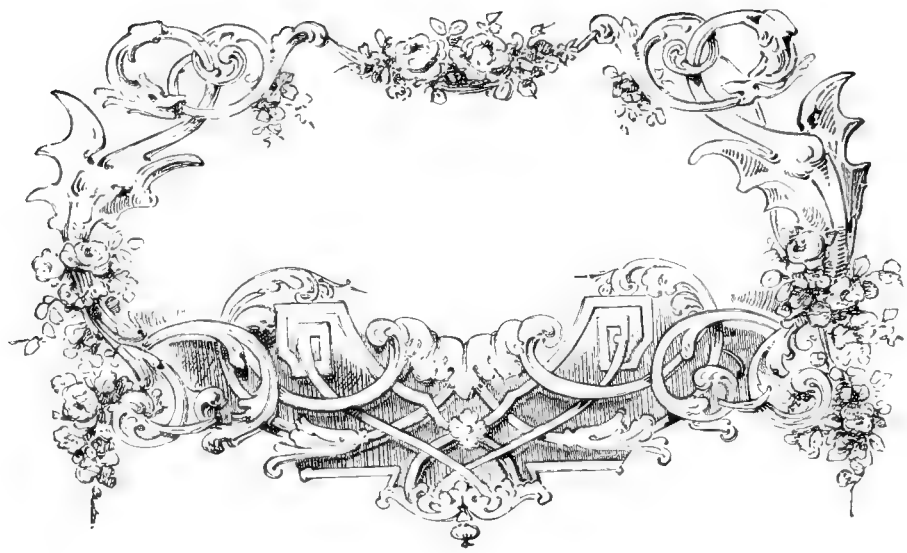
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REPTILES



OUR LIVING WORLD.

REPTILES.



THE remarkable beings which are classed together under the general title of REPTILES, or creeping animals, are spread over those portions of the globe where the climate is tolerably warm, and are found in the greatest profusion under the hotter latitudes. Impatient of cold, though capable of sustaining a temperature of such freezing chilliness that any of the higher animals would perish under its severity, and for the most part being lovers of wet and swampy situations, the Reptiles swarm within the regions near the equator, and in the rivers or vast morasses of the tropical countries the very soil appears to teem with their strange and varied forms. Indeed, the number of Reptiles to be found in any country is roughly indicated by the parallels of latitude, the lands near the equator being the most prolific in these creatures, and containing fewer as they recede towards the poles.

Some Reptiles inhabit the dry and burning deserts; but the generality of these creatures are semi-aquatic in their habits, are fitted by their structure for progression on land or in water, and are able to pass a considerable time below the surface without requiring to breathe.

This capacity is mostly the result of the manner in which the circulation and aeration of their blood is effected.

As has been shown in the two volumes on Mammalia and Birds, the heart in these animals is divided into a double set of compartments, technically termed auricles and ventricles, each set having no direct communication with the other. In the Reptiles, however, this structure is considerably modified, the arterial and venous blood finding a communication either within or just outside the two ventricles, so that the blood is never so perfectly aerated as in the higher animals. The blood is consequently much colder than in the creatures where the oxygen obtains a freer access to its particles.

In consequence of this organization the whole character of the Reptiles is widely different from that of the higher animals. Dull sluggishness seems to be the general character of a Reptile, for though there are some species which whisk about with lightning speed, and others, especially the larger lizards, can be lashed into a state of terrific frenzy by love, rage, or hunger, their ordinary movements are inert, their gestures express no feeling, and their eyes, though bright, are stony, cold, and passionless. Their mode of feeding accords with the general habits of their bodies, and the process of digestion is peculiarly slow.

Most of the Reptiles possess four legs, but are not supported wholly upon them, their bellies reaching the ground and being dragged along by the limbs. One or two species can support themselves in the air while passing from one tree to another, much after the fashion of the flying squirrels; and in former days, when Reptiles were apparently the highest race on the surface of the earth, certain species were furnished with wing-like developments of limb and skin, and could apparently flap their way along like the bats of the present time.

Excepting some of the tortoise tribe, the Reptiles are carnivorous beings, and many of them, such as the crocodiles and alligators, are among the most terrible of rapacious creatures. In this class of animals we find the first examples of structures which transmute Nature's harmless gifts into poison, a capacity which is very common in the later orders, such as the spiders and insects, and is developed to a terrible extent in some of the very lowest beings that possess animal life, rendering them most formidable even to man.

The skeleton of a true Reptile, from which class the *Batrachians*, *i. e.* the frogs, salamanders, and their kin are excluded, for reasons which will presently be given, is composed of well-ossified bones, and is peculiarly valuable to the physiologist. It is well known to all who have studied the rudiments of anatomy, that each bone is formed from several centres, so to speak, consisting of mere cartilaginous substance at its earliest formation, and becoming gradually ossified from several spots.

In the young of the higher animals these centres are only seen during their very earliest stages, and are by degrees so fused together that all trace of them is obliterated. But in the Reptiles it is found that many of the bones either remain in their separate parts, or leave so distinct a mark at the place where they unite, that their shape and dimensions are clearly shown. In the head of the adult crocodile, for example, the frontal bone is composed of five distinct pieces, the temporal of at least five pieces, and each side of the lower jaw-bone is composed of either five or six portions united by sutures.

With the exception of the tortoises, the Reptiles mostly possess a goodly array of teeth, set in the jaw or palate, and as a general fact, being sharp and more or less curved backward. Their bodies are covered with various modifications of the structure termed the dermal, *i. e.* skin skeleton, and are furnished with scales and plates of different forms. In some cases the scales lie overlapping each other like those of the fish, in others they are modified into knobby plates, and in some, of which the tortoises afford well-known examples, they form large flat plates on the back and breast, and scales upon the feet and legs.

The young of Reptiles are produced from eggs, mostly being hatched after they have been laid, but in some cases the young escape from the eggs before they make their appearance in the world. As a general fact, however, the eggs of Reptiles are placed in some convenient spot, where they are hatched by the heat of the sun. Some species are very jealous about their eggs, keeping a strict watch over them, and several of the larger serpents have a curious fashion of laying the eggs in a heap, and then coiling themselves around them in a great hollow cone. The size of the eggs is extremely variable, for, although as a general fact those of the smaller Reptiles are large in proportion to the dimensions of the parent, those of the crocodiles and alligators are wonderfully small, not larger than those of our domestic geese, and in many cases much smaller. They are usually of a dull white color, and in some instances are without a brittle shell, their covering being of a tough leathery consistence.

In form, and often in color, the Reptiles exhibit an inexhaustible variety, and even each order displays a diversity of outward aspect unexampled in the two previous classes of Mammals and Birds. Strange, grotesque, and oftentimes most repulsive in appearance, though sometimes adorned with the brightest tints, the Reptiles excite an instinctive repugnance in the human breast; and whether it be a lizard, a snake, or a tortoise, the sudden and unsuspected contact of one of these beings will cause even the most habituated to recoil from its cold touch. This antipathy may, perhaps, have some connection with the instinctive association of cold with death; but whatever may be the cause, the feeling is deep and universal.



SHIELDED REPTILES.

TORTOISES.



THE very curious reptiles which are known by the general name of TORTOISES, are remarkable for affording the first example of a skeleton brought to the exterior of the body, a formation which is frequent enough in the lower orders, the crustaceans and insects being familiar examples thereof. In these reptiles the bones of the chest are developed into a curious kind of box, more or less perfect, which contains within itself all the muscles and the viscera, and in most cases can receive into its cavity the head, neck, and limbs; in one genus so effectually, that when the animal has withdrawn its limbs and head, it is contained in a tightly closed case without any apparent opening.

The shell of the Tortoise is divided into two portions, the upper being termed the carapace, and the lower the plastron.

The carapace is formed by a remarkable development of the vertebræ and ribs, which throw out flat processes, and are joined together by sutures like the bones of the skull. The back is therefore incapable of movement, and from the arched shape of the bones is wonderfully strong when resting on the ground. In the Tortoises these bones are united throughout their entire length, but in the Turtles the ends of the ribs retain their original width.

The plastron is similarly formed of the breast-bone, which is thought in these creatures to be developed to the greatest extent of which it is capable. It is composed of nine pieces, each being formed from one of the bony centres already mentioned. These bones are arranged in four pairs, and one in the centre of the front.

As all the limbs have to be worked from the interior of the chest, amid the vital organs and muscles for moving them, they undergo considerable modification. The shoulder-blade, for example, is a curious three-branched bone, quite unique among vertebrate animals, the portion which represents the true shoulder-blade being almost cylindrical, one of the branches flattened, and the other cylindrical, but larger than the real blade-bone. This structure admits of the attachment of powerful muscles, and gives to the fore limbs the great strength which is needed for digging, swimming, climbing, and various modes of exertion. The strong curved bones of the fore limbs bear an evident analogy to the corresponding parts in the mole, with its powerful claws and feet, and its very long blade-bone.

The horny substance commonly termed "tortoise-shell," which is spread in flattened plates on the exterior of the bony case, is thought to be a modification of the scales found on lizards, serpents, etc., and which exist on the legs and other parts of the Tortoises themselves. The row of horny pieces which are found on the edge of the carapace also belong to the "dermal skeleton."

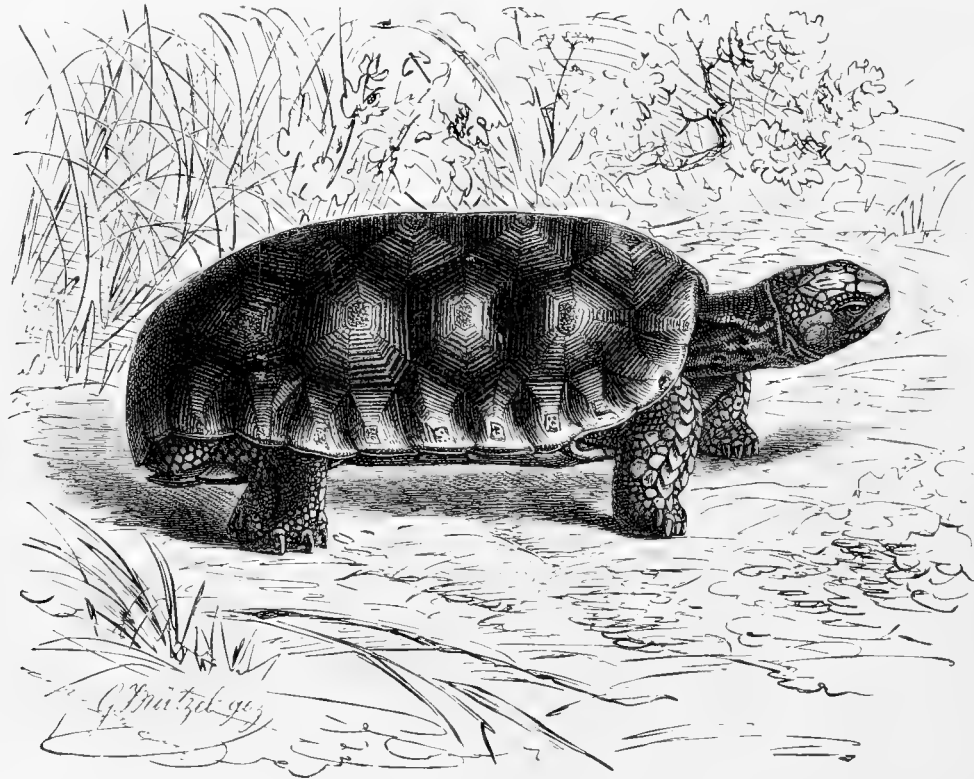
The Tortoises are quite devoid of teeth, the edge of the jaws being sharp and horny, so as to inflict a severe wound; and in many species one or both jaws are sharply hooked at the tip like a falcon's beak. The neck is always rather long, and in many species can be protruded to a considerable extent. Generally, the process of thrusting the neck from the shell is a slow one, but the withdrawal is accomplished with marvellous rapidity, on account of certain long muscles which tie the neck to the back of the carapace. Possibly these muscles, together with their tendons, would, when dried in the baking sunshine, produce musical sounds when touched, and thus give rise to the old poetical legend of the origin of the lyre.

The brain of the Tortoise is very small in proportion to the size of the animal, in the turtle weighing not quite one five-thousandth part of the whole body, and in the land Tortoise about one two-thousandth part. In man the brain is about one-fortieth the weight of the body.

The Tortoises produce their young from eggs, mostly soft and leathery in the texture of their covering, which are laid in some convenient spot, and left to be hatched by heat not derived from the parent. The circulation in the Tortoise is not very complete, but the arterial blood is redder and brighter than the venous.

IN the true TORTOISES the feet are club-shaped and the claws blunt, and the neck can be wholly withdrawn within the shell.

The first example of these creatures is the GOPHER, or MUNGOFA TORTOISE, a native of America. This is a rather pretty, though not brightly colored species, its shell being mostly



GOPHER TORTOISE. — *Testudo gopher*.

brownish-yellow, boldly and variously clouded with rich dark brown. The lower jaw is yellow, and the whole of the plastron is yellow-brown. It is found plentifully in Georgia and Alabama, but, according to Mr. Holbrook, is not seen farther north than South Carolina. When full grown it is a moderately large species, from thirteen to more than fourteen inches in length, and very convex. The following interesting account of its habits is given by Mr. Holbrook in his valuable "North American Herpetology:"—

"They select dry and sandy places, are generally found in troops, and are very abundant in pine-barren countries. They are gentle in their habits, living entirely on vegetable substances. They are fond of the sweet potato (*Convolvulus batatas*), and at times do much injury to gardens by destroying melons, as well as bulbous roots, etc., etc. In the wild state they are represented as nocturnal animals, or as seeking their food by night: when domesticated—and I have kept many of them for years—they may be seen grazing at all hours of the day.

"When first placed in confinement, they chose the lowest part of the garden, where they could most easily burrow. This spot being once overflowed by salt water in a high spring-tide, they migrated to the upper part, nearly eighty yards distant, and prepared anew their habita-

tions. They seldom wandered far from their holes, and generally spent part of the day in their burrows. They delighted in the sun in mild weather, but could not support the intense heat of our summer noons; at those hours they retreated to their holes, or sought shelter from the scorching rays of the sun under the shade of broad-leaved plants. A tanyer (*Arum esculentum*) that grew near their holes was a favorite haunt. They could not endure rain, and retreated hastily to their burrows, or to other shelter, at the coming on of a shower.

“As winter approached, they confined themselves to the immediate neighborhood of their holes, and basked in the sunshine. As the cold increased, they retired to their burrows, where they became torpid; a few warm days, however, even in winter, would again restore them to life and activity.

“The adults are remarkably strong, sustaining and moving with a weight of two hundred pounds or more. The female is generally larger than the male, with the sternum convex; the sternum of the male is concave, especially on its posterior part. The eggs are larger than those of a pigeon, round, with a hard calcareous shell; they are much esteemed as an article of food.”

PERHAPS the best known species of these creatures is the COMMON LAND TORTOISE, so frequently exposed for sale in our markets, and so favorite an inhabitant of gardens.

This appears to be the only species that inhabits Europe, and even in that continent it is by no means widely spread, being confined to those countries which border the Mediterranean.

It is one of the vegetable feeders, eating various plants, and being very fond of lettuce leaves, which it crops in a rather curious manner, biting them off sharply when fresh and crisp, but dragging them asunder when stringy, by putting the fore feet upon them, and pulling with the jaws. This Tortoise will drink milk, and does so by opening its mouth, scooping up the milk in its lower jaw, as if with a spoon, and then raising its head to let the liquid run down its throat.

One of these animals, which I kept for some time, displayed a remarkable capacity for climbing, and was very fond of mounting upon various articles of furniture, stools being its favorite resort. It revelled in warmth, and could not be kept away from the hearth-rug, especially delighting to climb upon a footstool that generally lay beside the fender. It used to clamber on the stool in a rather ingenious manner. First it got on its hind legs, rearing itself against the angle formed by the stool and fender. Then it would slowly raise one of its hind legs, hitch the claws into a hole in the fender, and raise itself very gradually, until it could fix the claws of the other hind foot into the thick carpet-work of the stool. A few such steps would bring it to the top of the stool, when it would fall down flat, crawl close to the fender, and there lie motionless. If it were taken off twenty times a day, and carried to the other end of the room, it would always be found in its favorite resort in a few minutes.

This Tortoise had a curious kind of voice, not unlike the mewling of a little kitten. The Common Tortoise is known to live to a great age.

To this genus belongs a very large species, worthy of a passing description. This is the great INDIAN TORTOISE (*Testudo Indica*), a native of the Galapagos. This species is also known scientifically by the name of *Testudo planiceps*. It is seen in the accompanying full-page illustration. Mr. Darwin writes as follows of this animal and its habits: “The Tortoise is very fond of water, drinking large quantities, and wallowing in the mud. The larger islands alone produce springs, and these are always situated toward the central parts, and at a considerable elevation. Hence broad and well-beaten paths radiate in every direction from the wells, even down to the sea-coast; and the Spaniards, by following them up, first discovered the watering-places.

“When landed at Chatham Island, I could not imagine what animal travelled so methodically along the well-beaten tracks. Near the springs it was a curious spectacle to behold many of these great monsters, one set eagerly travelling onwards with outstretched necks, and another set returning, after having drunk their fill. When the Tortoise arrives at the spring, quite regardless of any spectator, it buries its head in the water above its eyes, and greedily swallows great mouthfuls, at the rate of about ten in a minute. The inhabitants say each

animal stays three or four days in the neighborhood of the water, and then returns to the lower country.

“For some time after a visit to the springs the bladder is distended with fluid, which is said gradually to decrease in volume, and to become less pure. The inhabitants, when walking in the lower districts, and overcome with thirst, often take advantage of this circumstance by killing a Tortoise, and, if the bladder is full, drinking the contents. In one I saw killed, the fluid was quite limpid, and had only a very slightly bitter taste. The inhabitants, however, always drink first the water in the pericardium, which is described as being best.”

The flesh of these Tortoises is very good, and is largely eaten, both fresh and salted. A clear oil is also obtained from the fat. Those who catch these Tortoises do not choose to go through the trouble of cutting up and dressing an animal that is not quite fat, and, as the fitness of its condition cannot be ascertained by the ordinary process, a summary method is employed, viz., cutting a slit through the softer skin near the tail, so as to show the fat under the carapace. Should the Tortoise be in poor condition, it is allowed to go free, and, with the imperturbable temperament of the reptile race, seems to care little for the wound.

Dr. Livingstone mentions a species of Land Tortoise which is remarkable for its love of salt, and the extreme strength of the shell, which, as will be seen, baffles even the teeth of the hyena, which can crush an ox-bone with ease.

“Occasionally we lighted upon Land Tortoises, which, with their unlaidd eggs, make a very agreeable dish. We saw many of their trails leading to the salt fountains; they must have come great distances for this health-giving article. In lieu thereof, they often devour wood-ashes. The young are taken for the sake of their shells, which, when filled with sweet-smelling roots, the women hang around their persons. When taken it is used as food, and the shell converted into a rude basin to hold food or water.

“It owes its continuance neither to speed nor cunning. Its color, yellow and dark-brown, is well adapted, by its similiarity to the surrounding grass and brushwood, to render it undistinguishable; and though it makes an awkward attempt to run on the approach of man, its trust is in its bony covering, from which even the teeth of a hyena glance off foiled.

“When this long-lived creature is about to deposit her eggs, she lets herself into the ground by throwing the earth up around her shell until only the top is visible; then, covering up the eggs, she leaves them until the rains begin to fall, and the fresh herbage appears; the young ones then come out, their shells still quite soft, and unattended by their dam, begin the world for themselves. Their food is tender grass, and a plant named ‘thotona,’ and they frequently resort to heaps of ashes, and places containing efflorescence of the nitrates for the salts these contain.”

THE curious Tortoise which is known only by the comparatively scientific name of PYXIS inhabits several parts of the world, and is not uncommon in some portions of India and Madagascar.

In common with one or two other species, hereafter to be described, the Pyxis has the power of drawing its head, neck, and limbs within the shell and then shutting itself down by means of a lid, formed by the movable front of the sternum. In most of this tribe of reptiles, the sternum is hard and immovable, but in the Pyxis, it moves on a leathery kind of hinge, so as to open when the creature wishes to thrust out its head and limbs, and to close firmly when it withdraws within the shelter of its bony armor.

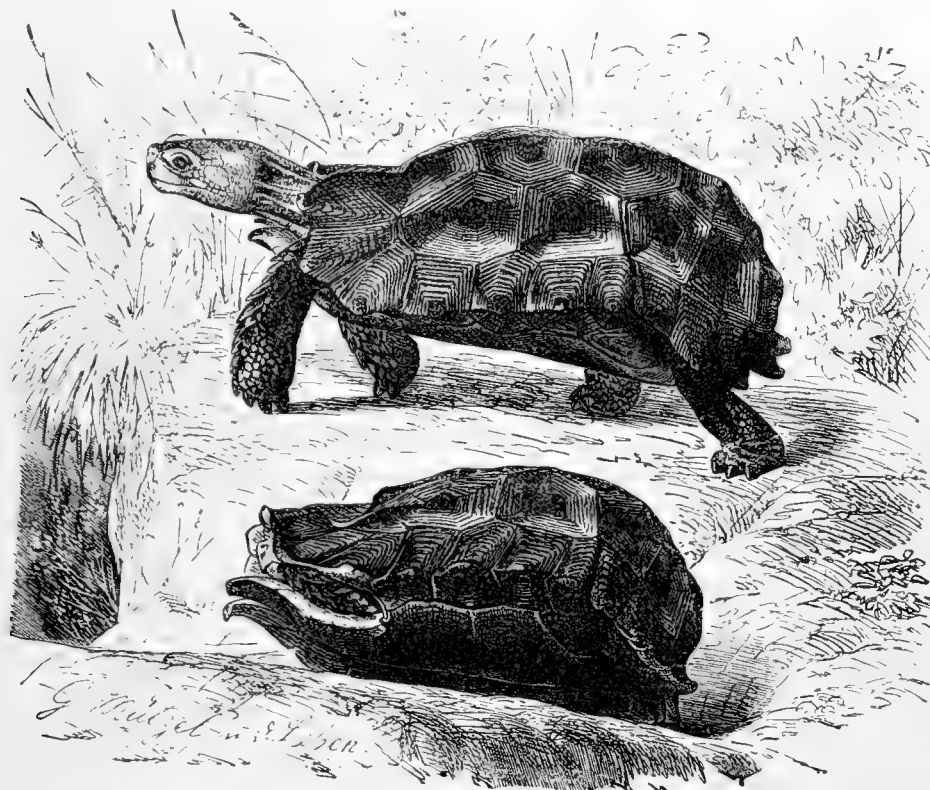
In order to permit of this total withdrawal into the shell, the carapace is oval and more convex than is usually the case, so as to afford a sufficient space for the reception of the head and limbs. These, too, are rather diminutive in proportion to the size of the animal, and so formed as to be packed into a small compass. The Tortoise employs this curious mode of guarding its vulnerable points whenever it fears danger, and is then so securely locked up in its armor-plates that it is safe from almost every enemy except man. The word Pyxis is Greek, and is very appropriately given to this species, its signification being a box.

The Pyxis is a pretty, but not a large species. The color is extremely variable, scarcely any two individuals being precisely alike, but the general colors are yellow and black. On the



INDIAN TORTOISE, OR ELEPHANT TORTOISE.

carapace the plates are marked with a number of radiating triangular spots, and on the plates which edge the shell there are lines of black. Below, the yellow generally takes a more orange tint, and is diversified with black marks round its edge.



THE PYXIS.—*Pyxis arachnoides*.

WE now come to a group of Tortoises called TERRAPINS.

These creatures are inhabitants of the water, and are mostly found in rivers. They are carnivorous in their diet, and take their food while in the water. They may be known by their flattened heads, covered with skin, sometimes hard, but often of a soft consistency, and their broad feet with the toes webbed as far as the claws.

THE LETTERED TORTOISE is, together with its companion, an American species of the large genus *Emys*, examples of which are found in various portions of the world, and of which nearly fifty species are known to zoologists. All these creatures have their heads covered with a thin but hard skin.

The Lettered Terrapin is very common in Northern America, and is found in the rivers, ponds, lakes, or even the marshy grounds, where it can obtain an abundant supply of food. It is fond of reptiles, and causes great destruction among the frogs in their earlier stages of existence. It also has a great liking for worms, and, like the green crab of our own coasts, is very apt to take the fisherman's bait, and exasperates him greatly by making him pull up nothing but a little Tortoise when he thought he had caught a fine fish. Regular anglers, therefore, bear an intense hatred to this Tortoise.

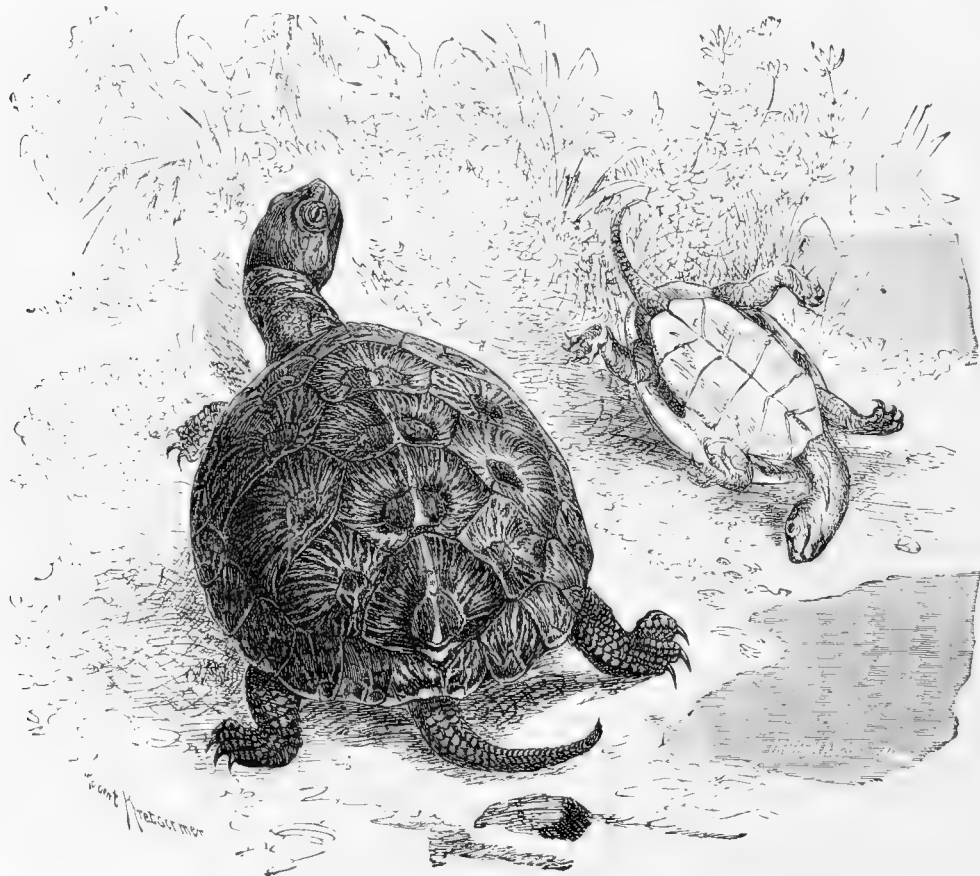
It is easily kept in captivity, and will then feed on many substances, preferring those of an animal nature, and being very fond of various reptiles. It will also eat vegetable substances, and one of these Tortoises was fond of purslain (*Portulacca oleracea*).

In color it is very pretty, though rather variable. Generally, it is dark brown above, and the edges are boldly scribbled with broad scarlet marks, something like the letters of some strange language. Below it is yellow, and the head is yellow and black

THE CHICKEN TORTOISE is also found in North America.

It is very common in the ponds, lakes, or marshy grounds, and though very plentiful, and by no means quick in its movements, is not easily caught, owing to its extreme wariness. Hundreds of these Tortoises may be seen reposing on logs, stones, or the branches of fallen trees, where they are apparently an easy prey. But they are very sensitive to the approach of an enemy, and the first that perceives the coming danger tumbles off its perch and falls into the water with a great splash that arouses the fears of all its companions, which go tumbling and splashing into the water in all directions, and in a few seconds not a Tortoise is to be seen where they were so plentiful before they took alarm.

The Chicken Tortoise swims well, but not rapidly, and as it passes along with its head and neck elevated above the surface, it looks so like the dark water-snake of the same country, that at a little distance it might readily be mistaken for that reptile.



LETTERED TORTOISE.—*Emys scripta*. CHICKEN TORTOISE.—*Emys reticularia*.

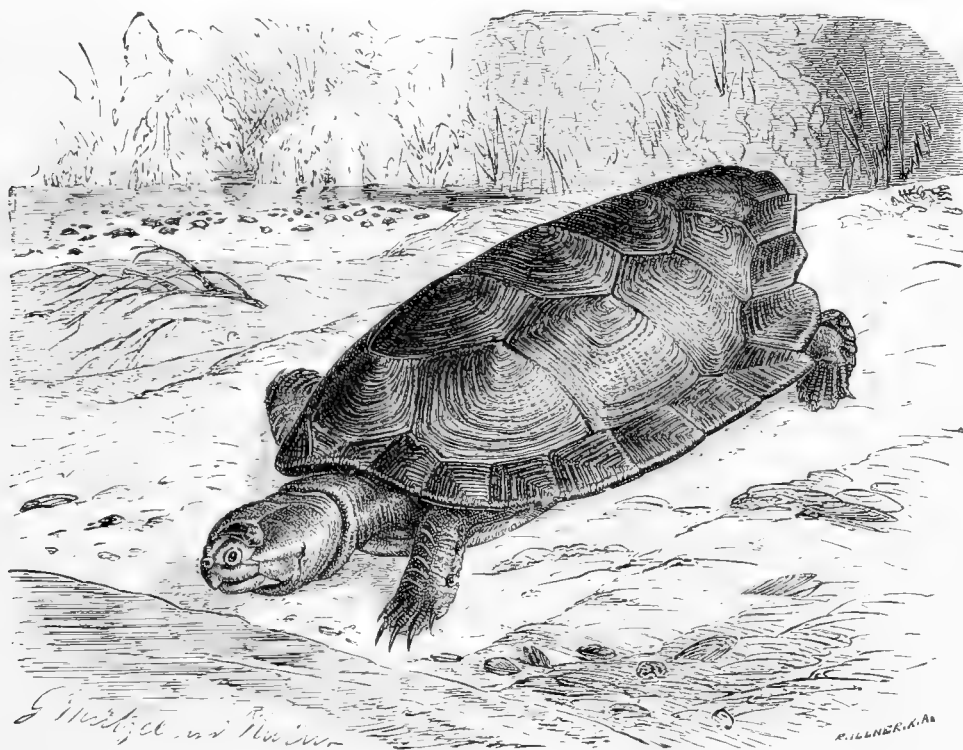
It is rather a small species, seldom exceeding ten inches in length. Its flesh is remarkably excellent, very tender and delicately flavored, something like that of a young chicken, so that this Tortoise is in great request as an article of food, and is largely sold in the markets, though not so plentifully as the common salt-water terrapin. Its color is dark brown above, and the plates are scribbled with yellow lines, and wrinkled longitudinally. The neck is long in proportion to the size of the animal, so long, indeed, that the head and neck together are almost as long as the shell. The lower jaw is hooked in front.

AN allied species, popularly called the QUAKER TORTOISE, and scientifically *Emys oliveacea*, is remarkable for the extreme length of the claws of the fore feet, the three middle claws being elongated in a manner that irresistibly reminds the observer of the nails belonging to a Chinese mandarin of very high rank.

THE SALT-WATER TERRAPIN is a well-known species, living in North and South America, where it is in great request for the table.

The generic name of *Malaclemys*, or Soft Terrapin, has been given to this species on account of the formation of the head, which is covered with soft, spongy skin. The head is large in proportion to the size of the animal, and flattened above.

This Terrapin lives in the salt-water marshes, where it is very plentiful, and from which it never travels to any great distance. During the warm months of the year it is lively, and constantly searching after prey, but when the cold weather comes on, it burrows a hole in the muddy banks of its native marsh, and there lies buried until the warm sunbeams of spring break its slumbers, and induce it once more to seek the upper earth and resume its former active existence.



QUAKER TORTOISE.—*Emys olivacea*.

It is more active in its movements than is the case with the Tortoises in general, and can not only swim rapidly, but walk with tolerable speed. It is very shy, and discovers approaching peril with a keenness of perception that could scarcely be expected from one of these shielded reptiles, whose dullness and torpidity have long been proverbial.

Mr. Holbrook, in his valuable "North American Herpetology," writes as follows concerning this Terrapin:—

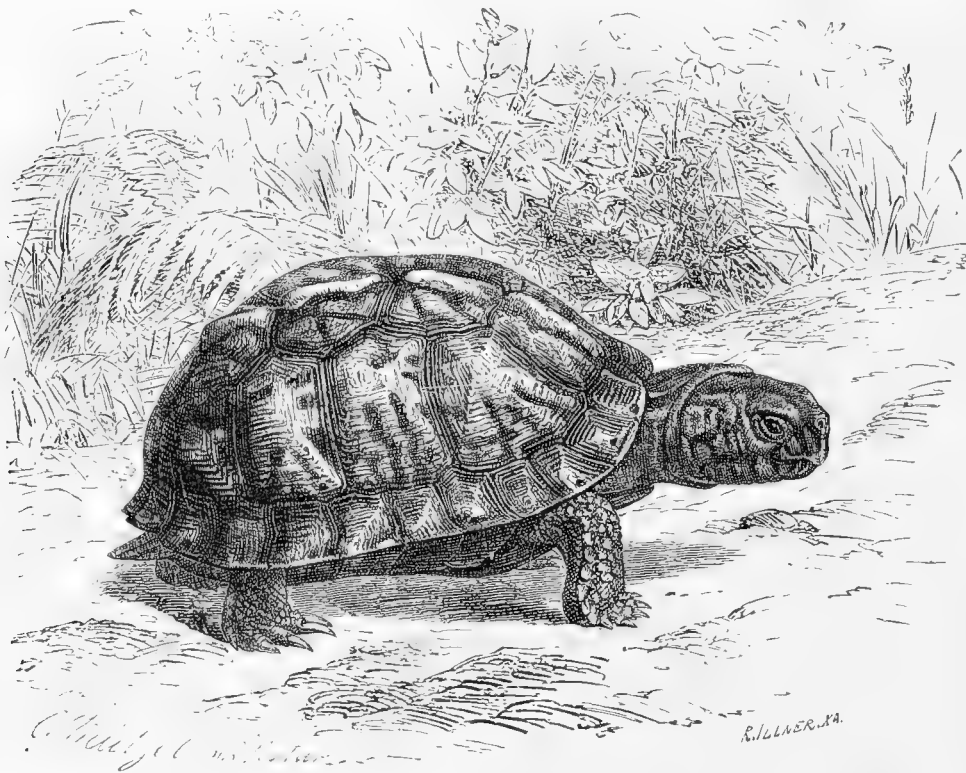
"They are very abundant in the salt marshes around Charleston, and are easily taken when the female is about to deposit her eggs in the spring and early summer months. They are then brought in immense numbers to market; yet, notwithstanding this great destruction, they are so prolific that their number appears undiminished. Their flesh is excellent at all times, but in the northern cities it is most esteemed when the animal has been dug out of the mud in its state of hibernation. The males are smaller than the females, and have the concentric striæ more deeply impressed."

The color of this Salt-water Terrapin is rather variable, but is usually dark greenish-brown on the upper surface, and yellow on the plates which surround the edge of the shell. Below it is yellow, and in many specimens it is marked with variously shaped spots of dark gray. The lower jaw is furnished with a hook, and the sides of the head are dusty white sprinkled with many small black spots.

VERY many species of Tortoise are extremely variable in their color, but there are few which are so remarkable in this respect as the creature which is appropriately named the Box Tortoise (*Cistudo carolina*).

This species belongs to America, and is found spread over the whole of the Northern States. It is very plentiful in the localities which it favors, and although so small a creature, is able by means of its wonderful organization to protect itself against almost every foe. Many of the Tortoises can withdraw their limbs and head into their shell, leaving open, however, the apertures through which this movement is achieved, so that the animal might be killed or hooked out by a persevering foe, such as the jaguar, which is known to attack turtles, insinuate its lithe paw within the shell, and scoop out the inhabitant with its sharp curved claws.

But in those instances where the animal has the power of closing the openings through which the legs, tail, and head protrude, there is hardly any mode of getting at the flesh with-



BOX TORTOISE.—*Cistudo carolina*.

out breaking the shell, a feat beyond the power of any animal, except perhaps an elephant, to perform. Certain birds, it is said, are clever enough to soar to a great height with the Tortoise, and break the shell by letting it fall upon a convenient rock, but this story does not seem to be very strongly attested. Several species possess this valuable capability, but none to so perfect a degree as the Box Tortoise, which, according to the Rev. Sydney Smith's felicitous summary, need fear no enemy except man and the boa constrictor, the former taking him home and roasting him, and the latter swallowing him entire and consuming him slowly in its interior, as the Court of Chancery does a large estate.

With regard to this curious propensity, it is evident that there is some analogy between these Tortoises and certain mammalia, which are also able to withdraw themselves within the protection of certain armor with which they are furnished. In the case of the hedgehog, the animal assumes more of an offensive than a defensive character, and relies, not on an impenetrable covering, for the skin is soft, and a pointed weapon can find an easy entrance between the spines, but on the bristly array of bayonet-like spikes that protrude their threatening points in every direction, and bid a tacit defiance to the foe.

The scale-covered manis, again, although guarded with successive layers of broad, horny plates, is, in point of fact, less protected when rolled up than when walking quietly along; for when at rest, the scales overlap each other like the tiles of a house, so that any weapon would glance aside, but when curled up the scales are erected and leave a passage for the arrow or the spear between them.

The real defence of the hedgehog lies in the points of its quills and of the manis in the razor-like edges of its scales, but the defence of the Tortoise is wholly inaggressive, and is more allied to that of the armadillo or perhaps the singular pichiciago (*Chlamydophorus truncatus*), a most remarkable little creature with a curious shelly covering spread over nearly the whole upper surface and down the hind-quarters. A description of this animal may be found in the volume on the Mammalia, page 631. There are again many of the lower animals which have a similar mode of defence, a very familiar example being the well-known pill-woodlouse so common in our gardens, which rolls itself into a round ball when alarmed, and permits itself to be handled and even rolled along the ground without displaying any signs of life.

The Box Tortoise is a terrestrial species, and always keeps to the dry forest-lands, detesting the vicinity of water. It is commonly found in the pine forests, because they are always on thoroughly dry soil, and on account of its fondness for such localities is sometimes known by the popular name of the Pine Terrapin. The negroes call it by the name of Cooter. In the wild state it mostly feeds on insects, and is peculiarly fond of the cricket tribe, but in captivity it will eat almost any food that is offered, taking insects, meat, apples, or even bread.

It is a very little creature, being when adult a very little more than six inches in length. In color it is extremely variable, but is generally yellowish-brown, striped with a brighter hue, and sometimes mottled with black. Of a number of specimens no two were exactly alike, some being yellow, spotted with black, while others exactly reversed these tints, and were black, spotted with yellow. Others again were yellow with black rays, and others olive with yellow rays and streaks. The carapace has a very slight keel along its upper edge.

The upper jaw of this species is furnished with a rather broad hook, and the lower jaw is also hooked, but not so boldly.

This is an interesting species from having its shell so adapted by a hinged cover in front that it shuts itself tightly within. What complete protection is here afforded from any ordinary foe! Tortoises are mostly notable for longevity, and this species seems to be especially favored. We remember to have captured one of them while in a woodland of Worcester County, in Massachusetts, and found the initials of a relative cut on its back. They were recognized as having been cut there thirty or more years previously. This species, from being an inhabitant of dry woods, is more likely than those of ponds and wet places to be found and captured; hence the more frequent selection of this Turtle for such carving purposes.

Other species, found in various parts of the world, seem to have the same curious box-like shell.

The Box Turtle inhabits the United States from Maine and New York to Missouri and southward. A variety called the Three-toed Box Turtle (*C. triunquus*), found in Pennsylvania and southward, is paler in color, and has the hind-feet mostly three-toed. It is called Pine Barren Terrapin, or Cooter, in the South.

THE GOPHER (*Testudo carolina*). This is the common Land Tortoise of the Southern States. It is not known farther north than North Carolina, where among the pine barrens it abounds in great numbers, living entirely on vegetables. The flesh is esteemed a great delicacy. The length of the species is about fourteen inches.

About twenty species of Land Tortoises are known to science, inhabiting both hemispheres. They are all herbivorous, confined to the land, and inhabit the warmer portions of their respective localities. Their special characteristic is the habit of burrowing.

The Pond Turtles, family *Emyidae*, are represented over the whole world, widely distributed, by about eighty species.

THE WOOD TORTOISE (*Chelopus insculpta*) inhabits the States east of the Ohio, in fields and woods. Its shell is keeled, its plates marked with concentric *striae*, and radiating lines. A black spot on each scale gives characteristic marking.

MUHLENBERG'S TORTOISE (*C. muhlenbergii*) is the most circumscribed in its *habitat*, being found only in Pennsylvania and New Jersey. It is rare in those places. Its length is about three and a half inches. It inhabits small brooks and streams of running water.

THE SPECKLED TORTOISE (*Chelopus guttatus*) is found in Eastern United States, and as far west as Northern Indiana, where it is abundant. Its main color is black with orange spots. The plastron is yellow, blotched with black. This Tortoise is a favorite pet with the small boy of New England.

BLANDING'S TORTOISE (*Emys meleagris*) inhabits the moist woods and fields in Wisconsin, and eastward to the Alleghanies. Its coloration and markings are somewhat like those of the latter. The shell has no keel.

THE PAINTED TORTOISE (*Chrysemys picta*) is familiarly known in some quarters as the Mud Turtle. It is one of the most common in the Eastern States. It is greenish-black, the plates having a paler margin. The marginal plates are marked with bright red, looking much as if it were freshly painted. The plastron is yellow, blotched with brown. Its length of shell is about six inches. Two varieties are found respectively in Wisconsin and in Western New York.

THE MAP TURTLE (*Malacoclemmys geographicus*) is singular in its markings, suggesting the lines on a map, hence the name. Its locality is the Mississippi River, and northward to New York.

LESUEUR'S MAP TURTLE (*M. lesueri*) is yet another species, found in Wisconsin and Ohio, and from thence southwest. It is much like the preceding, but grayer; the markings are paler and in larger pattern.

THE SALT MARSH TURTLE (*M. palustris*), called also Diamond-back, is of a greenish or dark olive color, with concentric dark stripes along the plates of both shells. It inhabits along the coast from New York to Texas. It is found along the northern shores of Long Island, where it is called Salt Water Terrapin, and is the justly prized and notable luxury of epicures. It frequents low brackish or salt streams near the sea-shore, hibernating in the mud, during the season, from whence it is taken in great numbers for the markets; it is then very fat.

THE SMOOTH TERRAPIN (*Pseudemys terrapin*) is sold in the markets as the same as the preceding. It is said that the two are procured from the same localities. DeKay thinks that the latter inhabits the salt and brackish waters indifferently.

RED-BELLIED TERRAPIN (*Pseudemys rugosa*). This is found in the Middle States, from New Jersey to Virginia. It is a handsome creature—for a reptile—and is easily distinguished by its serrated jaws. As an edible it is somewhat prized. Its length is eleven inches.

HIEROGLYPHIC TURTLE (*P. hieroglyphica*). Found quite circumscribed in the Eastern States. The shell is smooth, flat, and olive-brown in color, with broad, reticulated, yellowish lines; the lower is pale yellow; the head very small; length of shell, twelve inches.

YELLOW-BELLIED TERRAPIN (*P. troostii*). This species is found in the valley of the Mississippi, and northward to Illinois. Its colors are greenish-black, the side-plates having

horn-colored lines and spots ; the under shell yellow, with large black blotches ; the throat striped green ; shell eight inches in length.

THE ELEGANT TERRAPIN (*P. elegans*) is a Western species, being confined to the region east of the Rocky Mountains as far as Illinois. The colors are brown with heavy lines and blotches ; a blood-colored band on each side of the neck. The under shell is yellow, with a dusky blotch on each plate.

THE ROUGH TERRAPIN (*P. scabra*) is found along the shore from Virginia to Florida. It is dark brown with yellow stripes ; under shell yellow, with small black blotches in front. Length of shell, eight inches.

A number of other species are enumerated as North American, and recorded in the list of North American Reptiles at the close of this volume.

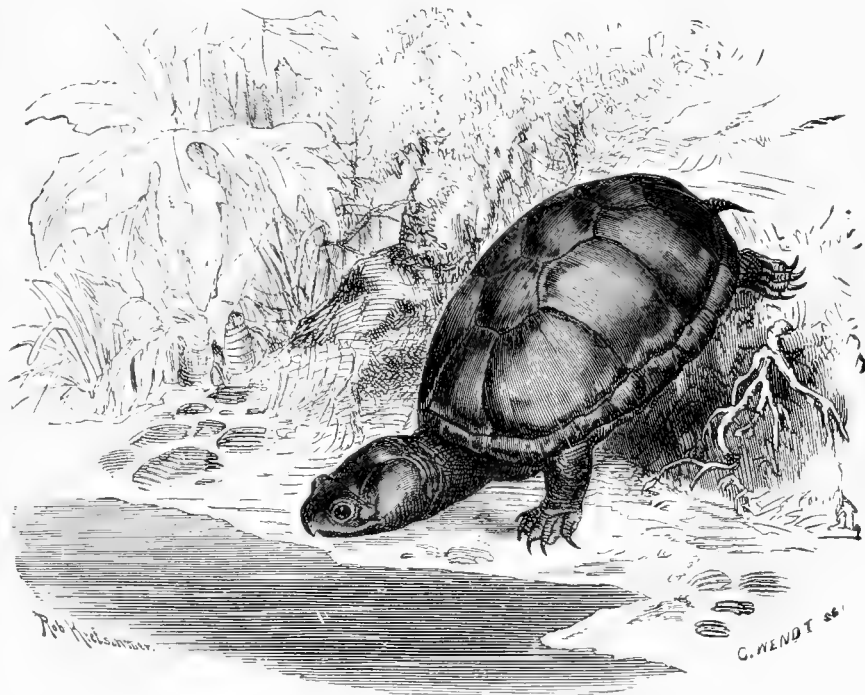
THE SMALL MUD TURTLE (*Cinosternum pennsylvanicum*) is found abundantly in New York, and southward to Florida. The family and generic names indicate the fact that it has a movable sternum. The shell is dusky-brown ; the head and neck with light stripes and yellow dots. In some localities it is called Small Box Turtle. It abounds in muddy ponds and pools, living on fish. Length of shell, three and a half inches.

THE MUSK TURTLE (*Aromochelys odorata*). Abundant in eastern United States, and westward to Indiana. Its exceedingly potent musky odor quite distinguishes it. Shell, three and a half inches in length.

THE LITTLE MUSK TURTLE (*A. carinata*) is found in the Mississippi region.

THE COMMON MUD TORTOISE, so called from its mud-haunting propensities, is an example of rather a curious genus of Tortoises, inhabiting America.

It is an odd little creature, being when adult not quite four inches in length, and moving with moderate speed. It is mostly found in ponds and muddy pools, where it feeds upon fish, aquatic insects, and similar diet, catching even the active fish without much difficulty. I lately saw some aquatic Tortoises, which I think belonged to this genus, which had to be ejected from a large basin of a fountain because they killed the newts which inhabited the same locality. Their movements in the water were so deliberate that it was not until they were detected in the very act of biting the newts that their delinquencies were discovered. Their mode of attack was simply to creep under their victim as it balanced itself



MUD TORTOISE.—*Cinosternum pennsylvanicum*.

until they were detected in the very act of biting the newts that their delinquencies were discovered. Their mode of attack was simply to creep under their victim as it balanced itself

in the water or swam gently within reach, and then to secure it with a quiet snap of its beak.

Like the lettered Terrapin, already mentioned, it has a vexatious habit of taking the angler's bait, and causes many a fisherman to lose his temper when pulling up a useless little Mud Tortoise instead of the fish on which he had set his heart. It seizes the worm just as it catches the newts, taking it so quietly into its mouth that the float is hardly shaken by the touch. But when the fisherman pulls his line, the Tortoise kicks, pulls and flounces about in so energetic a style that it often deludes the angler into the idea that he has hooked quite a fine fish.

This species has a decided smell of musk, a peculiarity which is found in others of the same genus, one of which (*Cinosternum odoratum*) goes by the appropriate, though not very refined, name of Stink-pot, in consequence of the powerful musky odor which it exudes.

The color of the Mud Tortoise is mostly dusky-brown above, and chestnut below, though this coloring is liable to some variation in different individuals. The tail is thick and pointed, and horny at the tip. The head is large, and there are four large warty appendages on the chin.

THE last example of the Terrapin is that singular animal which is appropriately called the ALLIGATOR TERRAPIN (*Chelydra serpentina*), from the great resemblance which it bears to that reptile.

It is also an American species, and lives mostly in the water. When adult it reaches a large size, often exceeding three feet in length, and as it is very fierce of disposition, lithe of neck, and strong of jaw, it is somewhat dreaded by those who have had a practical acquaintance with its powers. The jaws of this animal are sharp edged, and remarkably strong, cutting like the blades of steel shears. Mr. Bell remarks that he has seen one of these creatures bite asunder a stick of half an inch in diameter. When caught, therefore, the captors always cut off these dangerous heads at once.

Mr. Holbrook gives the following interesting account of the Alligator Terrapin and its habits:—

“It is found in stagnant pools or in streams where the waters are of sluggish motion. Generally they prefer deep water, and live at the bottom of rivers; at times, however, they approach the surface, above which they elevate the tip of their pointed snout, all other parts being concealed, and in this way they float slowly along with the current, but if disturbed, they descend speedily to the bottom.

“They are extremely voracious, feeding on fish, reptiles, or any animal substance that falls in their way. They take the hook readily, whatever may be the bait, though most attracted by pieces of fish; in this way many are caught for market. It is, however, necessary to have strong hooks and tackle, otherwise they would be broken, for the animal puts forth great strength in its struggles to escape, both with its firm jaws and by bringing its anterior extremities across the line. When caught, they always give out an odor of musk, more or less distinct; sometimes in very old animals it is so strong as to be disagreeable.

“Occasionally he leaves the water, and is seen on the banks of rivers or in meadows, even at a distance from his accustomed element. On land, his motions are awkward; he walks slowly, with his head, neck, and long tail extended, elevating himself on his legs like the alligator, which at that time he greatly resembles in his motions. Like the alligator also, after having walked a short distance, he falls on his sternum to rest for a few moments, and then proceeds on his journey.

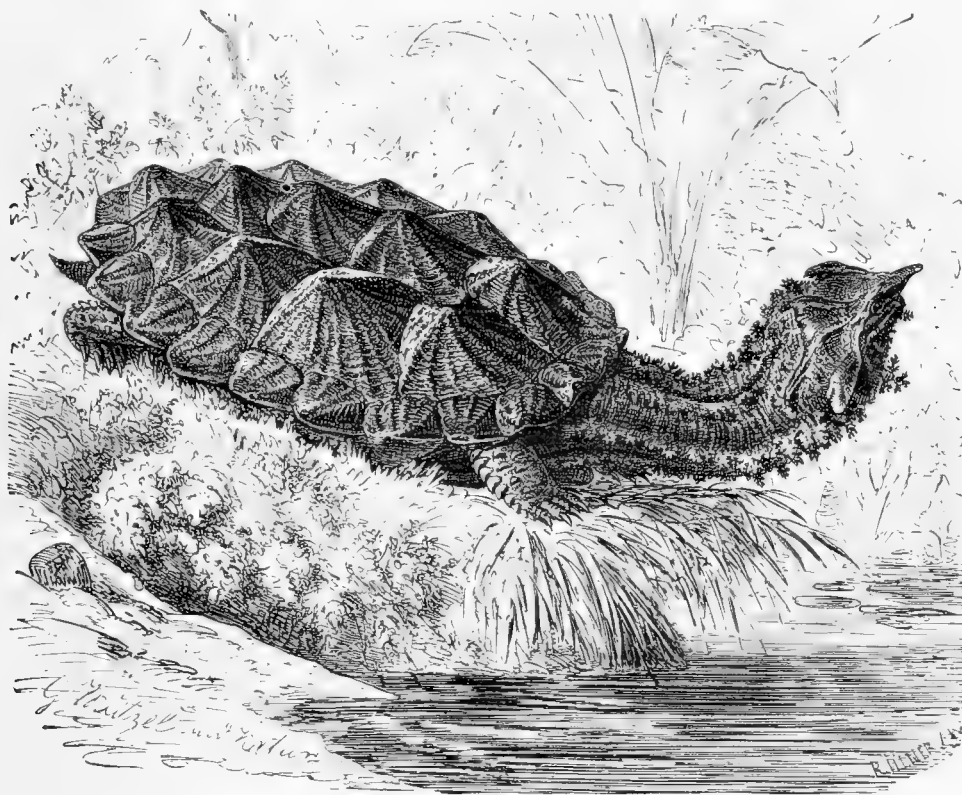
“In captivity they prefer dark places, and are exceedingly ferocious; they will seize upon and bite severely anything that is offered them, and their grasp upon the object with their strong jaws is so tenacious, that they may even be raised from the ground without losing their hold.

“In many cities they are brought in numbers to market, and are esteemed excellent food, though I think that they are far inferior to the green turtle, the soft-shelled, or even several of the emydes. They are kept for months in tubs of fresh water, and feed on such offal as may be given them, though they never become fat or increase much in weight.”

Though a very valuable and curious reptile, the Alligator Terrapin is far from beautiful, with its little dusky shell, its long, knob-covered tail, its singular legs and feet, and its great, sharply-toothed jaws. On account of its habit of snapping fiercely at its opponents, it is often called by the name of Snapping Turtle, a title, however, which rightly belongs to a species which will shortly be described.

Its head is large, and covered with a hard, wrinkled skin; the neck is long, thick, and furnished with a number of projecting tubercles. Under the chin are two distinct barbels. When adult, the shell is so formed that a depression runs along the centre, leaving a kind of keel at each side of the central line; but when young, the shell forms three distinct keels. It is rather flat, oblong, and at the hinder portion is deeply cleft, so as to form a row of blunt teeth, but while young the teeth are sharp. The tail is stout, long, and is furnished with a series of large, blunt tubercles along its central line.

THE SNAPPING TURTLE is the familiar name of this species in the countryside of New England. It is rather common in all parts of North America, and is found southward as far as Ecuador. Dr. Pickering, of Eastern Massachusetts, records the length of one as "over four feet;" the shell being only about half that in length. This exposure of so large a proportion of its fleshy parts is scarcely paralleled in any other species. Its stout and long tail, and its long neck quite warrant the use of a Southern designation it has—Alligator Tortoise. The savage, snapping habit gives it the common Northern name. The term Alligator Terrapin seems very appropriate, as the Terrapins all have the corrugated backs. In some quarters the flesh is esteemed.



MATAMATA.—*Chelys matamata*.

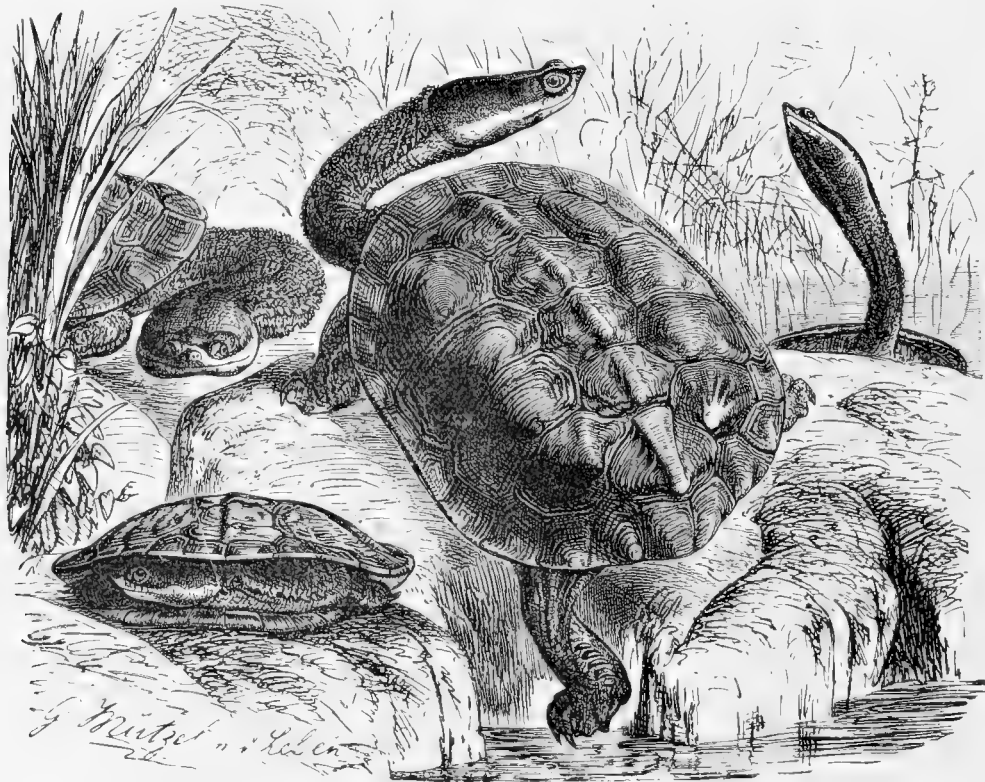
WE now arrive at another family of Tortoises, termed Chelydes, an example of which is the remarkable MATAMATA, the acknowledge type of its family.

All the Chelydes have broad, flattened heads, long, broad, contractile necks, and when in repose have a curious custom of bending their necks under the side of the carapace. Their feet are webbed, in order to enable them to pass rapidly through the water, and there is always

a lobe between the claws. They are aquatic Tortoises, carnivorous, and voracious, and only feed while in the water. When swimming, the whole of the shell is kept below the surface.

The Matamata is certainly the most remarkable of aspect among all the Tortoises, and perhaps may lay claim to be considered one of the oddest-looking animals in the world, far exceeding in its grotesque ungainliness even the wild and weird creations of the middle-age painters.

This Tortoise inhabits Southern America, and is most plentiful in Cayenne. Formerly it was very common, but on account of the excellence of its flesh, it has been subject to such persecution that its numbers have been considerably diminished. It haunts the lakes and rivers, where it swims well and with some speed. As is the case with most aquatic Tortoises, it is carnivorous, and feeds on fish, reptiles, and other creatures, which it captures by a sudden snap of its sharp beak. In general, it appears not to care for chasing the intended prey, but conceals itself among the reeds and herbage of the river-side, and from its hiding-place thrusts



NEW HOLLAND CHELODINE, OR SNAKE TORTOISE.—*Hydromedusa maximiliani*.

out its neck suddenly upon its victims as they pass unsuspectingly within reach of their destroyer. On occasion, however, it will issue from its concealment, dart rapidly through the water and seize a fish, reptile, or even a water-fowl, and then retire with its prey to its former hiding-place.

It is a large and formidable creature, attaining, when adult, to a length of three feet.

The head of the Matamata is most singular in shape, and remarkable for the strange appendages which are placed upon it. The head itself is much flattened, and rather broad, and the snout is prolonged in a most extraordinary manner, so as to form an elongated and flexible double tube.

On the top of the head are two membranous prolongations of the skin, standing boldly from the head, and having much the appearance of ears. From the chin hang two curiously-fringed membranes, and the throat is decorated with four similar membranes, but of larger size and more deeply fringed. The neck is long, and bears upon its upper surface two rows of small, membranous tufts, deeply fringed, and greatly resembling, in every point but that of size, the tufts on the chin and throat. The limbs are powerful, and the tail is short.

The shell of the Matamata is rather convex, broader before than behind, and rather flattened in the middle of the back. The shields are elevated, rather sharp at their tips, and are arranged so as to form three regular keels along the back.

A NEARLY allied species of river Tortoise is figured on page 18. It is the NEW HOLLAND CHELODINE, sometimes called the YELLOW CHELODINE, from the olive-yellow color of the plastron.

This remarkable reptile may almost deserve the name of the Snake Tortoise, its long, flexible neck, and flat, narrow, and pointed head, having a very serpentine aspect. As its name imports, it is an inhabitant of Australia, and is found most commonly in New Holland. It is a water-loving creature, not caring much for rivers and running streams, but haunting the pools, marshes, and stagnant waters, where it lives in the midst of abundance, finding ample food among the fishes and aquatic reptiles which generally swarm in such localities. It is an active animal, traversing the water with considerable speed, and capturing its prey by means of its sharp jaws.

The gape is very large, and the jaws are comparatively slender. The shell is broad, rather flattened, and the shields are thin and smooth, not being elevated as in the preceding species. The general color of the shell is brown above and yellow below, each shield having a black line round its edge.

WE now arrive at another family of the Tortoises, known popularly as Soft Turtles—a rather inaccurate title, inasmuch as they are not turtles, but Tortoises—and scientifically as *Trionycidae*. The latter title is of Greek origin, signifying three-clawed, in allusion to the fact that, although the species belonging to the family have five toes on each foot, only the three inner toes of each foot are armed with claws.

These Tortoises, represented in the accompanying oleograph, are rather interesting to the careful observer, because the peculiar structure of the external covering permits the formation of the skeleton to be seen without the necessity for separating the shells. In particular, the method in which the breast-bone is developed into the broad, flattened plate which forms the plastron, can clearly be seen through the skin, and even the position of the sutures can be made out without much difficulty.

The head of these creatures is rather oval and flattened, the jaws are horny, but covered with hanging, fleshy lips, and the mouth is lengthened into a cylindrical trunk. The neck is long, and can be contracted, the feet are short, very wide, and the toes are connected together by strong webs. They all live in warm climates, and are found in rivers and lakes.

The typical species is the celebrated FIERCE TRIONYX, OR SNAPPING TURTLE, a reptile which derives its former title from the exceeding ferocity of its disposition, and the latter from the method in which it secures its prey or attacks its foes. It is found spread over many parts of North America.

This fierce and determined marauder of the waters is even more formidable than the two previous species, and not only causes terror among the smaller creatures which inhabit the same localities, but is even dreaded by man, whose limbs have often been severely wounded by the bite of these ferocious reptiles. Like the aquatic Tortoises, it is carnivorous in its habits, and is terribly destructive among the fish, smaller quadrupeds, birds, and reptiles. Lurking on the banks, it snatches away many an unfortunate animal as it comes to drink, or seizes the water-fowl that have ventured too close to their terrible neighbor. So fiercely carnivorous is this Tortoise, and so voracious is its appetite, that it will even catch young alligators, and devour them in spite of their teeth and struggles.

The flesh of this species is very delicate, tender, and richly flavored, so that it often meets the doom which it has inflicted on so many other animals. As it is so voracious, it will take almost any kind of bait, provided that it be composed of animal substance, but it prefers fish, and cannot resist a hook so baited.

Its captor's work, however, is not confined to hooking and drawing it ashore, as the Snapping Turtle, when it finds itself with a hook firmly fixed in its jaws, and itself being irresistibly

dragged from the water, seems possessed with tenfold ferocity, writhing its long, flexible neck, darting its head furiously at its foes with the rapidity of a serpent's stroke, and snapping sharply with its formidable jaws, one bite of which would shred away the fingers from the hand, or the toes from the feet, as easily as the gardener's scissors sever the twigs and leaves. Such a misfortune has indeed been known to occur. Mr. Bell records an instance where a Snapping Turtle, that was being conveyed to England, contrived to reach the hand of one of the sailors in its fierce struggles, and bit off one of his fingers.

The eggs of the Snapping Turtle are very spherical in form, and brittle of substance. The female lays a large number of these eggs, from fifty to sixty being the usual average, and always deposits them in some dry situation. In order to find a suitable spot for the deposition of her eggs, the female leaves the water, and is often forced to traverse a considerable distance before she can find a spot sufficiently dry for her purpose. Sometimes she will even ascend a very steep acclivity in her anxiety to find a locality that is quite dry, covered with sandy soil, and exposed to the full rays of the sun. She begins her task about May, and the little Tortoises are hatched in July.

The following curious account of the tenacity of life possessed by these creatures has been kindly forwarded to me:—

“As regards the tenacity of life of the Snapping Turtle, and the sympathy (*rapport*) which seems to exist between its severed limbs and main trunk, for some time after the separation has taken place, I witnessed a very curious incident when staying at a farm in Massachusetts.

“When I had brought the animal home, suspended by its tail, I killed it by chopping its head off, yet the head would open and shut the mouth, and roll its eyes. When I held a stick between the open jaws it closed them with violence, and kept hold of it. Meanwhile the headless body was crawling on the ground.

“About a quarter of an hour after having severed the head from the body, my mother had got boiling water, which I threw over the body, placed in a tub, in order to make the horny matter separate from the flesh; the moment this was done the back heaved and the sides were puffed out as if wind were blown between the skin and flesh, and instantaneously the head, which lay about three or four feet from the tub, on the ground, opened its mouth with a slight hissing sound, let go its hold on the stick, and the part of the neck adhering to the head expanded, as if also wind was blown into it, and both body and head lay motionless and dead. After having taken out thirty-four eggs, I took out the heart, which, strange to say, was still throbbing with life, contracting and expanding. I put it upon a plate, where it kept on beating until about noon the following day.”

In this species, the front edge of the carapace is furnished with a great number of tooth-like points, all radiating from the shell. These teeth, or tubercles, distinguish it from two other American species, appropriately termed the Unarmed Trionyx (*Trionyx muticus*), and the Mississippi Snapper (*Macrochelys lacertina*). This species is common in the Gulf States, and as far north as Illinois. It is regarded as one of the strongest and most ferocious of reptiles.

Holbrook records a Turtle under the name of Temminck's Snapper (*Chelonura temmincki*).

BEFORE taking leave of the Soft Turtles, we must cast a casual glance at two rather curious species. The one is the TYRSE (*Tyrse*, or *Trionyx niloticus*), a native of Africa, as its name imports. This animal is found in the Nile, and other African rivers, and is a good representation of the American reptile, being very fierce, strong and voracious, and said to devour the young crocodiles, just as the snapping turtle eats young alligators. The shell of the Tyrse is rather convex, but often is flattened along the line of the vertebræ, and its back is olive-green spotted with yellow or white.

The other species is the DOGANIA (*Dogania subplanus*, or *Trionyx subplanus*). This curious-looking reptile is an Asiatic species, and is found in India. Its neck seems preternaturally long, and supports a very large head, broad behind, and produced into a conical muzzle in front. The shell is rather oval, much flattened, and quite conceals the conical tail. Its color is brown, mottled largely with yellow; the head is also yellow

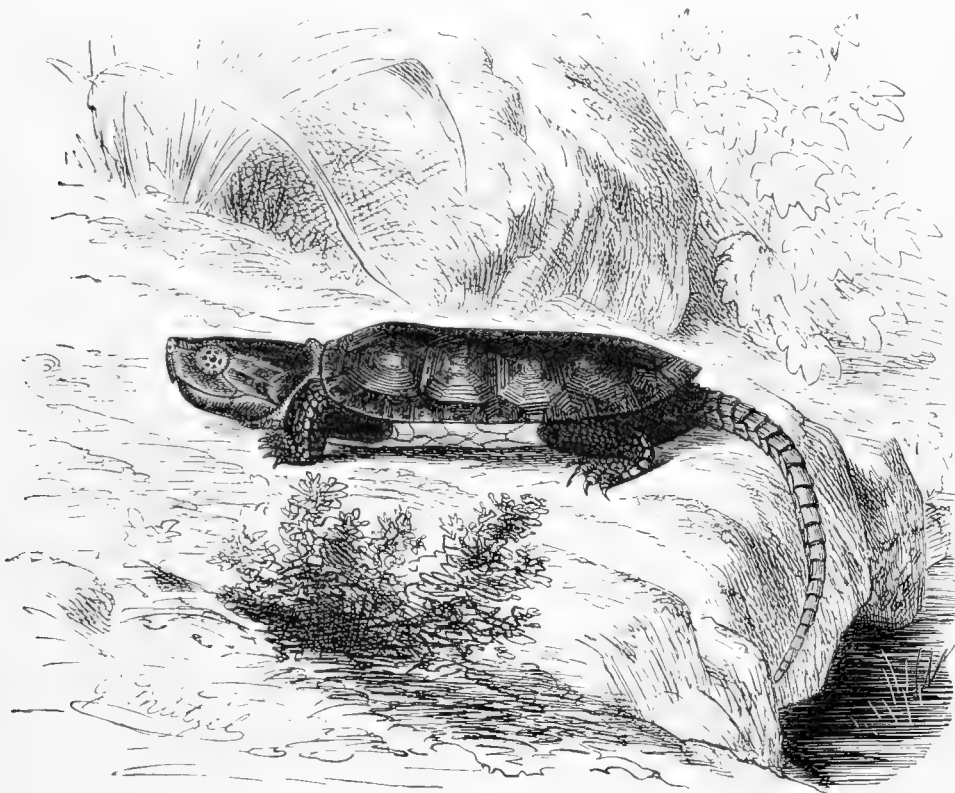


SELMAR HESS, PUBLISHER, N. Y.

SOFT TURTLES.

and brown. The ribs are not fully united together until the animal has attained a rather advanced age.

WE now arrive at the TURTLES, a group that can be distinguished by many unmistakable marks. Their feet are very long, those of the fore-limbs being longest, flat, expanded at the end, and often furnished with flattened claws. In fact, the feet are modified into fins or paddles, in order to suit the habits of these reptiles, which only feel themselves at home in the water, and are often met at sea some hundreds of miles from the nearest land. The ribs of the Turtles, instead of being united throughout their length, as in the tortoises, are only wide, flat, and united for part of their length, the remaining portions being free, and radiating like the spokes of a wheel.



DOGANIA.—*Dogania subplanus*.

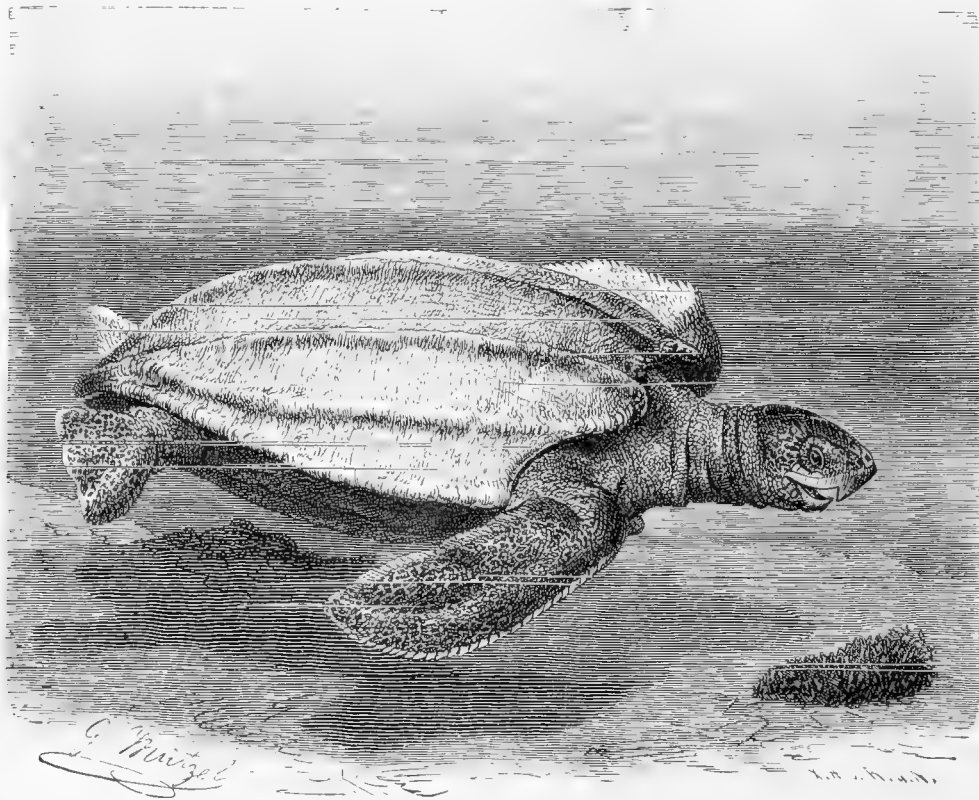
These reptiles inhabit the seas of the torrid and the temperate zones, and their food is mostly of a vegetable nature, consisting of various seaweeds, but there are a few species which are animal feeders, and eat creatures such as mollusks, star-fish, and other marine inhabitants. Several species are remarkably excellent for food, and caught in great numbers for the table, while others are equally useful in supplying the beautiful translucent substance known by the name of tortoise-shell. Their head is rather globular, and their jaws are naked and horny, and are capable of inflicting a severe wound.

THE first example of the true Turtles is the LUTH, or LEATHERY TURTLE (*Dermatochelys coriacea*), so called from the soft leather-like substance with which its shell is covered.

This species is found in the Atlantic, Pacific, and Indian Oceans, where it grows to a very large size, often weighing more than sixteen hundred pounds, and measuring eight feet in length. Being a very good swimmer, owing to the great development of the limbs, especially the fore-legs, it ventures far out to sea, and is occasionally driven to strange countries. Specimens of this reptile have been taken on the coast of France, and on other shores. These individuals were rather large, weighing about seven or eight hundred pounds.

The Leathery Turtle feeds on fish, crustacea, mollusks, radiates, and other animals, and its flesh seems to be hurtful, causing many symptoms of poisoning in those who eat it.

This species is remarkable for having no horny plates, the bones of the carapace and plastron being covered with a strong leathery skin, smooth in the adult animal, but covered with tubercles in the young. Along the back run seven ridges, sharp, and slightly toothed in the full-grown Turtle, but bluntly tubercled in the young. The eye is very curious, as the lids are set vertically instead of horizontally, and when the creature opens and shuts its eyes, have a very singular effect. The jaws are very formidable, being sharply edged, deeply scooped with three rounded notches in the front of the upper jaw, so as to form two curved sharply pointed teeth, and the extremity of the lower jaw is strongly hooked.



LUTH, OR LEATHERY TURTLE.—*Dermatochelys coriacea*.

The legs of the Leathery Turtle are very long, especially the two fore-limbs, which, in a specimen measuring eight feet in total length, were nearly three feet long, and more than nine inches wide. The feet are not furnished with claws, but the toes have a little horny scale at their tips, which take the place of the claws. The general color of this animal is dark brown, with pale yellow spots, but sometimes the skin is irregularly pied with black and white.

This great creature is essentially a sea-going one, though perhaps not more so than the Hawk's-bill, Green, and Loggerhead species. Its very large flippers rather suggest the above statement.

The editor of this edition has taken the liberty to drop from the original text the statement that this Tortoise resorts to the Tortugas Islands for breeding purposes. This statement has no foundation in fact. The great Loggerheads and the Green Turtles do resort to that group of keys, and breed in considerable numbers, a notice of which will be seen in the text on those species. The breeding-places of the Leathery Tortoise are not known to science.

Our first acquaintance with this creature was during the summer of 1855, when a middle-sized one came ashore on Nahant Beach, near Boston, Mass. A bullet-hole in the neck explained its present condition. Until this specimen came ashore this species was regarded

as nearly unknown on the Atlantic coast. The only specimen then known to have been seen and captured near the American Atlantic shores, was an enormous one now preserved in the Boston Museum. It was captured off the mouth of Boston harbor. Its length was eight feet and one inch. In color, jet-black. This was purchased at a large price, and it continues to occupy the same place as one of the most notable of the curiosities of the Museum. For many years this species remained unknown on our shores, excepting as represented by these two specimens. Somewhat later examples came to be more numerous. At the present time it is not an unusual thing to see a Leathery Tortoise when, in summer, cruising some distance off shore.

We saw several in the waters of the Gulf of Mexico, while resident on the Florida Reef. Those we have examined were of a dense black color and rather shiny, like the skin of a porpoise. This is probably the most bulky of living Turtles. The enormous fossil Turtle which was found in one of the Western Territories is allied to the present species.

ANOTHER well-known species of Turtle deserves a passing notice. This is the **LOGGERHEAD TURTLE**, or **CAOUANE** (*Thalassochelys caretta*), sometimes called the **RHINOCEROS TURTLE**.

This fine species has a wide range of locality, being found in the most warm seas. It is extremely powerful, fierce, and voracious, biting with great force, and cutting hard substances without much difficulty. According to Catesby, "the Loggerhead Turtles are the boldest and most voracious of all other Turtles. Their flesh is rank and little sought for, which occasions them to be more numerous than any other kind. They range the ocean over, an instance of which, among many others that I have known, happened in latitude 30° north, when our boat was hoisted out, and a Loggerhead Turtle struck, as it was sleeping on the surface of the water.

"This, by our reckoning, appeared to be midway between the Azores and the Bahama Islands, either of which places being the nearest land it could have come from, or that they are known to frequent, there being none on the north continent of America farther north than Florida. It being amphibious, and yet at so great a distance from land in the breeding-time, makes it the more remarkable. They feed mostly on shell-fish, the great strength of their beaks enabling them to break very large shells." Several other species belong to the same genus.

In general appearance this species is not unlike the common Green Turtle, which will presently be described, but the shell is broader, deeper colored; and has two more plates on the back. The plates along the upper part of the back are six-sided, rather square, and keeled. There are two claws on each foot.

THE **LOGGERHEAD TURTLE** is so abundant in the waters about the Dry Tortugas, on the Florida Reef, that one of the principal islands or keys is named from it. This creature attains a large size; some measuring quite five feet in length. It is so named from the great comparative size of its head. Considerable difference is seen between this and the Green Turtle in this respect.

The Loggerheads make their appearance in the shoal waters near the keys in early summer. On the first moonlight night they are ready to go on shore to deposit their eggs. On these occasions people living near, mostly wreckers and fishermen, resort to the region and watch for the creatures, to secure their eggs first, and then the carcasses. Before leaving the water the reptiles are exceedingly shy and cautious, but once fairly at work digging holes above the high-water mark, they heed nothing until the eggs are all deposited. So intent are they on this business it is a common practice to sit on the creatures' shell and take the eggs as they are deposited. The patient reptiles then carefully draw the sand over the empty hole with as much care as if the complement of eggs was yet there. This accomplished, they hurry off to sea again.

THE well-known **CARET**, or **HAWK'S-BILL TURTLE** (*Eretmochelys*), so called from the formation of the mouth, is a native of the warm American and Indian seas, and is common in many of the islands of those oceans.

The Hawk's-bill Turtle is the animal which furnishes the valuable "tortoise-shell" of commerce, and is therefore a creature of great importance. The scales of the back are thirteen in number, and as they overlap each other for about one-third of their length, they are larger than in any other species where the edges only meet. In this species, too, the scales are thicker, stronger, and more beautifully clouded than in any other Turtle. The removal of the plates is a very cruel process, the poor reptiles being exposed to a strong heat which causes the plates to come easily off the back. In many cases the natives are very rough in their mode of conducting this process, and get the plates away by lighting a fire on the back of the animal. This mode of management, however, is injurious to the quality of the tortoise-shell. After the plates have been removed, the Turtle is permitted to go free, as its flesh is not eaten, and after a time it is furnished with a second set of plates. These, however, are of inferior quality, and not so thick as the first set.

When first removed, they are rather crumpled, dirty, opaque, brittle, and quite useless for the purposes of manufacture, and have to undergo certain processes in order that these defects may be corrected. Boiling water and steam are the two principal agents in this part of the manufacture, the plates being boiled and steamed until they are soft and clean, and then pressed between wooden blocks until they are flat. The tortoise-shell possesses the valuable property of uniting together perfectly, if two pieces are thoroughly softened, heated, and then subjected to the action of a powerful press. By this mode of treatment, the tortoise-shell can be formed into pieces of any size or thickness, and can even be forced into moulds, retaining, when cold, a perfect impression of the mould. Even the chippings and scrapings of this valuable substance are collected, and being heated and pressed, are formed into solid cakes fit for the purposes of manufacture.

The uses to which this costly and beautiful substance are put, are innumerable. The most familiar form in which the tortoise-shell is presented to us is the comb, but it is also employed for knife-handles, boxes, and many other articles of ornament or use.

This species is not nearly so large as the green Turtle, and its flesh is not used for food. The eggs, however, are thought to be a great delicacy. It is remarkable that when these eggs are boiled, the albumen, or "white" as it is popularly called, does not become firm. The external membrane is white, flexible, and the eggs are nearly spherical in their form. Their number is very great, and the animal usually lays them in sets at intervals of about three weeks.

The young are generally hatched in about three weeks after the eggs are laid in the sand, the hot rays of the sun being the only means by which they obtain their development. When first excluded from the shell, the young Turtles are very small and soft, not obtaining their hard scaly covering until they have reached a more advanced age. Numberless animals, fish, and birds feed on these little helpless creatures, and multitudes of them are snapped up before they have breathed for more than a few minutes. The rudiments of the scales are perceptible upon the backs of these little creatures, but the only hard portion is the little spot in the centre of each plate, which is technically called the areola, the layers of tortoise-shell being added by degrees from the edges of the plates.

Many birds are always hovering about the islands where Turtles lay their eggs, and as soon as the little things make their appearance from the sand and hurry instinctively towards the sea, they are seized by the many foes that are watching for their prey. Even when they reach the water, their perils are not at an end, for there are marine as well as aerial and terrestrial foes, and as many fall victims on the water as on land. So terrible is the destruction among these reptiles in their early days of life, that were it not for the great number of eggs laid, they would soon be extirpated from the earth.

The shell of the Hawk's-bill Turtle is rather flat, and heart-shaped. When young, the centre of each plate is rather pointed, but in the adult animal the points are worn away and never restored. The plates surrounding the edges of the shell are arranged so as to form strong teeth pointing towards the tail. In the younger specimens, there are two keels running the length of the plastron, but in the older individuals these are worn away like the projections on the back. The jaws are strongly hooked at their tips, and the under jaw shuts

within the upper. The tail is very short. The color of this species is yellow richly marbled with deep brown above. The under parts are yellowish-white, splashed with black on the areola in the half-grown and younger individuals, and the head is brown, the plates being often edged with yellow.

The Hawk's-bill Turtle is rather common around the Florida Reef, though large ones are rarely found. The young we have seen among the mangroves in the water-ways of the Everglades. They are highly esteemed as an edible.

THE best known of all the Turtles is the celebrated GREEN TURTLE (*Chelonia mydas*), so called from the green color of its fat.

This useful animal is found in the seas and on the shores of both continents, and is most plentiful about the Island of Ascension and the Antilles, where it is subject to incessant persecution for the sake of its flesh. The shell of this reptile is of very little use, and of small value, but the flesh is remarkably rich and well-flavored, and the green fat has long enjoyed a world-wide and fully deserved reputation.

In Europe the flesh of the Green Turtle is little but an object of luxury, attainable only at great cost, and dressed with sundry accompaniments that increase rather than diminish its natural richness. But in many instances, more especially on board ship, when the sailors have been forced to eat salt provisions until the system becomes deteriorated, and the fearful scourge of scurvy is impending over crew and officers, the Turtle becomes an absolute necessity, and is the means of saving many a noble vessel from destruction, by giving the crew a healthful change of diet, and purifying the blood from the baneful effects of a course of salted provisions.

Landsmen have little notion of the real texture and flavor of "salt junk," their ideas being generally confined to the delicately corned and pinky beef or pork that is served up to table, with the accompaniments of sundry fresh and well-dressed vegetables. Whereas, salt junk is something like rough mahogany in look and hardness, and salted to such a degree as almost to blister the tongue of a landsman. It may easily be imagined how any one who has been condemned to a course of this diet for a lengthened time would welcome fresh meat of any kind whatever, and we need not wonder at the extraordinary relish with which sailors will eat sharks, sea-birds, and various other strangely flavored creatures.

The flesh and fat of the Turtle are valuable in a medicinal point of view, and will supply in a more agreeable, though more costly manner, the various remedies for consumptive tendencies, decline, and similar diseases, of which cod-liver oil is the most familiar and one of the most nauseous examples.

Formerly, before steam power was applied to vessels, the Turtle was extremely scarce and very expensive, but it can now be obtained on much more reasonable terms. Many vessels are now in the habit of bringing over Turtles as part of their cargo, and it is found that these valuable reptiles are easily managed when on board, requiring hardly any attention. The following short account of some captive Turtles has been kindly presented to me by a partaker of their voyage and their flesh:—

"The Island of Ascension is a great resort of Turtle, which are there captured and retained prisoners in some large ponds, from which they are occasionally transferred to ships for 'rations' for the crew. These Turtles may be seen in the ponds, lazily moving along, one above another, sometimes three or four deep. They occasionally come to the surface to take breath, and will splash about at times quite merrily, as though ignorant that their destiny tended towards conversion into soup and cutlets. At the best, however, they are lethargic, awkward creatures.

"About half a dozen fine Turtle were conveyed on board our ship during my stay at the Island of Ascension; they were unwieldly monsters, measuring rather more than four feet six inches in length, and about three feet in breadth. They were allowed to lie either in the boats, or on the after-part of the poop, and seldom disturbed themselves unless the vessel gave an extra roll, or they were stirred up by a pail of water being thrown over them or a wet swab rubbed over their hooked beaks.

“Their tenacity of life was remarkable ; they remained on board ship during upwards of three weeks without any food, and their only refresher was a cold bath, derived from the before-mentioned pail of water, which they usually received with a dreamy lengthy sort of hiss. Even after their three weeks’ starvation, they died very hard. One, whose throat was cut in the morning, and from whose body numerous eggs had been extracted, was giving an occasional flap with her fins late in the afternoon ; the fact of her throat having been cut and her body otherwise mutilated appeared merely to produce the effect of ultimately damaging her constitution, and I have grave doubts whether the fact of her ceasing to move was not as much due to the destruction of the various membranes as to the extinction of her reptilian life.”

As these animals are large and very powerful, it is not a very easy task to secure and bring them on board. The usual plan is to intercept them as they are traversing the sands, and to turn them over on their backs, where they lie until they can be removed. Many of the tortoise tribe can recover their position when thus overturned, but the Green Turtle is quite unable to restore itself to its proper attitude, and lies helplessly sprawling until it is lifted into the boat and taken on board. In many cases the creature is so enormously heavy that the united strength of the pursuers is inadequate to the task, and they are consequently forced to employ levers and so to tilt it over.

Sometimes the Turtle is fairly chased in the water and struck with a curious kind of harpoon, consisting of an iron head about ten inches in length, and a staff nearly twelve feet long. The head is only loosely slipped into a socket on the staff and the two are connected with a cord. Two men generally unite in this chase, one paddling the canoe and the other wielding the harpoon. They start towards the most likely spots, and look carefully at the bottom of the sea, where it is about six or ten feet in depth, to see whether the expected prey is lying at its ease and does not perceive them.

Sometimes they are forced to give chase to a Turtle on the surface, and sometimes the individual on which they had fixed, takes the alarm, and swims away. In either case they continually pursue the single swimming reptile, until it is fatigued with constant irritation, and sinks to the bottom to rest. No sooner has the Turtle assumed this position than the harpooner lowers his weapon into the water, takes an accurate aim, and then drives the steel spike deep into the shell. Off dashes the Turtle, carrying with it the harpoon. Were it not for the peculiar construction of the harpoon, the weapon would soon be shaken off, and the Turtle escape, but as the shaft slips readily off the head, there is no leverage and the steel head remains fixed, towing after it the long wooden shaft, which soon tires out the poor victim. When thoroughly fatigued, it is drawn to the surface, a rope put around it, and either taken into the boat or hauled ashore.

The food of this Turtle consists of vegetable substances, mostly algæ, which is found in great abundance in those warm climates. This animal grows to a very great size, as may be imagined from the fact that it often requires the united aid of three men to turn it over. A very pure limpid oil is obtained from these species, useful for burning in lamps and other similar purposes. A fat full-grown specimen will sometimes furnish thirty pints of this substance.

The eggs of the Turtle are thought as great delicacies as its flesh, and it is rather a remarkable fact, that although the flesh of the hawk’s-bill Turtle is distasteful to all palates and hurtful to many constitutions, the eggs are both agreeable in flavor and perfectly harmless. It is while the female Turtle is visiting shore for the purpose of depositing her eggs that she is usually captured, as these sea-loving reptiles care little for the shore except for this purpose. So admirable an account of the manner in which the Turtle behaves when laying her eggs is written by Audubon, that the description must be given in his own words :—

“On nearing the shore, and mostly on fine, calm moonlight nights, the Turtle raises her head above the water, being still distant thirty or forty yards from the beach, looks around her, and attentively examines the objects on shore. Should she observe nothing likely to disturb her intended operations, she emits a loud, hissing sound, by which such of her enemies as are unaccustomed to it are startled, and apt to remove to another place, although unseen by her.

“Should she hear any more noise, or perceive any indication of danger, she instantly sinks and goes off to a distance; but should everything be quiet, she advances slowly towards the beach, crawls over it, her head raised to the full stretch of her neck, and when she has reached a place fitted for her purpose, she gazes all around in silence. Finding all well, she proceeds to form a hole in the sand, which she effects by removing it from under her body with her hind flappers, scooping it out with so much dexterity, that the sides seldom, if ever, fall in. The sand is raised alternately with each flapper as with a ladle, until it has accumulated behind her, when, supporting herself with her head and fore part on the ground, she, with a spring from each flapper, sends the sand around her, scattering it to the distance of several feet.

“In this manner the hole is dug to the depth of eighteen inches, or sometimes more than two feet. This labor I have seen performed in the short space of nine minutes. The eggs are then dropped one by one, and disposed in regular layers to the number of one hundred and fifty, or sometimes nearly two hundred. The whole time spent in this operation may be about twenty minutes. She now scrapes the loose sand back over the eggs, and so levels and smooths the surface, that few persons, on seeing the spot, would imagine that anything had been done to it. This accomplished to her mind, she retreats to the water with all possible despatch, leaving the hatching of the eggs to the heat of the sand.

“When a Turtle, a loggerhead for example, is in the act of dropping her eggs, she will not move, although one should go up to her, or even seat himself on her back; but the moment it is finished, off she starts, nor would it be possible for one, unless he were as strong as Hercules, to turn her over and secure her.”

The Green Turtle is a staple article of commerce in Key West, on the Florida Reef. It is abundant on the waters in the Florida straits, and along the Gulf coasts. The fishermen in the latter regions practise the plugging method of capturing it. In Key West, the Turtles are placed in “crawls,” an enclosed space in shallow water, which allows of free circulation of sea water. Steamers plying to New York take on all that are supplied, for the Northern markets. We have seen the young of the Green Turtle in considerable numbers, in the shallow inlets of the mangrove swamps on the southern extremity of Florida. These young are exceedingly good as edibles. The old ones feed in the same localities on the tender algæ, which renders them delicate and fat. The other great sea Turtles are carnivorous, and prove very indifferent as food, though the garrison at Fort Jefferson issued the meat as rations a portion of the year. Its novelty, and change from beef occasionally, made it a welcome article of the commissary.

The aspect of this species is quite in contrast with the loggerhead, the head of the Green Turtle being so much the smaller.

Occasionally, the Green Turtle has been led on, by the influence of the warm waters of the gulf stream, to venture off the entrance of New York harbor—a dangerous locality, one would say, for such a highly prized edible. Fine specimens were kept in the New York Aquarium, where they could be observed with ease. Their peculiar movements in swimming remind one of the flight of a bird.

Dr. Strobel informed Dr. Holbrook, the distinguished author on this subject, that Green Turtles taken at Tortugas Islands were marked by the wreckers, and kept in confinement at Key West, sixty miles distant. Some escaped, and were recaptured while laying eggs, on the same island in the Tortugas group as they were formerly taken from.



CROCODILES AND ALLIGATORS.

THE link next to the tortoise tribe is formed of an important group of reptiles, containing the largest of the reptilian order, larger, indeed, than most present inhabitants of the earth, if we except one or two African and Indian animals, and some members of the cetaceous tribe. As is the case with nearly all reptiles, they are carnivorous, and owing to their great size, strength of muscle, voracity of appetite, and the terrible armature of sharp teeth with which their jaws are supplied, they are the dread of the countries which they inhabit, ruling the rivers with a sway as despotic as is exercised by the lion and tiger on land, the eagle in the air, or the shark in the seas.

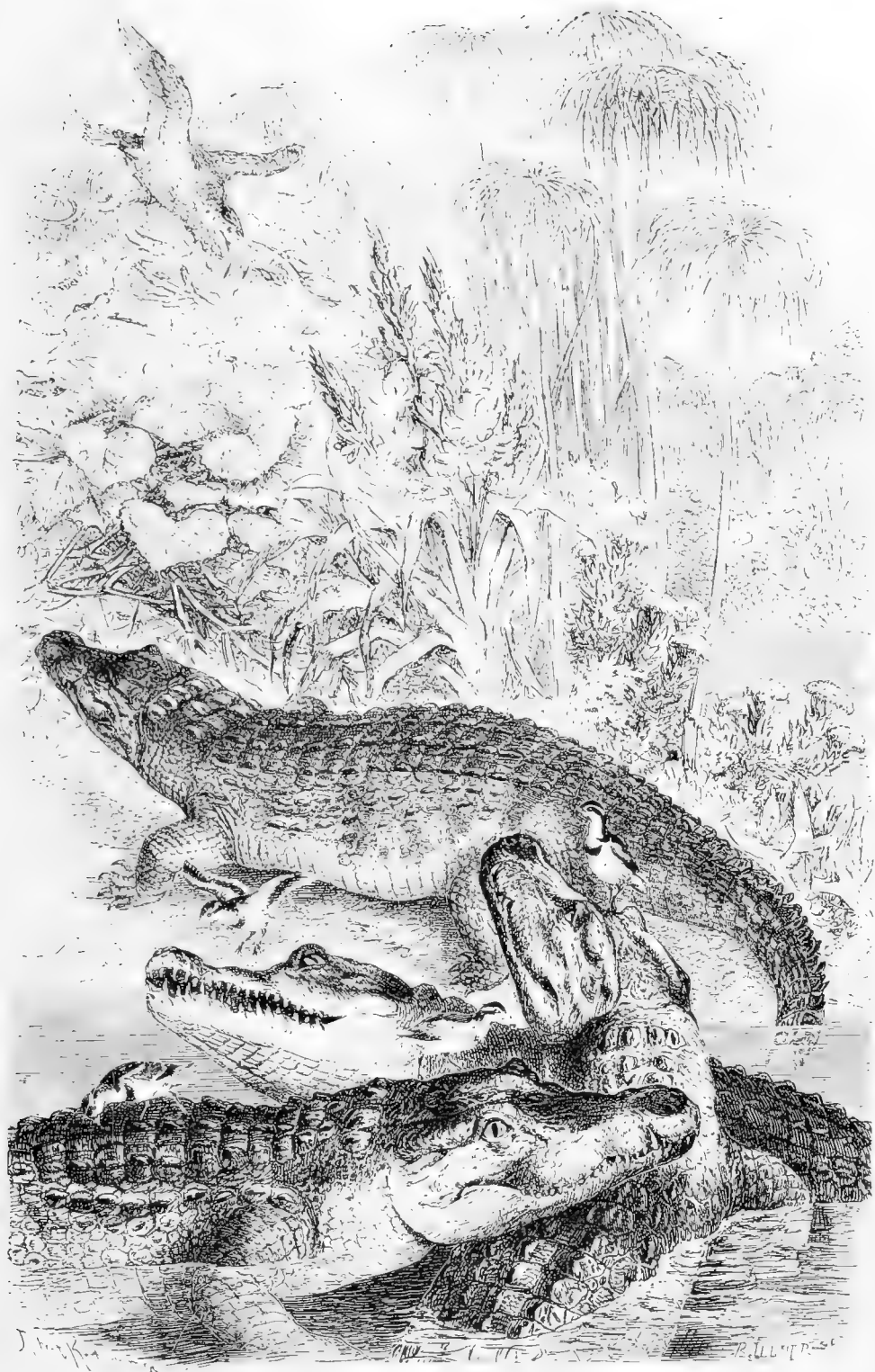
On account of the peculiar manner in which their bodies are covered with square, keeled, bony plates embedded in the skin, and protecting the body with an armor that effectually guards its upper and more exposed portions from any ordinary weapon, they are separated from the true lizards, and scientifically termed EMYDOSAURI, or Tortoise-lizards, the bony plates being considered to have a certain analogy with those of the shielded reptiles. By some zoological authors these animals are termed LORICATA, or Mailed Reptiles, from the Latin word *lorica*, which signifies a coat of mail, or cuirass.

Although these creatures are capable of walking upon land, for which purpose they are furnished with four legs, they are more fitted for the water than its shores, and are swift and graceful in the one, as they are stiff, awkward, and clumsy on the other. Through the water they urge their course with extraordinary speed, their long, flattened, flexible tail answering the double purpose of an oar and a rudder; but on land their bodies are so heavy and their legs are so weak, that they can hardly be said to walk, a term which seems to imply that the body is wholly supported by the legs, but to push or drag themselves along the ground, on which rests a considerable portion of their weight.

The head of these creatures is always rather elongated, and in some species is lengthened into a narrow and prolonged snout. Each jaw is furnished with a row of sharply-pointed and rather conical teeth. These teeth are hollow, mostly grooved on the surface, and are replaced when they fall by new teeth that grow behind them, and in process of time push the old ones out of their sockets.

The nostrils are placed at the very extremity of the skull, and upon a slightly raised prominence, so that the animal is able to breathe by merely exposing an inch or so above the water, and thus can conceal itself from almost any foe, or make an unsuspected approach upon its prey. There is yet another more important use for the position of the nostrils. The Crocodiles feed on fishes and various water-loving creatures, but also are in the habit of lurking by the river-bank, and suddenly seizing upon any unfortunate animal that may come to drink. Suppose, for example, that a calf or a dog is thus dragged into the water, the reptile grasps it across the body, and sinks below the surface, so as to keep the head of the victim below water while itself can breathe by means of the elevated nostrils.

But as during this process the mouth is held widely open, it might be rationally presumed that considerable inconvenience would be caused by the water running down the throat. Such would indeed be the case, were not this difficulty provided for by a simple yet very wonderful contrivance. At the back of the throat, a pair of thin, cartilaginous plates are so arranged, that when the animal opens its mouth the pressure of the water rushing into the mouth immediately closes one upon the other, and effectually prevents the passage of a single drop, the closure being in exact proportion to the volume of water. The structure, indeed, is very like that of the valves of the heart. The channels which lead from the nostrils run very far back through the skull, and open behind the throat-valves, so that respiration is in no way impeded. They cannot, however, swallow their prey while under water, but are obliged to bring it on shore for that purpose. The tongue is small, and fastened down to the lower jaw throughout its length, so that it was formerly thought that the Crocodiles were destitute of that organ.



AFRICAN CROCODILES AT HOME.

Testimonials to the "Tafeln" of Brehm's Thierleben.

The late CHARLES DARWIN writes:—"The illustrations are the best I ever saw in any work. I find it superfluous to enter here into particulars, as I already, in the 'Descent of Man,' have willingly and openly confessed how much I have profited by Mr. Brehm's book, and how highly I esteem it."

Sir JOHN LUBBOCK, Bart., D.C.L.:—"You have, I think, done good service in publishing them. They are certainly very admirable."
W. B. CAMPBELL, M.D., LL.D., writes:—"I can quite endorse the favorable opinions already given by distinguished zoologists as to the high character of the illustrations generally."

Animate Creation.

WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston, who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet, etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield, and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities. Our endeavor has been to find an author whose work would be noted for its fund of anecdote and vitality rather than for merely anatomical and scientific presentation, and we arrived at the conclusion that we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work—a work most popularly approved by speakers of the English language. It would be superfluous to say one word concerning the standard character of his book, from the pages of which old and young at the other side of the Atlantic have obtained so much instruction and rational amusement. Avoiding the lengthened dissertations and minute classifications of specialists, he presents to his readers in popular terms a complete treatise on the Animal Kingdom of all climes and countries. The one objection that could be urged against it was, that animal life in America might be treated more fully and American forms given more consideration. In order to obviate this drawback and to do full justice to the creatures of our own country, we secured the aid of Dr. J. B. HOLDER, of the American Museum of Natural History in New York, an undoubted American authority, who has adapted Wood's work to American wants and given prominence to American forms of Animal life.

The splendid work on Rodentia, by Allen, Coues, and others, will be fully consulted. The valuable work on North American Birds, by Baird, Brewer, and Ridgway, will be the guide in the treatment of birds. The late arrangement of the classification and nomenclature of North American Birds, by Mr. Ridgway, and the Committee on that subject of the Ornithologists' Union, will be utilized in full. The arrangement of Mammals will be after the latest classification by Professor Flower, of the Zoological Society of London.

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There is rather a curious structure in the vertebræ of the neck. These bones are furnished with short, transverse processes like false ribs, which have the effect of preventing the animal from turning its head from side to side. On land, therefore, where its feeble limbs are so inadequate to the support of the long and heavy body, it can easily be avoided by any one of ordinary agility. The eyes are large, and set rather far back upon the head. The ears are carefully guarded from the ingress of water by a pair of tightly-closing valves. Below the throat are a pair of glands which secrete a substance having a strong musky scent which is very disagreeable, and in old individuals taint the whole flesh with its rank odor, and render it uneatable to ordinary palates.

The young of these reptiles are hatched from eggs, which are strangely small in proportion to the large dimensions of the adult animal, the newly-hatched offspring being so small as hardly to be recognized as belonging to the same species as their parents, especially as there are certain differences of shape hereafter to be mentioned.

These great reptiles are divided, or rather fall naturally, into two families, namely, the Crocodiles and the Alligators. All the members of these families can be easily distinguished by the shape of their jaws and teeth, the lower canine teeth of the Crocodiles fitting into a *notch* in the edge of the upper jaw, and those of the Alligators fitting into a *pit* in the upper jaw. This peculiarity causes an obvious difference in the outline of the head, the muzzle of the Crocodiles being narrowed behind the nostrils, while that of the Alligators forms an unbroken line to the extremity. A glance, therefore, at the head will suffice to settle the family to which any species belongs. In the Crocodiles, moreover, the hind legs are fringed behind with a series of compressed scales.

OUR first example of the Crocodiles is the very remarkable GAVIAL, or GANGETIC CROCODILE, sometimes known by the name of NAKOO.

This curious reptile is one of the largest, if not the very largest of its order, sometimes reaching a length of twenty-five feet. As its popular name imports, it is a native of India, and swarms in many of the Indian rivers, the Ganges being greatly infested with its presence. It is a striking animal, the extraordinary length of its muzzle giving it a most singular and rather grotesque aspect.

This prolongation of the head varies considerably according to the age and sex of the individual. In the young Gavial, for example, just hatched from the egg, the head is short and blunt, and only attains its full development when the creature has reached adult age. The males can be distinguished from the other sex by the shape of the muzzle, which is much smaller at the extremity. There are many teeth, the full complement being about one hundred and twenty. They are similar in appearance, and about equal in length.

The color of this species is dark olive-brown, spotted with black. Several species of African Gavials are known to zoologists, besides the Asiatic animal, but on account of the different formation of the head, such as the absence of a swollen muzzle in the male, and some important variations in the plates of the neck and back, they are placed in another genus, and termed False Gavials. Two other Crocodiles are named, BENNETT'S GAVIAL (*Mecistops bennettii*), which is an inhabitant of Western Africa, and the FALSE GAVIAL (*Mecistops cataphractus*). Some naturalists, however, think that these animals are only varieties of the same species. The False Gavial is represented in the engraving on next page.

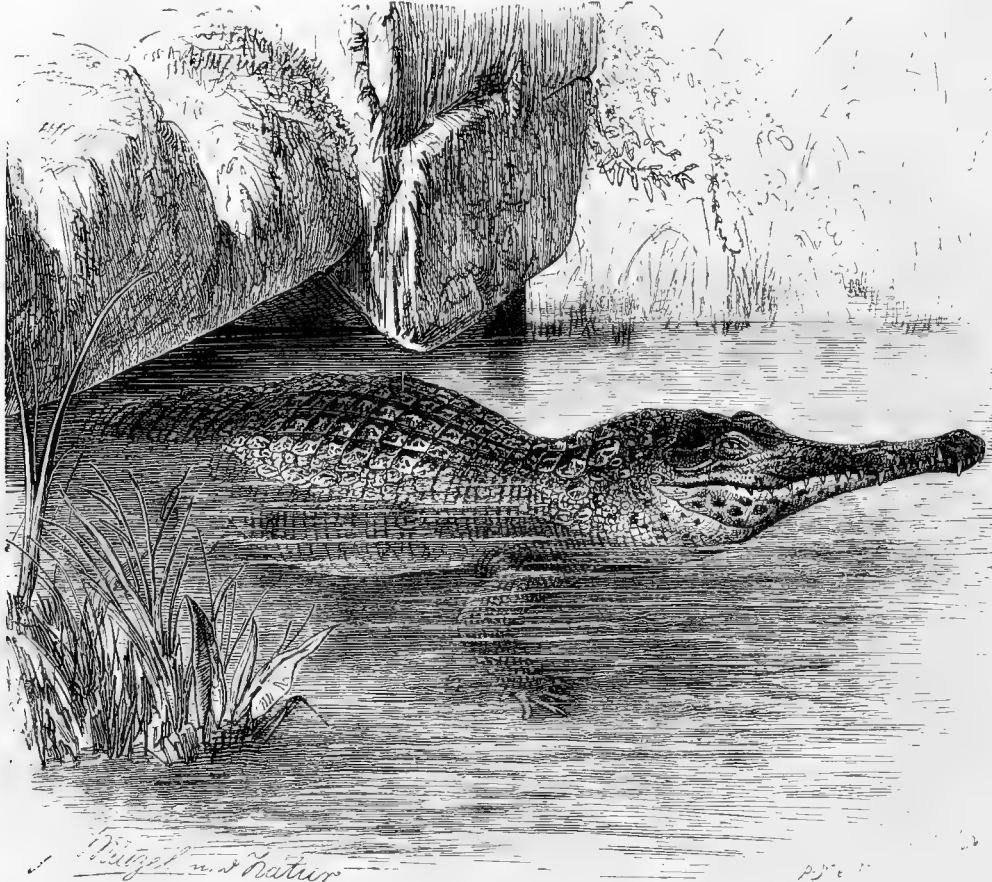
WE now arrive at the true Crocodiles, in which the jaws are moderately lengthened, wide, flat, tapering, and rather dilated at the extremities. The most peculiar of these reptiles is the long-celebrated CROCODILE of Northern Africa.

This terrible creature is found chiefly in the Nile, where it absolutely swarms, and though a most destructive and greatly dreaded animal, is without doubt as valuable in the water as the hyena and vulture upon the land. Living exclusively on animal food, and rather preferring tainted or even putrefying to fresh meat, it is of great service in devouring the dead animals that would otherwise pollute the waters and surrounding atmosphere.

It also feeds on fish, which it can catch by means of its great swiftness in the water,

and is a dangerous foe to cattle or other beasts that come to the river-side for drink. Some persons relate that when its intended victim does not come sufficiently near to be snapped up, the Crocodile crawls to the banks, and with a sweep of its long and powerful tail strikes the poor creature into the water, where it is immediately seized in the Crocodile's ready jaws.

Human beings have a great dread of this terrible reptile. Many instances are known where men have been surprised near the water's edge, or captured when they have fallen into the river. There is, it is said, only one way of escape from the jaws of a Crocodile, and



FALSE GAVIAL.—*Mecistops culaphractus*.

that is to turn boldly upon the scaly foe, and press the thumbs into his eyes, so as to force him to relax his hold, or relinquish the pursuit. Mr. Petherick relates a curious instance, where a man was drawing water, and was chased by a Crocodile into the recess in the earth in which he was standing while working the lever of the "shadoof." The man crouched as far back as he could squeeze himself, and the Crocodile tried to follow him, but got itself so firmly wedged in the narrow channel through which it was endeavoring to force its way, that it could neither reach the man, whose trembling breast was within a span of the reptile's terrible teeth, nor retreat from the strange position into which it had forced itself. After spending some time in terror, the poor man contrived to give the alarm to his comrades, who came running to his assistance, and despatched the Crocodile as it lay helplessly fixed in the crevice.

The plates which cover the skin of the Crocodile are of exceeding hardness, so hard, indeed, that they are employed as armor by some ingenious warriors. A coat of natural scale armor formed from the Crocodile skin may sometimes be seen. Even a rifle ball may be turned by these horny plates, provided that it strikes rather obliquely; and they are impervious to ordinary steel weapons. Modern rifles, however, especially if the ball is hardened with solder or tin, make little account of the plates, but cut their way through them without difficulty.



GAVIAL, OR GANGETIC CROCODILE.

As this reptile is so dangerous and costly a neighbor to the inhabitant of the river banks, many means have been adopted for its destruction. One such method, where a kind of harpoon is employed, is described by Dr. Rüppell: "The most favorable season is either the winter, when the animal usually sleeps on sand-banks, luxuriating in the rays of the sun, or the spring, after the pairing time, when the female regularly watches the sand islands where she has buried her eggs. The native finds out the place, and on the south side of it, that is, to the leeward, he digs a hole in the sand, throwing up the earth to the side which he expects the animal to take. Then he conceals himself, and the Crocodile, should it fail to observe him, comes to the accustomed spot and soon falls asleep.

"The huntsman then darts his harpoon with all his force at the animal, for in order that its stroke may be successful, the iron ought to penetrate to the depth of at least four inches, in order that the barb may be fixed firmly in the flesh. The Crocodile, on being wounded, rushes into the water, and the huntsman retreats into a canoe, with which a companion hastens to his assistance. A piece of wood attached to the harpoon by a long cord, swims on the water, and shows the direction in which the Crocodile is moving. The huntsmen, pulling at this rope, drag the beast to the surface of the water, where it is again pierced by a second harpoon. . . .

"When the animal is struck, it by no means remains inactive; on the contrary, it lashes instantly with its tail, and endeavors to bite the rope asunder. To prevent this, the rope is made of about thirty separate slender lines, not twisted together, but merely placed in juxtaposition, and bound round at intervals of every two feet. The thin lines get between the teeth or become entangled about them."

In spite of the great strength of the reptile, two men can drag a tolerably large one out of the water, tie up his mouth, twist his legs over his back, and kill him by driving a sharp steel spike into the spinal cord just at the back of the skull.

There are many other modes of capturing and killing the Crocodile, such as a hook baited with meat, to which the voracious reptiles are attracted by the cries of a pig, which is pulled by the tail or otherwise maltreated, for the purpose of eliciting those ear-piercing yells which aggrieved swine always produce. The yelping of a dog answers the same purpose, and is used in the same manner. In some cases the negroes are bold enough to engage the Crocodile in its own element, and to attack it with a long knife, which they plunge into the belly.

The eggs of the Crocodile are about as large as those of the goose, and many in number, so that these terrible reptiles would overrun the country, were they not persecuted in the earliest stages by many creatures, who discover and eat the eggs, almost as soon as they are laid. It is curious that the Crocodile is attended by a bird which warns it of danger, just as the rhinoceros has its winged attendant, and the shark its pilot fish. The Crocodile bird is popularly called the ziczac, from its peculiar cry.

SEVERAL other species of Crocodiles are known, among which two species are deserving of a short notice, namely, the INDIAN CROCODILE (*Crocodylus porosus*), and the AMERICAN CROCODILE (*Crocodylus americanus*). As the name of alligator is popularly given to these and other reptiles, there is great confusion respecting the precise animal which is under discussion.

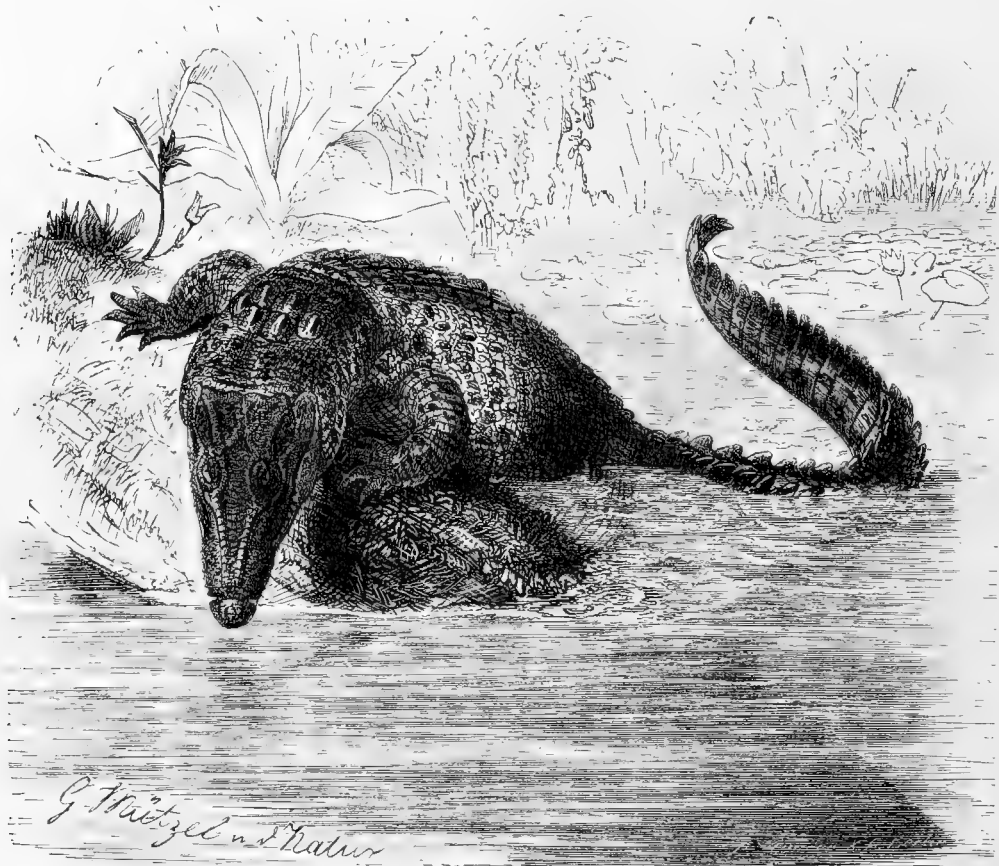
The Indian Crocodile, as its name imports, is an Asiatic species, and is found largely in India. It is sometimes called the DOUBLE-CRESTED CROCODILE, because the head is furnished with two long ridges extending from the front of the eye over the upper jaw. This species is common in Ceylon, and literally swarms in the still waters and tanks, though it is but rarely found in rapid streams, and never except in the low lands, the hill marshes being free from these pests. Respecting this animal, Sir E. Tennent writes as follows:

"The species which inhabit the fresh water is essentially cowardly in its instinct, and hastens to conceal itself on the approach of man. A gentleman who told me the circumstance, when riding in the jungle, overtook a Crocodile evidently roaming in search

of water. It fled to a shallow pool almost dried by the sun, and thrusting its head into the mud till it covered up its eyes, it remained unmoved in profound confidence of perfect concealment.

“Some years ago, during the progress of the pearl fishery, Sir Robert Wilmot Horton employed men to drag for Crocodiles in a pond which was infested with them in the immediate vicinity of Aripo. The pool was about fifty yards in length by ten or twelve wide, shallowing gradually to the edge, and not exceeding four or five feet in the deepest part.

“As the party approached the pond, from twenty to thirty reptiles, which had been basking in the sun, rose and fled to the water. A net, specially weighted so as to sink its lower edge to the bottom, was then stretched from bank to bank, and swept to the farther end of the pond, followed by a line of men with poles to drive the Crocodiles forward. So



INDIAN CROCODILE.—*Crocodylus porosus*.

complete was the arrangement, that no individual could avoid the net; yet, to the astonishment of the governor's party, not one was to be found when it was drawn on shore, and no means of escape was apparent or possible, except dashing into the mud at the bottom of the pond.”

The extreme tenacity of life possessed by these reptiles is well exemplified, though in a rather painful manner, by an incident which occurred in Ceylon. A fine specimen had been caught by a hook, to all appearance killed, the viscera removed, and the aperture kept open by a stick placed across it. A few hours afterwards the men came to their victim with the intention of cutting off the head, but were much surprised to find the spot vacant. On examination of the locality, it was evident that the creature had recovered itself in some strange manner, crawled away for some distance, and made its escape into the water.

The same author also describes the habits of another species, the MARSH CROCODILE (*Crocodylus palustris*), sometimes known by the names of MUGGER, or GOA; an animal which has a large range of locality, being found in Asia and Australia. Sometimes this species grows

to a great length. I have seen a skull twenty-six inches in length, denoting a total length of thirty-three feet.

This animal is in the habit of traversing considerable distances in search of water, but, according to the Singhalese, its feet are sadly cut in passing over the hard, stony ground. If it is baffled in its search, it returns to the exhausted pool, burrows beneath the mud, and there waits until released by the rains. Sir E. Tennent mentions one instance where he saw the recent impress of a Crocodile in the mud from which it had just emerged, and he was told of a curious incident which befell an officer attached to the surveying department. Having pitched his tent, he had retired to rest as usual, but during the night he was disturbed by a movement of the earth below his bed. On the following morning the mystery was solved by the appearance of a Crocodile, which made its way from under the bed.

As is the case with the common Crocodile of Egypt, the young of this reptile are very small when hatched, but so fierce, even in their early days, that they can be caught by pushing a stick towards them, letting them bite it, and pulling them out before they loosen their hold. A gentleman who has resided for eight years in Ceylon told me that one of his friends was so taken with the appearance of these little reptiles, that he captured one, packed it carefully, and took it home. On arriving in his house, he put the Crocodile, then about nine or ten inches long, into a basin of water, and left it. Shortly afterwards a little boy, one of his children, peeped into the basin, and seeing the Crocodile, gave it a push with his finger. The fierce little creature at once snapped at the offending finger, and held it so tightly that the poor child could not shake it off, and ran screaming about the house with the young Crocodile dangling at the end of his finger, until it was removed by an attendant.

ANOTHER well-known species is the AMERICAN CROCODILE, so often and so wrongly termed the alligator. This reptile is found in the tropical and hotter parts of America, and is very common in some localities. When first hatched, the young seem to feed only on living insects, and according to the experiments of M. Bosc, they would not even touch the insects with which they were supplied, until their intended prey began to crawl. During the summer they become lively at night, and make such a hideous bellowing that a person unaccustomed to it has no chance of sleeping. They also have a habit of clattering their jaws together with a loud noise.

This creature is only lately a known resident in North American waters. But few years since, it was supposed that the islands of the West Indies were the most northern range of any species of Crocodile. Dr. Jeffries Wyman, of Boston, discovered a specimen in Bisquine Bay, off the southern extremity of Florida. Three years since, Mr. Ralph Monroe, of Staten Island, N. Y., visited that region, and, while hunting on Virginia Key, some miles from the mainland, discovered several Crocodiles. Two of them he captured, and the preserved skins he presented to the American Museum, in Central Park. Since then, he has killed a specimen of the largest known dimensions, fourteen feet in length, which he has sent to the same institution.

The first comparison with the alligator does not impress one with any considerable sense of difference, but the difference in breadth of the heads, when viewed from above, is very striking. That of the Crocodile is extremely narrow, while that of the alligator is heavy and very wide. The entire "build" of the Crocodile is manifestly favorable to a maritime existence, while that of the alligator is for just such a life as it leads, one of sluggishness and inactivity.

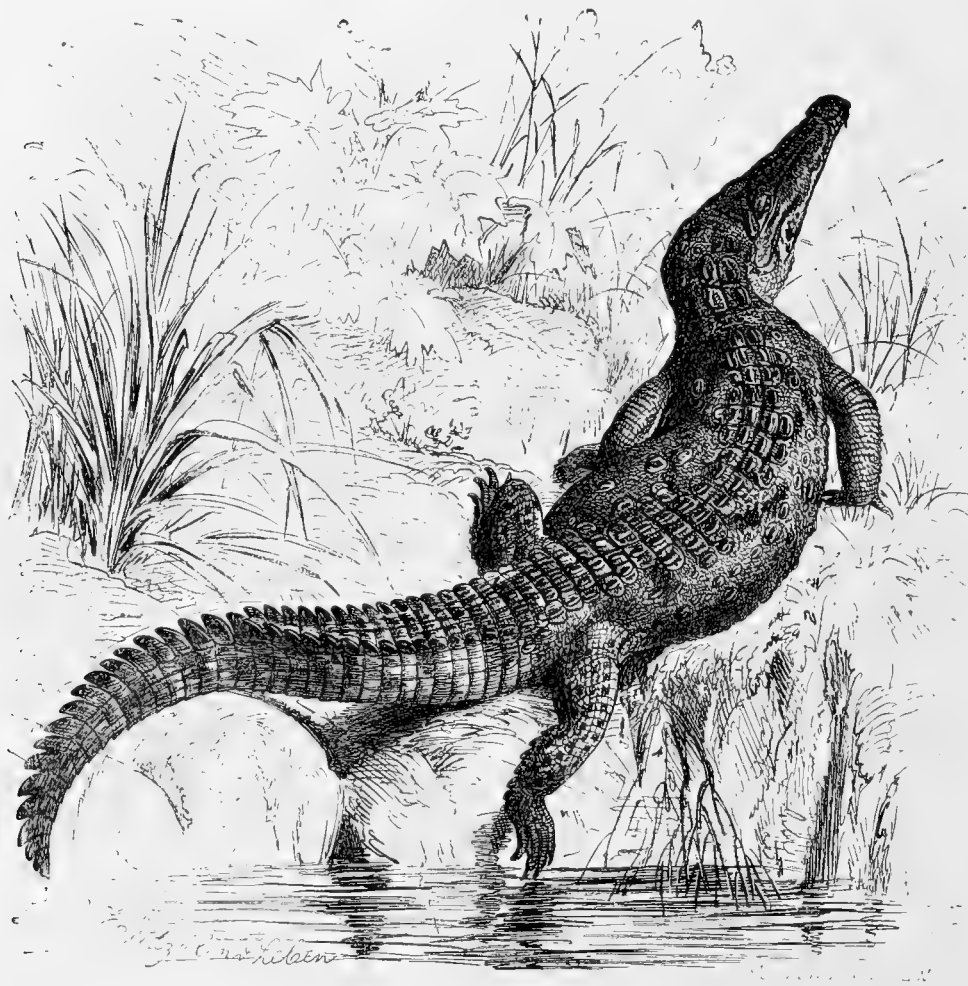
The Crocodile is an active swimmer, and its teeth and jaws are evidently constructed to seize upon fishes while swimming. It is seen mostly in salt-water creeks near the ocean.

Some doubt has been entertained about the identity of this species with that found in the West Indies. It is very natural for this creature, being a sea-going one, to swim across the Florida Straits. It is illustrated on the next page.

ANOTHER species, the MARGINED CROCODILE (*Crocodilus marginátus*), resides in the rivers of Southern Africa. It may be distinguished from the Egyptian species by the great

concavity of the forehead, and the strong keels of the dorsal, or back plates. I am indebted to Captain Drayson, author of "Sporting Scenes among the Kaffirs," for the following account of the Margined Crocodile and its habits, from which it appears that the reptile is formidable not only to the creatures on which it usually feeds, but to man himself:—

"About two or three miles from the Bay of Natal there is a river called the Umganie; into this river a lake called the Sea-cow Lake empties itself. The lake was, during my residence at Natal, the retreat of several hippopotami and Crocodiles, both of which were in the habit of *treking* into the Umganie River. Often, when riding round the banks of this lake, I have disturbed two or three Crocodiles, which were stealing amongst the reeds and long grass,

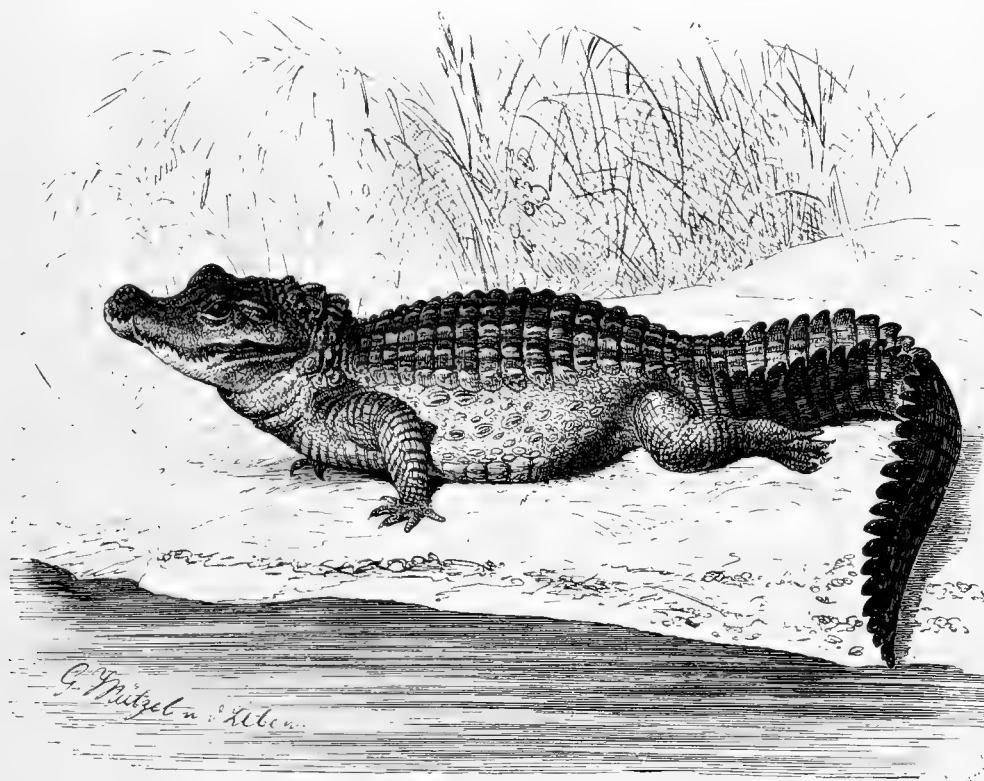


AMERICAN CROCODILE.—*Crocodylus americanus*.

in hope of stalking a fat toad, or a sleepy guana. Sometimes a scaly reptile might be awakened from his dose by the sound of my horse's feet, and would rush through the long reeds towards his retreat. Their movement is much more rapid than would be supposed from their appearance, and they care nothing for a fall head over tail, but almost fling themselves down the steep banks when alarmed.

"On the banks of the Umganie were several Kaffir kraals, in one of which resided a man who had been roughly treated by a Crocodile. This man, seeing me pass his residence, called to me, and asked as a favor that I would watch at a particular part of the river until I shot a rascally Crocodile that had nearly killed him. The Crocodile, he informed me, always made its appearance about sundown, and he hinted that a position might be selected so that the sun would dazzle the Crocodile and prevent him from seeing me. Finding that I was willing to gratify his revenge, he limped out of the inclosure surrounding his huts, and offering me his snuff-gourd, he, at my request, gave me the following account of his escape.

“He had so frequently crossed the stream below his huts at all times of day, and had seen Crocodiles of small dimensions, that he had become, as it were, familiarized to them, and did not imagine that there was any danger to be expected from them. One evening, at about sun-down, he was wading across the river, the water of which reached above his waist. Suddenly he felt himself seized by the under part of his thigh, whilst he was at the same instant dragged under water. His wife was following him, and seeing him fall, she scrambled forward to the place where he had disappeared, and thus caused considerable noise and splashing, which (or something else, perhaps the toughness and bad flavor of the Kaffir) had the effect of making the Crocodile quit his hold on the Kaffir, not, however, without tearing off a great portion of the under part of his thigh. The man, with difficulty, escaped to the shore, but he remained a cripple for life, unable to do more than put the toes of his foot on the ground.”



MARGINED CROCODILE.—*Crocodylus marginatus*.

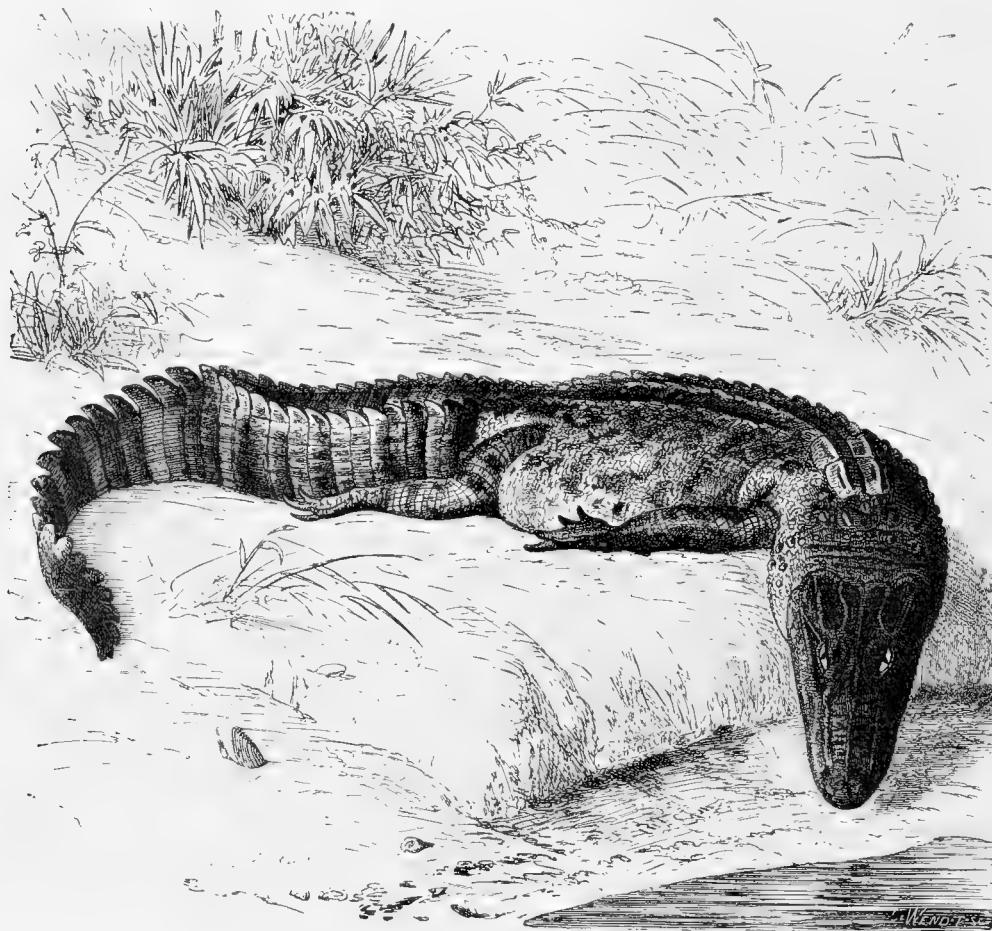
WE now come to the ALLIGATORS, the second family of those huge reptiles which may be known, as has already been mentioned, by the lower canine teeth fitting into pits in the upper jaw. They are divided into three genera, all of which are inhabitants of the New World. They are indiscriminately called Alligators, Crocodiles, or Caymans, by the natives or the non-zoological traveller, and there is consequently much difficulty in identifying the particular species. The genus Alligator may be known by the partly-webbed toes, the outer toe being free.

The COMMON ALLIGATOR inhabits Northern America, and is plentifully found in the Mississippi, the lakes and rivers of Louisiana and Carolina, and similar localities. It is a fierce and dangerous reptile, in many of its habits bearing a close resemblance to the crocodiles, and the other members of the family.

Unlike the crocodile, however, it avoids the salt water, and is but seldom seen even near the mouths of rivers, where the tide gives a brackish taste to their waters. It is mostly a fish-eater, haunting those portions of the rivers where its prey most abounds, and catching them by diving under a passing shoal, snapping up one or two victims as it passes through them, tossing them in the air for the purpose of ejecting the water which has necessarily filled its mouth, catching them adroitly as they fall, and then swallowing them. Though timid, as are

most reptiles as long as their passions are not touched, the Alligator has within it a very mine of furious rage, which, when aroused, knows no fear. Urged by a blind instinct that sees no obstacles, and hardly deserves so intellectual a name as anger, it flings itself upon the assailants, and only ceases its attack as its last breath is drawn.

No easy matter is it to drive the breath out of an Alligator, for its life seems to take a separate hold of every fibre in the creature's body, and though pierced through and through with bullets, crushed by heavy blows, and its body converted into a very pin-cushion, spears taking the place of the pins, it writhes and twists, and struggles with wondrous strength, snapping direfully with its huge jaws, and lashing its muscular tail from side to side with such vigor that it takes a bold man to venture within range of that terrible weapon.



ALLIGATOR.—*Alligator mississippiensis*.

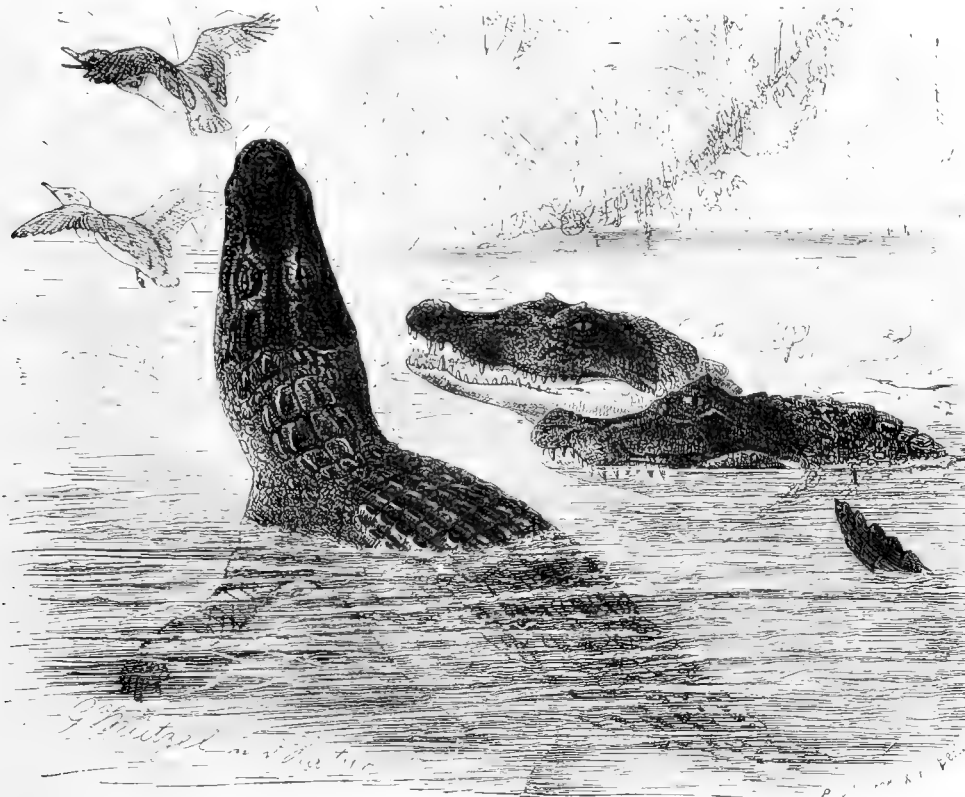
It is fortunate for the assailant that its head is not gifted with mobility equal to that of the tail. The Alligator can only turn its head very slightly indeed, on account of two bony projections, one on each side of the head, which are efficient obstacles to any but the smallest lateral motion. The antagonist may therefore easily escape if on land, by springing aside before the reptile can turn. He must, however, beware of its tail, for the Alligator when angry, sweeps right and left with that powerful member, and deals the most destructive blows with wonderful rapidity. Still, the creature would rather avoid than seek a combat, and does not act in this fashion until driven to despair.

In some parts of America they catch the Alligator in a very ingenious manner. An ordinary hook is said to be of little service against such a quarry, and the natives employ a kind of mixture between a hook and grapnel which very effectually answers their purpose. This so-called hook is made of four sticks of hard tough wood barbed at each end, slightly curving and bound together at one end so as to cause all the upper barbs to radiate from each other.

This apparatus is baited with the flesh of some animal, and suspended just about a foot from the water, the other end of the rope being made fast to a tree or strong stake.

As soon as the Alligator takes this bait and begins to pull at the cord, the barbs begin to make their way into its throat, and it is evident from the construction of the hook that the more the animal pulls, the firmer are the barbs struck into its throat. When thus hooked, its struggles are terrific, and Mr. Waterton, who succeeded in capturing a fine specimen more than ten feet in length, had the greatest difficulty in securing it without damaging its appearance.

The eggs of the Alligator are small and numerous. The parent deposits them in the sand of the river side, scratching a hole with her paws, and placing the eggs in a regular layer therein. She then scrapes some sand, dry leaves, grass and mud over them, smoothes it and deposits a second layer upon them. These eggs are then covered in a similar manner and



JACARE, OR YACARE.—*Jacare sclerops*.

another layer deposited until the mother reptile has laid from fifty to sixty eggs. Although they are hatched by the heat of the sun and the decaying vegetable matter, the mother does not desert her young, but leads them to the water and takes care of them until their limbs are sufficiently strong and their scales sufficiently firm to permit them to roam the waters without assistance.

As is the case with the crocodiles, the young Alligators are terribly persecuted by birds and beasts, and are even in danger of being eaten by the old males of their own species. During the winter months the Alligator buries itself in the mud, but a very little warmth is sufficient to make it quit its retreat and come into the open air again. While lively, especially at night, it is a most noisy animal, bellowing in so loud a tone and in so singular a cadence that even the nightly concert of jaguars and monkeys is hardly heard when the Alligators are roaring.

It sometimes attains to a great size, and is then formidable to man. Mr. Waterton mentions a case when one of these creatures was seen to rush out of the water, seize a man and

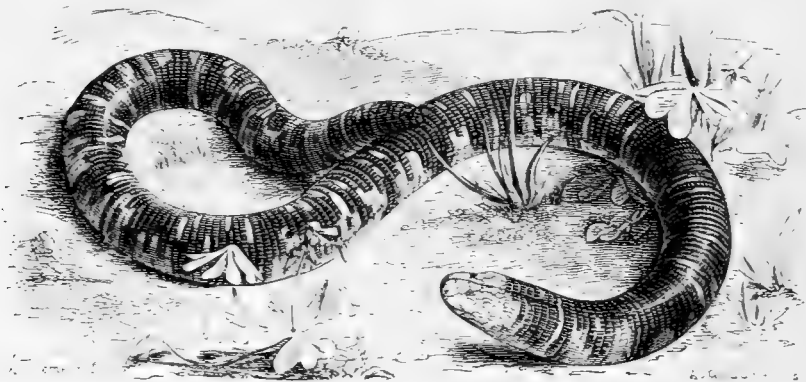
carry him away in spite of his cries and struggles. The beast plunged into the river with his prey, and neither Alligator nor man were afterwards seen.

The Alligator is a familiar reptile on the Gulf coast, and in the rivers of Florida. Its length is usually about six or seven feet. Specimens are found at times twice this length—fourteen feet being the extreme. A fine example in the Central Park Museum is twelve feet in length. The term Alligator is a corruption of the Spanish *el lagarto*, a lizard. Five species are known in various parts of the world.

THE JACARE, or YACARE (*Jacare sclerops*), also belongs to this family. It inhabits Brazil, and is not uncommon. It may be known by the ridge across the face between the eyes, the scarcely-webbed hind feet and the fleshy eyelids. On account of the aspect of its eyes it is sometimes called the Spectacled Cayman. It is said that, although this reptile attains a very large size, it will not attack a man even in the water, provided that he always keeps in motion. They pass the night in the water and the day on the shore, where they lie sleeping on the sand, dashing into the water if alarmed. It is depicted on the foregoing page.

AMPHISBÆNIDÆ.

WE now leave the crocodiles and alligators, and proceed to another order of reptiles. These creatures are termed Amphisbænidæ, from two Greek words signifying to go both ways, in allusion to the shape of the animal, which looks as if it had a head at each extremity. In former times, indeed, it was thought that not only could these reptiles creep backward and forward with equal ease, but that they absolutely possessed two veritable heads. None of these reptiles are of great size. They are divided into four families, three of which are without external feet, and the members of the other family only possess the front pair of legs very slightly developed. Their eyes are very minute and entirely covered with skin, so that their sight must be of the most limited character. As in the case of the mole, however, this deprivation of sight does not interfere with the welfare of the animal, for it lives mostly beneath the earth, where eyes would be useless.



SOOTY AMPHISBÆNA.—*Amphisbæna americana*.

The SOOTY AMPHISBÆNA is a native of Southern America, being found most plentifully in Brazil and Cayenne. It lives almost wholly underground, boring its way through the soft earth like the common worm, and traversing the soil with considerable address. It feeds upon animal substances, and is very fond of ants, termites, and their young. Indeed, it is no extraordinary occurrence on

breaking down a termite's nest, to find an *Amphisbæna* within, luxuriously curled up in the midst of plenty. Ants' nests below the ground are often penetrated and ransacked by this reptile.

Being too small to injure man by sheer force, and being devoid of poisonous teeth, this creature is quite harmless except to the insects on which it feeds. It is able to crawl in either direction with nearly equal ease and rapidity, and on account of the bluntness of its tail and the almost imperceptible eyes, affords some reason for the popular idea of its possessing two heads.

In speaking of this reptile, Stedman has the following remarks: "This is the snake which, supposed blind, and vulgarly said to be fed by the large ants, is in this country honored with the name of King of the Emmets. The flesh of the *Amphisbæna*, dried and reduced to a fine powder, is confidently administered as a sovereign and infallible remedy in all cases of dislocation and broken bones, it being very naturally inferred that an animal which has the power of healing an entire amputation in its own case, should at least be able to cure a simple fracture in the case of another."

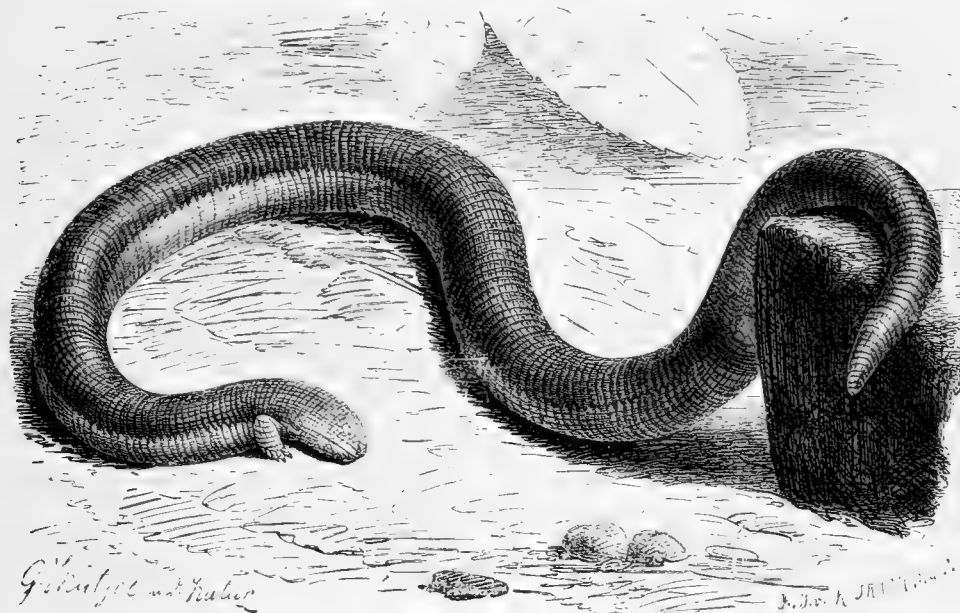
This process of reasoning alludes to a curious popular error respecting the *Amphisbæna*. The people of the countries which it inhabits believe that, if one of these reptiles is cut in two, each half, being furnished with a separate head, hastens to its fellow-part, and neatly fitting the severed surfaces, repairs the breach, and is soon restored to its original condition.

It is rather a dull and sluggish animal when exposed to light, crawling slowly upon the ground, twisting itself lazily about, and opening its mouth in a purposeless kind of fashion, without any definite intention of biting or escaping.

The color of the Sooty *Amphisbæna* is rather variable, but consists of black and white. Its length is about three feet. The White *Amphisbæna* (*Amphisbæna alba*) belongs also to this genus. It is of a white color, and remarkable for a little pellucid dot in the front edge of each scale.

CLOSELY allied to this creature is another reptile, very appropriately called the CHEIROTES, or HAND-EARED LIZARD (*Cheirôtes lumbricoides*). This is a native of Brazil, and, as far as is known, is of subterranean habits, like the *amphisbæna*.

The *Cheirotes* is the only example of all the *amphisbænas* that possesses external limbs, and even in this instance they are small and but slightly developed. There are no hind legs,



CHEIROTES, OR HAND-EARED LIZARD.—*Cheirôtes lumbricoides*

but the two fore legs are set just behind the head; nearly in the place where the ears might be expected to be seen. They are very short, rather flat and strong, and are terminated with five toes, four of which are armed with a tolerably strong claw. The fifth toe is very small and without a claw.

The head of this creature is no larger than the body, the teeth are conical, moderately strong and slightly curved backwards, the muzzle is arched, the tongue horny at the tip, the tail is short, and there is a row of small pores on the under side of the abdomen. In our illustration the animal is shown in its natural size, which varies from eight to ten inches. Its

color is yellow, spotted with brown above, and whitish below. This species is the sole representative of its family. The other two families—namely, the Trigonophidæ and the Lepidosternidæ—may easily be distinguished by the fact that in the former the teeth are set in the margin of the jaws, instead of on their inner side as in the other families; and that, in the latter, the scales on the chest are larger and of different shapes, whereas in the other two families they are all squared. Moreover, the pores under the abdomen are absent.

SCALED REPTILES; SQUAMATA.

LIZARDS; OR SAURA.

SLENDER-TONGUED LIZARDS; SEPTOGLOSSÆ.



Now leave the shielded reptiles and proceed to the Scaled Lizards. These creatures form a very large and important group, and may be distinguished from the previous section by the covering of the body, which is formed of scales either granular or overlapping each other, instead of the straight-edged plates which cover the bodies of the tortoise and crocodiles. The tongue of these animals is rather long, nicked at the tip, and often capable of extension. The young are produced from eggs, sometimes hatched before being deposited, but generally after they have been laid in some suitable spot. The eggs are covered with a rather soft, leathery shell.

The true LIZARDS have four limbs, generally visible, but in a few instances hidden under the skin. Their body is long and rounded, and the tail is tapering and mostly covered with scales set in regular circles or "whorls." The mouth cannot be dilated as in the snakes; because the under jawbones are firmly united in front, instead of being separable as in the serpents. The ear has a very singular appearance, the drum or "tympanum" being mostly distinct and exposed.

There are twenty-four families of true Lizards, and passing by several anatomical and structural distinctions, which will be found at the end of the volume, we will proceed at once to the first family, called the MONITORS. In all these creatures the head is covered with very little, many-sided scales; the tongue is long, slender, and capable of being withdrawn into a sheath at its base; the scales are small, rounded, and arranged in cross rings, those of the side resembling those of the back; the legs are four in number, and each foot has five toes. They are all inhabitants of the Old World, and are seldom, if ever, found far from water.

OUR first example of the true Lizards is the WHITE-THROATED REGENIA, or WHITE-THROATED VARAN, a remarkably fine and powerful species of Lizard, inhabiting Southern Africa. A rather full and accurate description of this Lizard is given by Dr. Smith:—

"It is usually discovered in rocky precipices or on low stony hills, and when surprised seeks concealment in the chinks of the former or the irregular cavities of the latter, and where any irregularities exist on the surface of the stones or rocks, it clasps them so firmly with its

toes that it becomes a task of no small difficulty to dislodge it, even though it be easily reached. Under such circumstances the strength of no one man is able to withdraw a full-grown individual, and I have seen two persons required to pull a specimen out of a position it had attained, even with the assistance of a rope tied in front of its hinder legs. The moment it was dislodged it flew with fury at its enemies, who by flight only saved themselves from being bitten. After it was killed, it was discovered that the points of all the nails had been previously broken or at the moment it lost its hold.



WHITE-THROATED REGENIA.—*Regenia albogularis*.

“It feeds upon crabs, frogs, and small quadrupeds, and from its partiality to the two former, it is often found among rocks near running streams, which fact having been observed by the natives, has led them to regard it as sacred, and not to be injured without danger of drought.”

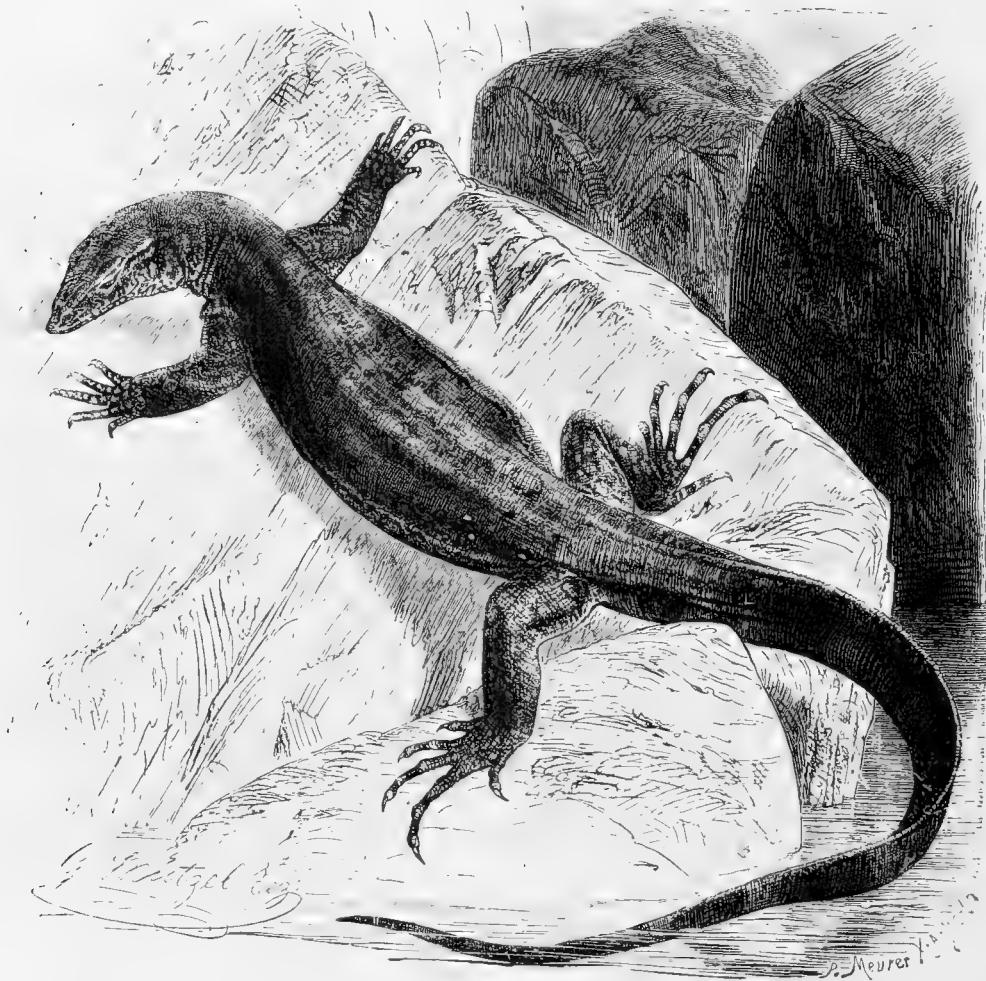
This fine Lizard has large, oblique nostrils, a shortish tail with a double keel on its upper surface, and the scales are oblong and have a blunt ridge or keel. The head is short and the scales of the body are large, convex, and surrounded with granulations. The length of the full-grown *Regenia* is nearly five feet, and its color is dark brown, above variegated with large white spots, and paler beneath, especially under the throat.

THE NILOTIC MONITOR, OR VARAN OF THE NILE, as it is sometimes called, is, as its name imports, a native of those parts of Africa through which the Nile, its favorite river, flows.

The natives have a curious idea that this reptile is hatched from crocodile's eggs that have been laid in hot elevated spots, and that in process of time it becomes a crocodile. This odd belief is analogous to the notion so firmly implanted in the minds of our own sea-side

population, that the little hermit crab, which is found so plentifully in periwinkle shells, is the young of the lobster before it is big and hard enough to have a shell of its own.

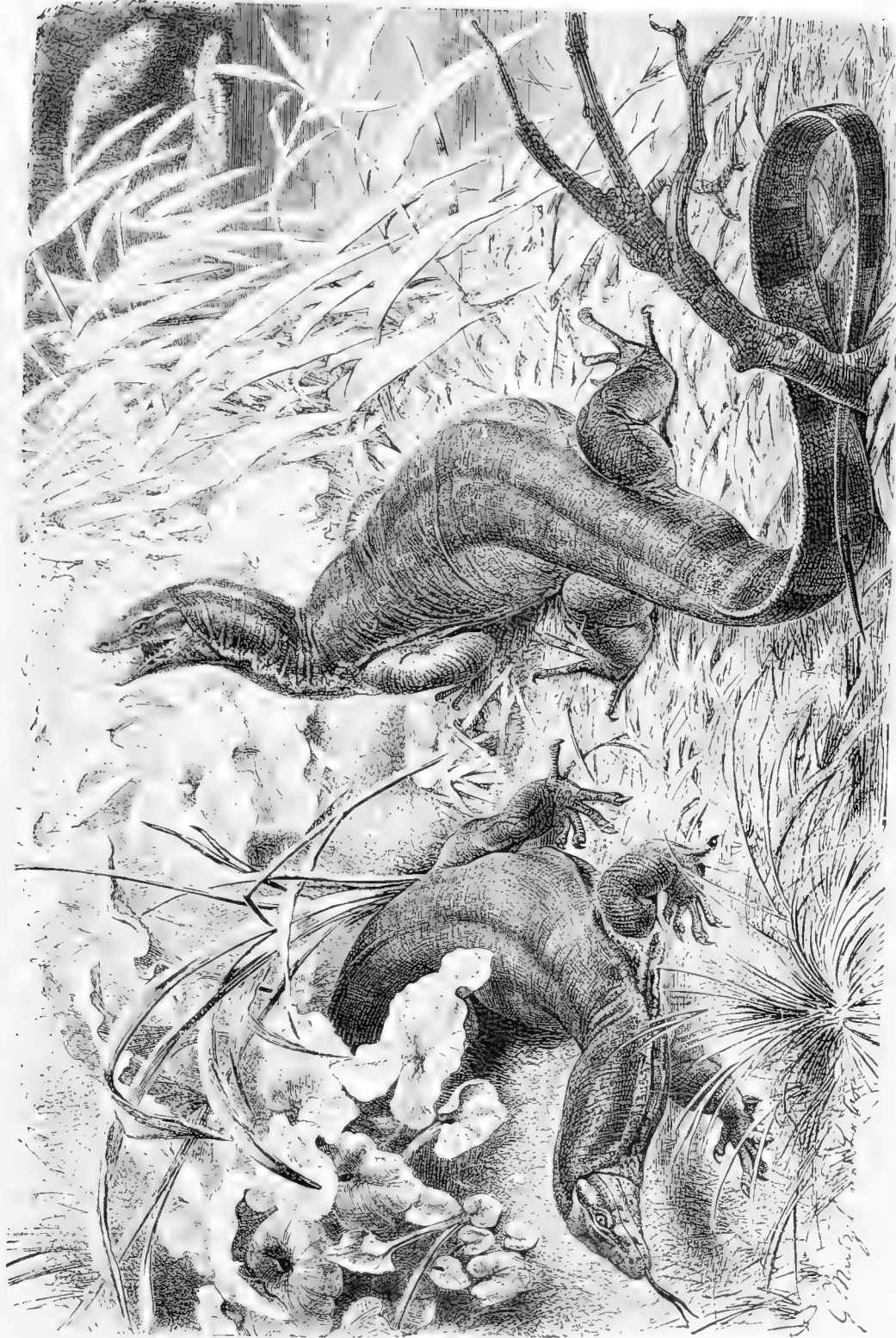
It is almost always found in the water, though it sometimes makes excursions on land in search of prey. To the natives it is a most useful creature, being one of the appointed means for keeping the numbers of the crocodile within due bounds. It not only searches on land for the eggs of the crocodile, and thus destroys great numbers before they are hatched, but chases the young in the water, through which it swims with great speed and agility, and devours them unless they can take refuge under the adult of their own species, from whose protection the Monitor will not venture to take them.



NILOTIC MONITOR.—*Monitor niloticus*.

When full grown, the Nilotic Monitor attains a length of five or six feet. The color of this species is olive-gray above, with blackish mottlings. The head is gray, and in the young animal, is marked with concentric rows of white spots. Upon the back of the neck is a series of whitish-yellow bands, of a horse-shoe, or semilunar shape, set crosswise, which, together with the equal-sized scales over the eyes, serve as marks which readily distinguish it from many other species. The under parts are gray, with cross bands of black, and marked with white spots when young.

Specimens belonging to this genus are scattered over the greater part of the world. For example, the INDIAN MONITOR (*Monitor dracena*) is found in the country from which it takes its name. It is rather a prettily marked animal, being brown with black spots when old, and yellow eye-like marks when young. Another species, GOULD'S MONITOR (*Monitor gouldii*), inhabits Australia, being most commonly found on the western side of the land.

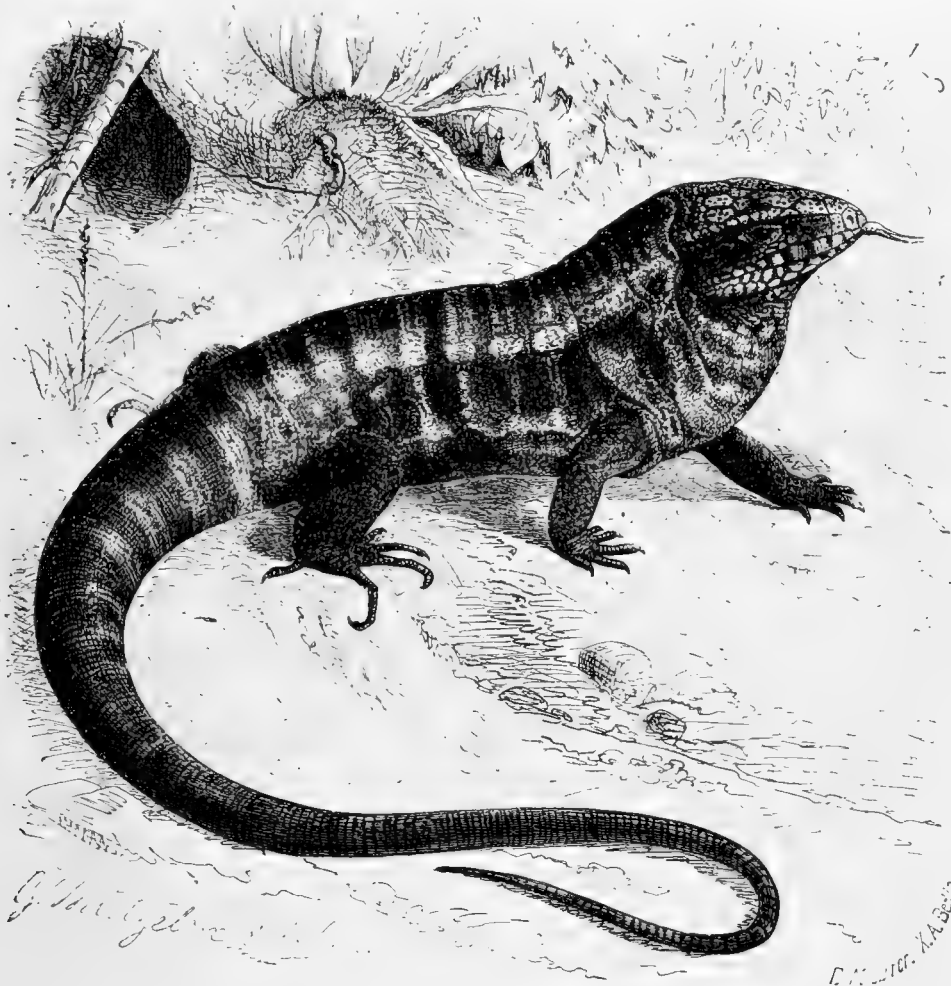


INDIAN MONITOR.



WE now arrive at another family of Lizards, called from the typical species, the Teguexins. In these reptiles, the head is covered with large, regular, many-sided shields, the sides are flat, and the throat has a double collar.

Our first example is the TEGUEXIN, or VARIEGATED LIZARD, so called on account of the contrasting colors with which it is decorated. It is also known by the name of SAFEGUARD, a title which has been given to it because it is thought to give notice, by hissing, of the approach of the alligator. The monitors derive their name from a similar belief, they being thought to warn human beings of the approach of poisonous serpents.



TEGUEXIN, OR VARIEGATED LIZARD.—*Tejus tejuixin*.

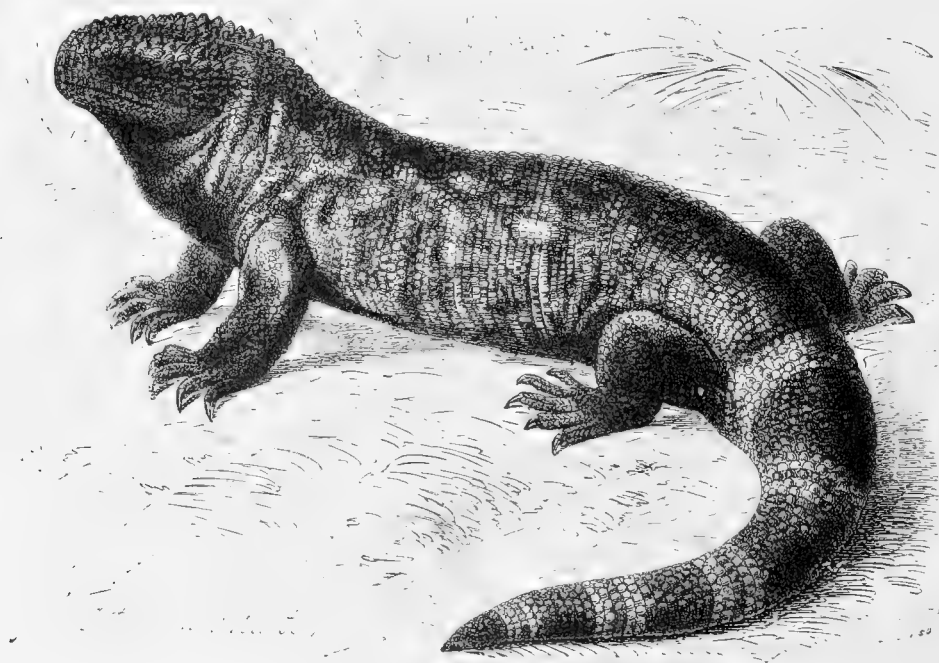
Several species of Teguexin are known, all inhabiting the warmer portions of America, and possessing similar habits. It is said that, although strong and agile, they do not ascend trees, but range at will the hot sandy plains or the dense damp underwood on the margins of lakes and rivers, into which they plunge if alarmed, and remain below the surface until the danger has passed away, their capacious lungs and imperfect circulation permitting them to endure a very long immersion without inconvenience.

The Teguexin is a large and powerful Lizard, exceeding five feet in length when full grown, and extremely active. It feeds mostly, if not entirely, upon animal food, and makes great havoc among snakes, frogs, toads, and other semi-aquatic creatures. It often indulges in diet of a higher nature, and when it can find an opportunity, devours poultry, or breaks and eats their eggs. Sometimes it has been known to eat Lizards of a closely allied species, a fact which has been proved by finding some bones, and other portions of the Ameiva lizard within the stomach of a Teguexin that had been killed. Together with these relics were found the shelly wing-cases of beetles, and the skins of sundry caterpillars.

The teeth of this species are strong, and the reptile can bite with great force. It is a bold and determined combatant when attacked, and if it succeeds in grasping a foe, retains its hold with the pertinacity of the bulldog. The flesh of the Teguexin is eaten, and thought to be excellent. According to Azara, the skin of its tail, when separated into rings, is considered to be a safeguard against paralysis, and worn for that purpose, as well as to remove tumors, another healing power which it is supposed to possess.

The general coloring of the Teguexin is as follows: The upper parts are deep black, with bold mottlings of yellow or green. On the upper part of each side there are two series of white spots, and the under parts are mostly yellow, with black bands. The coloring is, however, extremely variable.

THE curious little AMEIVA, which has just been mentioned as falling a victim to the previous species, is closely allied to the Teguexin. It is rather a pretty Lizard, with a very long whip-like tail, and peculiarly elongated toes on the hinder feet. The long tail is covered with a series of scales, arranged in rings, of which about one hundred and twenty have been counted in a perfect specimen. The color of the Ameiva is dark olive, speckled with black on the nape of the neck and front of the back. On the sides are rows or bands of white spots edged with black, from which peculiarity it is sometimes called the Spotted Lizard. There are many species of Ameiva, inhabiting either Central America, or the West Indian Islands.



CRUST LIZARD.—*Heloderma horridum*.

THE very odd-looking creature, scientifically termed *Heloderma horridum*, which is seen in the engraving, is an inhabitant of Mexico, where the natives call it Tola-chini. Though looking somewhat like an Ameiva, it forms a separate family, of which it is the only species. It differs from the Ameiva by the formation of its teeth and tail, the latter being thick, and shorter than the body. As the pointed teeth are set as in the deadly snakes, the natives of Mexico believe the reptile's bite to be fatal. This belief, however, is without any foundation, as the reptile really possesses no poisonous fangs. Like some frogs, the *Heloderma* has a penetrating scent, and when disturbed, it ejects an odorous saliva from its mouth. During the day it hides in self-made holes at the foot of trees, and there it lays in a lethargic position until night, when it chases its prey, consisting of beetles, worms and frogs. The *Heloderma* is of an earthy-brown color, the whole body being covered with yellow, white, and brownish-red spots, and the tail with dark scales. It attains a length of nearly three feet three inches.

THE SIX-LINED TARAGUIRA also belongs to the Teguxins. This pretty little Lizard, with its dark green body, and yellow streaks, inhabits North America. Mr. Holbrook makes the following remarks respecting its habits: "This is a very lively, active animal, choosing dry and sandy places for its residence, and is frequently met with in the neighborhood of plantations, or near fences and hedges. Most usually it is seen on the ground in search of insects; its motions are remarkably quick, and it runs with great speed. It is very timid. It feeds on insects, and generally seeks its food towards the close of the day, when they may be seen in corn fields, far from their usual retreat; and not unfrequently I have met male and female in company."

The Six-lined Lizard (*Onemidophorus sexilineatus*), called in the South "Taraguera," inhabits the States from Virginia to Mexico.

A brief notice must also be given of two curious species, also belonging to the same family. The first is the SPURRED CENTROPYX, or SPURRED LIZARD (*Centropyx calcatus*), so called from two pair of small, sharp, horny spikes, which are set at each side of the base of the tail. The color of this species is olive-green above, with three streaks of a paler hue, and a double series of black spots on the back. Below it is greenish-white.

The other species is the GREAT DRAGON (*Ada guianensis*), a native of tropical America. This fine Lizard is generally from four to nearly six feet in length, and is strong and nimble. It does not appear to be so good a swimmer as some of the preceding species, but runs fast, and can climb trees with great agility. It is generally found among the marshy and low-lying lands, though it spends more time on the land than in the water.

It is a desperate fighter when attacked, and as it has a habit of hiding itself in a deep burrow, and bites fiercely at the hand that is thrust forward to seize it, it is not easily captured. It is, however, much sought after, as its flesh is very good, and the eggs are thought to be great delicacies. There are usually from thirty to forty eggs. The general color of this reptile is olive, yellow beneath, and mottled with brown.

There are twelve genera and about forty species of the family *Teidæ*, or the Teguxins, this name being derived from some local designation. They are all peculiar to the New World.

THE true LIZARDS, or Lacertinidæ, now come before our notice. The tongue of these reptiles is long, flat, can be thrust out to some distance, and very deeply forked. The teeth are hollow at their roots, the scales are keeled, and the sides are flat. They are scattered over the greater part of the globe.

Europe possesses at least two examples of this family, one of which, the SCALY LIZARD, is extremely common.

This pretty little reptile is extremely plentiful upon heaths, banks and commons, where it may be seen darting about in its own quick, lively manner, flitting among the grass stalks with a series of sharp, twisting springs, snapping up the unsuspecting flies as they rest on the grass blades, and ever and anon slipping under shelter of a gorse bush, or heather tuft, only to emerge in another moment brisk and lively as ever.

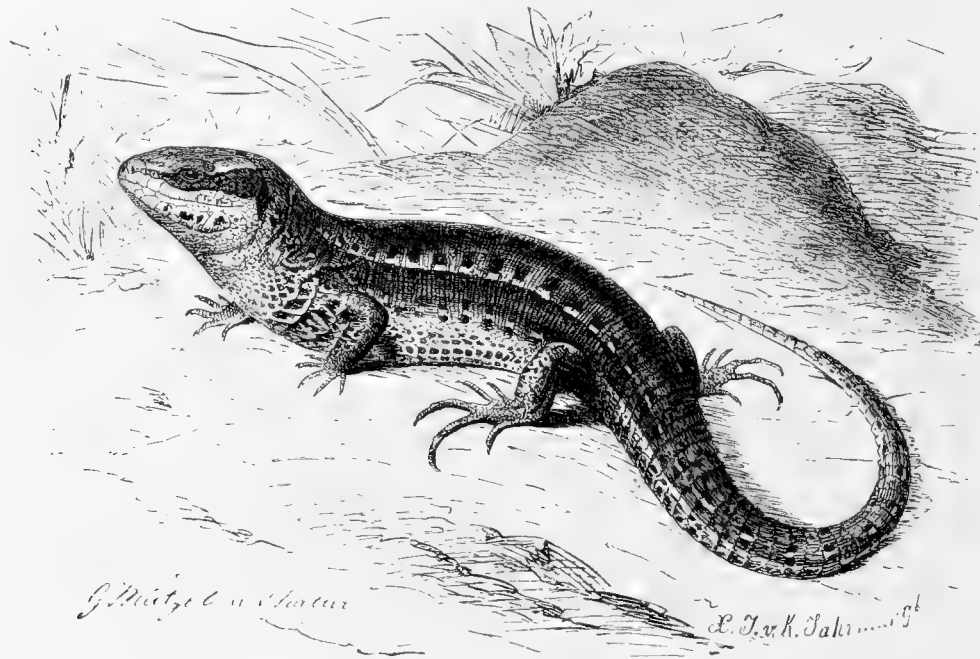
These little creatures are so quick and sharp sighted, that it is not very easy to catch them, especially if they are among gorse bushes, for they twist about so adroitly, that a very smart movement of the hand is required to follow them, and the prickly points of the gorse are always lurking among the grass, to the detriment of a tender skin. They can swim tolerably if thrown into the water, but do not seem to seek that element voluntarily. I have generally found that when flung into water, they lie for a short time quite motionless, with their limbs extended, and tail straight, as if bewildered with the sudden change. They soon, however, get their head towards shore, and then, with a serpentine movement of the tail, scull themselves to land.

This is one of the reptiles that produces living young, the eggs being hatched just before the young Lizards are born. With reptiles, the general plan is to place the eggs in some spot where they are exposed to the heat of the sunbeams; but this Lizard, together with the viper, is in the habit of lying on a sunny bank before her young ones are born, apparently for the

purpose of gaining sufficient heat to hatch the eggs. This process is aided by the thinness of the membrane covering the eggs.

The color of this little Lizard is extremely variable, but in general, the upper parts are olive-brown, with a dark brown line along the middle of the back, this line being often broken here and there. Along each side runs a broader band, and between these bands are sundry black spots and splashes. The under parts are orange, spotted with black in the male, and olive-gray in the female. The total length of the Scaly Lizard is about six inches, according to the figure in our illustration.

THE beautiful EYED LIZARD, or GREAT SPOTTED GREEN LIZARD, as it is sometimes called, from the colors with which it is decorated, is a native of Southern Europe, and various other warm portions of the world, being found in Algiers, Senegal, and parts of America.



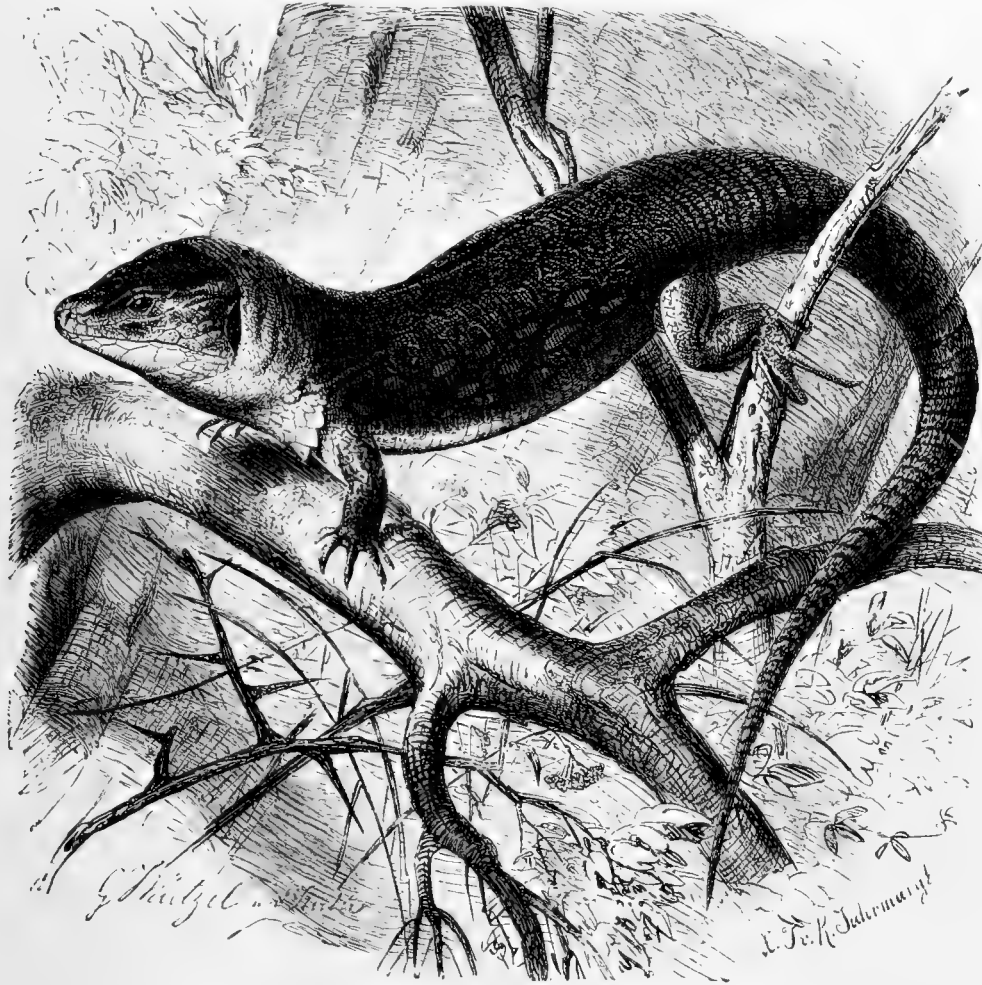
SCALY LIZARD.—*Zootoca vivipara*.

This creature inhabits dry spots, where the sun has most power, and may be seen among hedges, underwood, or loose stones, running about in search of food, and displaying the gem-like brilliancy of its clothing, as it darts from spot to spot with the agility which characterizes all the species of this genus.

It is of rather a fierce nature, having little fear, and boldly attacking any antagonist that may assail it. If it be irritated with a stick, it will turn sharply upon the offending weapon, and bite it smartly; and if a dog attempts to seize it, the courageous little creature will spring upon its muzzle, and maintain its hold with such pertinacity, that it will suffer itself to be killed rather than relinquish its grasp. In consequence of this combative character, it is greatly respected by the inhabitants of the country where it dwells, and being thought to be poisonous as well as ferocious, is dreaded with a fear quite as keen, though not so reasonable, as would be inspired by a rattlesnake or cobra.

The home of this species is generally made under the roots of trees, if the soil be sufficiently dry and sandy to suit its habits. Otherwise it will excavate a tunnel in the side of a bank or under a hedge, always choosing a southern aspect, so as to ensure the warmth which its nature seems to demand. Sometimes it settles upon a soft sandstone rock for its domicile, and hollows out a deep burrow in the softest part of the rock, mostly choosing the loose, sandy layers that often occur between two tolerably broad strata of rock. Like the rest of the Lizards, it feeds on insects and similar creatures, darting on them with great speed and certainty of aim.

The color of this Lizard is very beautiful, rendering it one of the most lovely of its tribe. The ground color of the body is bright, glittering green, as if covered with an armor of emeralds, upon which are set, along the sides, some rather large, eye-like spots of rich



EYED LIZARD.—*Lacerta ocellata*. (One-half natural size).

azure. A kind of network of black is also spread over the body, sometimes running in well-defined lines, and sometimes composed of rows of black dots. The temples of the Eyed Lizard are covered with unequal, many-sided scales, rather convex in their form. Its length when full grown is about fifteen or sixteen inches, but it is very variable in size as well as in color.

A VERY beautiful species of this genus is common in many parts of Europe, Asia, and Africa. This is the GREEN LIZARD. As its name imports, this reptile is of a green color, and with the exception of the preceding species, is as beautiful a creature as can be seen.

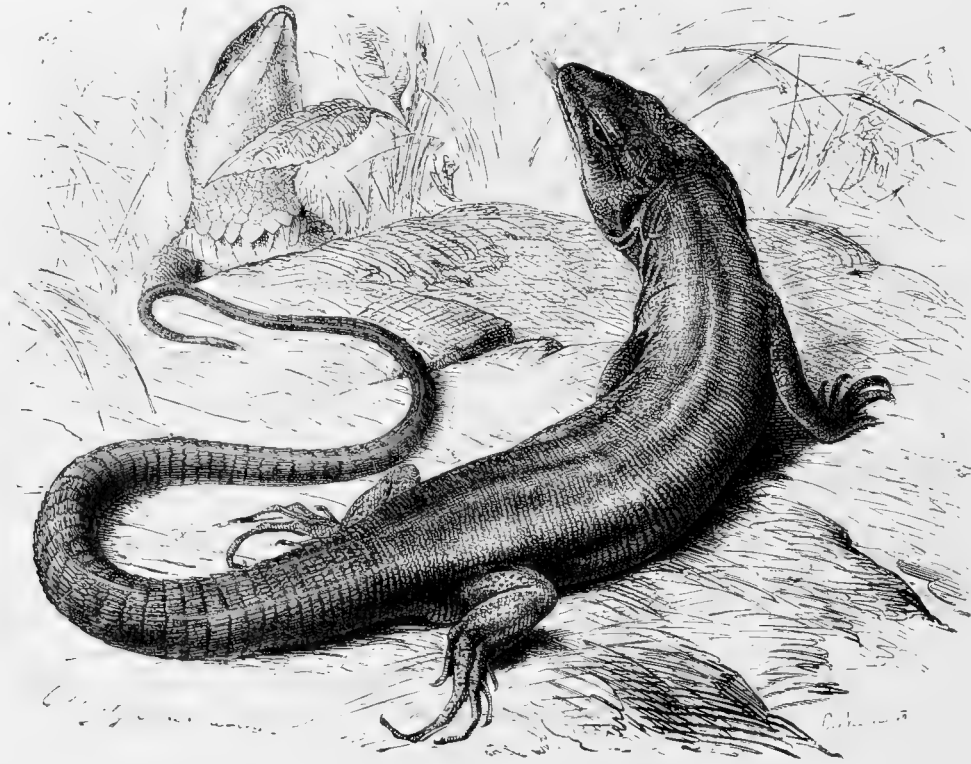
Like the eyed Lizard, it haunts sunny spots, and may be found in orchards, gardens, shrubberies, copses, and similar localities, where it can find plenty of food and obtain concealment when alarmed. Old ruins, too, are greatly haunted by this beautiful Lizard, which flits among the moss-covered stones with singular activity, lying at one moment as if asleep in the sunbeams, or crawling slowly, as if unable to proceed at any smarter pace, and then, when the hand is thrust towards it, disappearing with a rapidity that looks like magic.

Since the great demand for ferneries and vivaria of different descriptions has arisen, this Lizard is used as a beautiful ornament to a glass fern-case, and is sufficiently hardy to be kept alive with a very little care. It seems to revel in the sunshine, and there are few objects more

beautiful than the emerald green hues of this Lizard, as the sunbeams flash and glitter on its resplendent surface.

It is susceptible of kindness, and can soon be tamed by those who choose to take the trouble of familiarizing themselves with their bright and lively favorite. Although sufficiently bold and apt to bite if it fancies itself aggrieved, it can be so thoroughly tamed that it will come and take flies out of the hand. In France and other countries this pretty harmless little creature is greatly dreaded, the popular belief attributing to it sundry destructive powers of the same nature as those which our rustic population believe to be exercised by the common newt.

The color of this beautiful creature is rich shining green above, a little blue sometimes appearing upon the head, and the quality of the green being rather variable in different



GREEN LIZARD.—*Lucerta viridis*.

individuals. A multitude of little golden spots are also perceptible on the back, and similar dots of black are not unfrequently sprinkled over the surface. Underneath, the green fades into a yellower hue.

UNTIL comparatively later years, the SAND LIZARD was confounded with the scaly Lizard, which has recently been described.

This reptile is extremely variable in size and coloring, so variable, indeed, that it has often been separated into several species. Two varieties seem to be tolerably permanent, the brown and the green; the former, as it is believed, being found upon sandy heaths where the brown hues of the ground assimilate with those of the reptile, and the green variety on grass and more verdant situations, where the colors of the vegetation agree with those of the body.

Though quick and lively in its movements, it is not so dashingly active as the scaly Lizard, having a touch of deliberation as it runs from one spot to another, while the scaly Lizard seems almost to be acted upon by hidden springs. It does not bear confinement well, and in spite of its diminutive size and feeble powers, will attempt to bite the hand which disturbs it in a place whence it cannot escape. When it finds itself hopelessly imprisoned, it loses all appetite for its food, hides itself in the darkest corner of its strange domicile, and before many days have passed, is generally found lying dead on the ground.

Unlike the scaly Lizard, this species lays its eggs in a convenient spot and then leaves them to be hatched by the warm sunbeams. Sandy banks with a southern aspect are the favored resorts of this reptile, which scoops out certain shallow pits in the sand, deposits her eggs, covers them up, and then leaves them to their fate. Mr. Bell, who has paid great attention to this subject, has remarked that the eggs are probably laid for a considerable period before the young are hatched from them.

As has been already remarked, the coloring of this creature is exceedingly variable in different individuals. Generally it is sandy-brown above, with some faint bands of a darker brown with rows of black spots, which sometimes have a whitish dot in their centre. The sides have a tinge of green more or less distinct, and the under surface is white. In some individuals the green is very distinct. The average length of the Sand Lizard is about seven inches or a little more.

PASSING by a series of genera affording but few interesting points, we come to the curious animal called the CAPE SPINE-FOOT. The generic name *Acanthodáctylus*, signifies Thorn, or Spine-toed, and is very appropriately given to this animal and the other species of the same genus. All the Spine-foot Lizards are inhabitants of Africa, and most of them are found towards the northern portion of that continent.

According to Dr. Smith, "this Lizard is found on the sandy districts of Great Namaqua-land, and where the surface of the country is irregular it is generally met on the highest spots. Where small sand-hills occur, it resorts to them in preference to the other localities, and from the peculiar assistance it derives from the serrated fringes which edge its toes, it runs over the loose sand on the steep surfaces of those slopes with great activity. It feeds on insects."

The color of this Lizard is a very peculiar brown above, changing from yellow-brown to a much warmer hue, partaking of the orange. The top of the head is mottled with dark brown, and the back is freckled with the same hue. From the eyes run two whitish bands on each side, the lower terminating at the hind-leg and the upper reaching some distance along the tail. Between and about these bands are bold brown mottlings in the male, and an orange wash in the female. The upper part of the legs are also mottled with dark brown. The toes are very long, especially those of the hind-foot, and are edged with a fringe composed of sharply pointed scales. The female is larger and more clumsily made than the male.

ANOTHER pretty species of Lizard, termed the NAMAQUA EREMIAS, is found the portion of Africa from which it derives its name. The name *Eremias* signifies a dweller in a wilderness, and is given to this and several other species because it is always found in hot and arid situations, the sandy flats between Cape Town and Little Namaqua-land being its most favored localities.

It is chiefly remarkable for the great length and slenderness of its tail, which measures five and a half inches in length, although the head and body together are only two inches long. The color of the back and upper parts is delicate brown mottled with a deeper hue, and along the back are drawn four narrow lines of light reddish orange. The sides are cream-yellow, the upper portions of the legs are olive-brown, and the under surface of the animal is yellowish-white. There is a trifling variation in the coloring, according to the age of the individual. Thirteen or fourteen species of this genus are known to zoologists, most of them being natives of Africa.

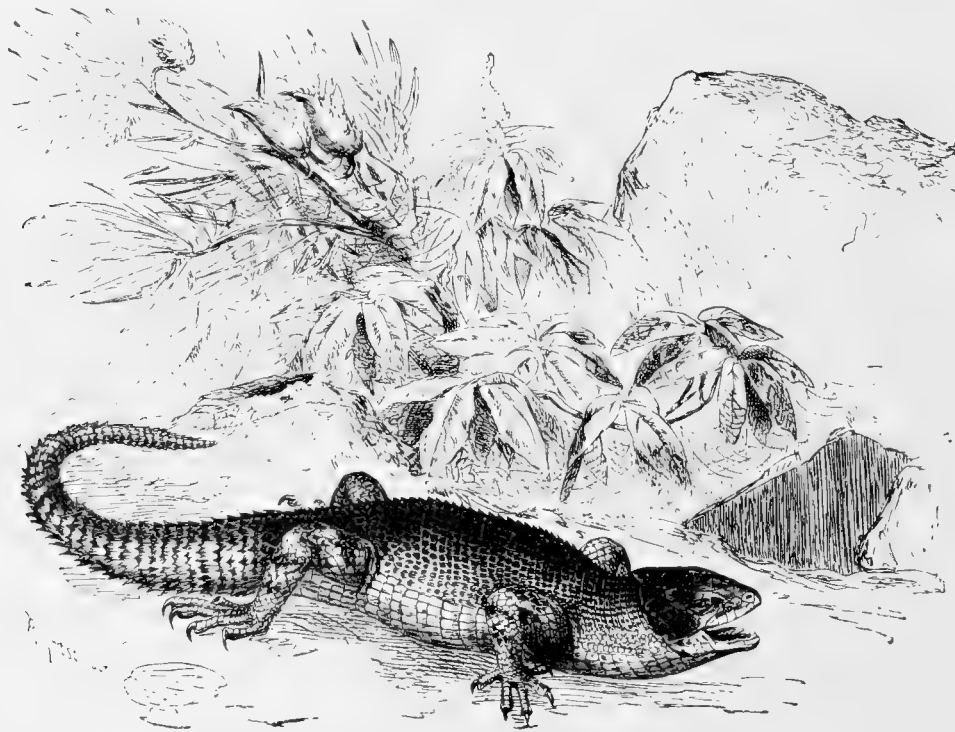
OUR last example of the true Lizards or *Lacertinidæ* is the curious little creature termed the ELEGANT OPHIOPS. Two species are known as belonging to this genus, and they can at once be separated from the true Lizards by the character of the eyelids, which are only rudimentary and hardly visible, so as to have gained for their owners the generic title of Ophiops, or Serpent-eyed Lizards.

The Elegant Ophiops inhabits the south-eastern portions of Europe, and the neighboring parts of Asia. The shores of the Mediterranean appear to be favorite localities of the Ophiops, and in those places it is not at all uncommon. It is lively and active in character, and, like

the rest of the same family, feeds on insects, which it catches by suddenly springing on them as they repose from their aerial excursions or crawl along the ground. Like most Lizards, it is rather variable in coloring, but the general tints are as follows. The back and upper parts are olive, sometimes deepening into bronze. Along each side run two bands of pale yellow, and between the bands are sundry black spots, also arranged in lines, but varying in form, size, and number, according to the age of the individual. The under parts are white.

QUITTING the true Lizards, we come to another family of reptiles, called the Zonuridæ, or Band-tailed Lizards, because the scales of the tail are arranged in regular series or rings, and by their overlapping cause the edges to stand out boldly in whorls. Along the sides of these reptiles runs a distinct longitudinal fold, covered with little granular scales, and the eyes are furnished with two valvular lids.

THE COMMON ZONURUS, or ROUGH-SCALED CORDYLE, is a native of Southern Africa, and very plentiful at the Cape, where it may be seen among the rocks or in sunny localities fitting

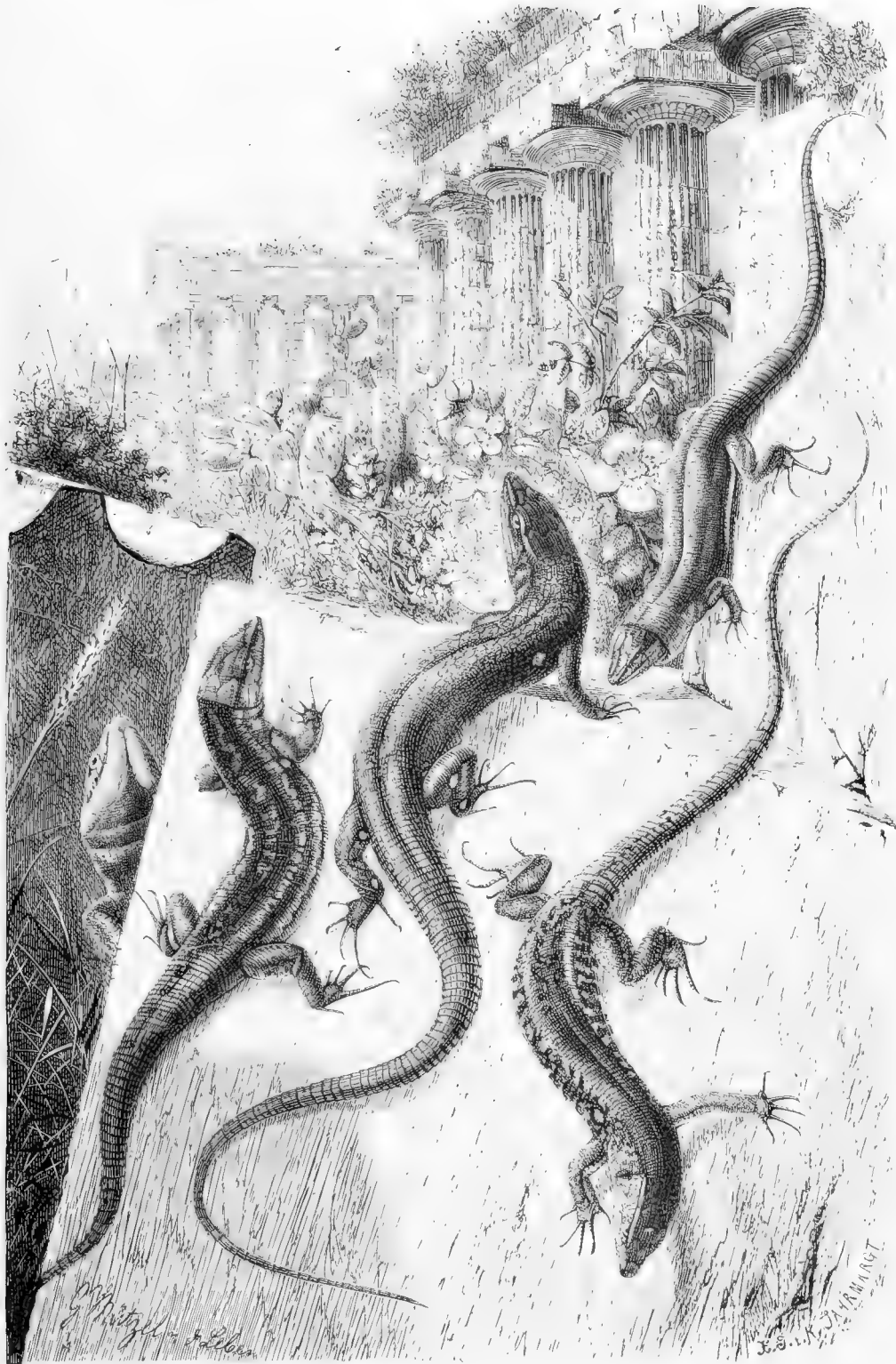


ROUGH-SCALED CORDYLE.—*Zonurus cordylus*. (One-half natural size.)

from spot to spot with some speed, though not exhibiting the singular activity which is possessed by many of the smaller Lizards. It is chiefly remarkable for the curious aspect of the tail, with its whorls of spike-tipped scales, which looks as if a number of thimbles had been deeply notched round their edges and then thrust into one another.

There is a somewhat similar reptile called the COMMON CORDYLE (*Cordylus polygonus*), but it may be distinguished by a peculiarity of structure which has caused it to be placed in a different genus. In the members of the genus *Zonurus*, the eyelids are opaque, as is generally the case, but in the genus *Cordylus* there is a smooth transparent spot in the centre of the lower eyelid.

The form of the Rough-scaled Cordyle is rather stout and flattened, as accords with the comparative slowness of its movements. In color it is variable, but the usual tints are orange-



ELEGANT OPHIOPS.

yellow on the back, sides, and tail, fading into yellow on the head, and white on the under parts. This species may be distinguished from the other Cordyles by the smooth shields of the head and the rhomboidal-shaped scales of the back, which are larger in the centre than on the sides, and decidedly keeled. On the flanks the keels are so long as to become spines, and the sides of the neck are covered with sharp spine-like scales.

THE FALSE CORDYLE is placed in a separate genus, on account of the shape and size of the scales upon the back and sides. Instead of being large and tolerably even in size, as in the preceding genus, they are very small and granular, alternating with bands of larger scales, which are three-sided, convex, and slightly keeled. These scales are largest on the sides of the back. The generic name *Microlepidotus* signifies small-scaled, and is given to these creatures in allusion to the minute scales of the back and sides.

The habits of this reptile are much like those of the previous species. Dr. A. Smith writes as follows respecting this creature, after describing the singular variations of color to which it is subject:—

“Each of the varieties appeared to be restricted to its own localities, and, so far as my observations extend, no specimens of two varieties are ever found in the same localities. All the varieties inhabit rocky situations; and, when they have a choice, they invariably prefer precipices and the stony walls of difficultly accessible ravines. In this situation they wander carelessly, in search of food or warmth, unless alarmed by what they may regard as enemies. On being closely approached in their retreats, they are with difficulty captured, as, by aid of the prominences on the hinder edge of each temple, they hold on with a tenacity which is quite surprising; and by them they occasionally offer such an effectual resistance to the force applied from behind, that the tail breaks off from the body before the reptile is secured.”

As, in Dr. Smith's work, the description of the different varieties occupy nearly five quarto pages of letter-press, it is evidently impossible to give more than a general description in this volume. Suffice it to say, that in one variety, found on the Table Mountain and about Cape Town, the color is ochry-yellow above, banded with dark brown; in another, which inhabits the rocks about Algoa Bay, it is yellow, with bold, black bars along the back; another, which lives on the banks of the Orange River, is brown above, warming into bright chestnut in the male, and olive-green mottled with dusky black in the female; and a fourth variety, which is found in the high, mountainous regions about Natal, is bright green, with an olive-green stripe and short bars of the same tint across the back. The tail is also banded with two shades of green, one a deep olive, and the other having a much yellower hue. The female of this variety is without the bands, and is only mottled with dark olive, and spotted with the same hue along the sides. The length of the False Cordyle is about eighteen inches.

A SMALL group of reptiles is collected under the generic title of *Gerrhosauri*, or *Basket-Lizards*, because the arrangement of their scales and coloring has an effect as if the body had been covered with delicate wicker-work, such as is employed to protect glass flasks from injury.

These Lizards are natives of Southern Africa, where they are far from uncommon. They are all rather pretty in form and coloring, but the most pleasing in general appearance is BIBRON'S GERRHOSAURUS (*Gerrhosaurus bibróni*). This animal is found near the Orange River, and may be seen slipping about among the rocky sides of the dark ravines that are so plentiful in that neighborhood. It is a very shy and timid creature, and if it fancies itself watched by an unfriendly eye, or suspects the least shadow of danger, it quietly glides under the heap of dead wood and dried leaves which collect in abundance in such localities, and will not venture out again until it is tolerably sure that the danger has passed away.

As in the case with most of these Lizards, there is considerable variation of coloring, but in general the upper surface is dark brown, and the sides of the head, the throat, and front of the fore limbs are bright scarlet. Along the back run four yellow lines, of which the two central only extend as far as the hind legs, whereas the two outer streaks are continued to the extremity of the tail. It is not a large species, being about ten or twelve inches in length.

THE generic name, SAUROPHIS, which is given to the reptile next in order, is of Greek origin, and signifies Lizard-snake, in allusion to the very serpentine aspect of its body.

This singular creature inhabits Southern Africa, and at first sight might be easily mistaken for a serpent as it crawls about the ground, its four tiny limbs being far too weak to render it any great assistance in progression, which is achieved, as in the serpents, by continual movement of the projecting edges of the scales. Very little is known of its habits.

The head of this reptile is of a somewhat pyramidal shape, and covered with shields, as are both temples. The scales of the back are slightly grooved, and a small keel runs across their length; they are regularly arranged in fourteen series. On the abdomen, the shields are in six rows. There are four very small and feeble limbs, each of which is furnished with four little short and compressed toes, with rather long claws at their extremities. The body is long and cylindrical, and a decided groove runs along each side. Its color is tawny brown, each scale being of a deeper hue at its edge, so as to give a slightly mottled appearance to the creature. The legs and lower edge of the temple are white, spotted with little dots of black.

ON account of the great rapidity of its movements, our next example has received the appropriate title of TACHYDROME, a name derived from the Greek, and signifying a swift runner.

This pretty little Lizard is an Asiatic animal, being mostly found in China, Cochin China, and Java. Although its limbs are much larger and more powerful in proportion to the size of the body than those of the preceding species, its tail is of such great comparative length, and so slender in its proportions, that, quick as is the creature in all its movements, it has much of a serpentine aspect. The tail, indeed, is longer in proportion to the body than is the case with any other of the order, being three times the length of the body and head, and tapers from the body like the thong of a whip from its handle.

The collar of this creature is covered with scales and decidedly toothed. The scales of the back are nearly square in form, slightly overlap each other, and are arranged in four longitudinal series. Each scale has a decided keel along its length. The scales of the sides are small and granular, and those of the abdomen and throat are larger, strongly keeled, and boldly overlap each other, a provision which is evidently intended for the purpose of aiding the creature in progression, and enabling it to hold itself firmly in any cleft into which it may have retreated. The scales of the common snake answer the same purpose, as any one may prove by taking a snake by the tail and drawing it backwards over a carpet, or by allowing itself to insinuate half of its body into a crevice in a rock or old wall, and then endeavoring to draw it out again by pulling at its tail.

The color of this pretty Lizard is dark olive above. On each side a bold, white streak, edged on either side with black, runs from the base of the head to the insertion of the tail. On the sides of the body and neck are a multitude of little black dots, each having a white centre, and between these dots the color is blue, glossed with golden yellow. The abdomen and under parts are pure shining white, and the tail is generally olive, though in some specimens it has something of a metallic or iridescent lustre, and gleams with golden or coppery reflections. Between the nostril and the eye runs a short black line, and on the temples are two similar lines, with a white streak between them. The total length of the Tachydrome is about one foot.

IN the curious snake-like Lizard called the SCHELTOPUSIC, OR PSEUDOPUS, the limbs are almost entirely absent, the front pair being altogether wanting, and not even exhibiting a trace of their locality, while the hind pair of legs are only indicated by two slight scale-like appendages at the junction of the tail with the body. It is often the case that with reptiles in which the limbs are externally wanting, their bones, although very small and delicate, are found beneath the skin. But in the Scheltopusic, the only indication of legs is found in a

pair of very tiny bones attached to the pelvis, and exhibiting the mearest rudiment of the missing limb.

Moreover, the pelvis itself is very small and slight, and is itself scarcely more than rudimentary in its form, though affording one of the needful transition links between the quadrupedal Lizards and the footless snakes, some of which, indeed, possess the rudiments of limbs even in a more doubtful state than is found in the Scheltopusic. In consequence of the absence of limbs, the movements of this reptile are completely those of a serpent, and so snake-like is it in all its gestures, that in the countries where it resides, it is popularly considered as a serpent, as is the case with the blind-worm.

The Scheltopusic is a native of the coast of Northern Africa, and is also found in Dalmatia, the Morea, and parts of Siberia, where it is called by the title under which it is now generally known. It seems to be rather a timid creature, and very mistrustful of strange sights or sounds, always remaining within the vicinity of some familiar spot, whither it seeks an immediate retreat if disturbed.

Thickly wooded valleys, where the underwood is dark and dense, and the vegetation is rank and heavy, are favorite localities of this harmless and weaponless reptile, which has no mode of defence if attacked, and can only retreat from the approach of danger by gliding silently under the brushwood and insinuating itself in some dark crevice, where it lies secure. So watchful is this creature, that although its movements are rather slow, it is not very easily captured, mostly gliding away in so silent a manner that it has reached its haven of safety before its presence is even suspected.

Even if it be seen and followed, it is not readily captured after once it has succeeded in burying itself among the brushwood, for its color is sufficiently sombre to harmonize so well with the dark soil and dead sticks and leaves among which it resides, that its outline can with difficulty be discerned, even by a practised eye. As is the case with most reptiles, it loves to emerge from its retreat and crawl to some spot where the sunbeams have thoroughly warmed the ground, and there to lie basking in the genial heat. While thus occupied, it is not so wary as at other times, and may be approached and secured before it can make good its retreat.

The whole aspect of this reptile is so serpentine that it has been attacked and killed under the impression that it was a poisonous snake, and great has been the surprise of its slayers to find that they had destroyed, not a venomous serpent, but a harmless Lizard. This creature has been often captured alive and kept in confinement. In its wild state it feeds mostly on insects, the smaller reptiles, and similar creatures, sometimes gliding into a nest of newly hatched birds and swallowing them. This propensity was once exhibited by a captive Scheltopusic; it had fed very contentedly on hard-boiled eggs, until one day it contrived to gain access to a nest full of very young birds, and swallowed the whole brood.

The jaw-teeth of this reptile, although not of a venomous character, are strong, and those of the palate, although small, are probably useful in aiding the creature to secure and swallow its prey. The tongue is thin and covered with a little papillæ of various sizes. Along each side runs a rather deep groove or furrow, which, on a closer inspection, is found to be double. The scales of the back are rather shining and closely set, and there is a slight keel running along the centre of each scale, which is shown more distinctly on the tail than on the body. The keel is shown more distinctly in the young than in the adult.

The color of this reptile is rather variable, but in general the ground color of the body is chestnut, profusely dotted with blackish spots, caused by the dark edges or spots of each scale. These scales are arranged in a regular series of thirteen longitudinal rows. The eye is bright golden-green, and has a very beautiful appearance, as it contrasts well with the chestnut and black of the body and head. The young Scheltopusic is very different from its parent in the coloring, being gray above, with rather obscure bands of grayish-brown, and the under surface is gray, with a whitish lustre. The length of the Scheltopusic is about eighteen inches, the tail occupying about three-fifths of the whole measurement.

IN the curious reptile which is appropriately called the GLASS SNAKE, there is not even a vestige of limbs, so that it is even more snake-like than the preceding species. The generic

title of *Ophisaurus* is of Greek origin, signifying Snake-lizard, and is given to the reptile on account of its serpentine aspect. The reader may remember that on page 52 there is an account of the saurophis, a name which is exactly the same as that of the present species, except that the one is called the lizard-snake and the other the snake-lizard, a distinction which, in the present case, is without a difference, so that the two reptiles might exchange titles and yet be appropriately named.

The Glass Snake is indeed so singularly like a serpent that it can only be distinguished from those reptiles by certain anatomical marks, such as the presence of eyelids, which are wanting in the true serpents, the tongue not sheathed at the base, and the solid jaw-bones, which in the serpents are so loosely put together that the parts become widely separated when the mouth of the creature is dilated in the act of swallowing its prey.

The Glass Snake is one of the earliest of the reptile tribe to make its appearance in the spring, shaking off its lethargy and coming out of its home to bask in the sunbeams and look after the early insects, long before the true snakes show themselves. It is generally found in spots where vegetation is abundant, probably because in such localities it finds a plentiful supply of the insects, small reptiles, and other creatures on which it feeds.

It is fond of frequenting the plantations of sweet potato (*Convolvulus batatas*), and during harvest-time is often dug up together with that vegetable. The home of this reptile is made in some very dry locality, and it generally chooses some spot where it can be sheltered by the roots of an old tree, or a crevice in a convenient bank. It moves with tolerable rapidity, and its pursuer must exercise considerable quickness before he can secure it.

To catch a perfect specimen of the Glass Snake is a very difficult business, for when alarmed, it has a remarkable habit of contracting the muscles of its tail with such exceeding force that the member snaps off from the body at a slight touch, and sometimes will break into two or more pieces if struck slightly with a switch, thus earning for itself the appropriate title of Glass Snake. The common blind-worm, which will be described in a future page, possesses a similar capacity, and often uses it in a rather perplexing fashion. Catesby remarks that this separation of the tail into fragments is caused by the construction of the joints, "the muscles being articulated in a singular manner quite through the vertebræ." The tail is more than twice the length of the body, from which it can only be distinguished by a rather close inspection.

The head of the Glass Snake is small in proportion to the body, rather pyramidal in shape. Along each side of the body runs a rather deep double groove. The coloring of this creature is extremely variable, but is generally as follows: The head is mottled above and at the sides with black and green, and the jaws are edged with yellow. The upper part of the body is marked with multitudinous lines of black, green, and yellow, and the abdomen is bright yellow along its length. In the tail there are about one hundred and forty rings of scales. Sometimes the upper surface is black on the sides and neck, and brown on the back, the head being marbled with yellow and black; another variety is chestnut above, with white spots edged with black, and the under parts pale orange; while a third variety is gray mottled with black. The total length of this reptile is from two to three feet.

The Glass Snakes are represented in North America by the *Opheosaurus ventralis*. It is seemingly a serpent, having no external limbs. The tail is very brittle, and the animal has from that fact been regarded as so brittle that a blow will fracture the body. The truth is, there are thin transverse *septa* between the vertebræ, and this is the point where separation takes place so readily. Its range is from Tennessee southward from Kansas.

FOUR small families now follow, containing but very few individuals. The first of these is called the CHALCIDÆ. These reptiles have long cylindrical bodies, with a slight granular groove on the front of each side, and four very short rudimentary limbs. The typical species of this family is the CHALCIS (*Chalcis flavescens*), a native of tropical America, Guiana, and the neighboring parts. The fore-feet have three toes, but the hind-feet are undivided, so as to form a single toe. The scales are squared, and arranged in twenty longitudinal series on the back, and six series on the abdomen.

THE next family, the ANADIADÆ, contains, as far as is known, only one species, the EYED ANADIA (*Anadia ocellata*), thought to inhabit tropical America. In this creature the lower eyelids are pellucid, the scales of the back and sides six-sided and not overlapping each other, while those of the abdomen are squared. The limbs are four in number, and there are five unequal and rather flattened toes on each foot. The color of this species is pale brown, with a bronze gloss, deepening on the sides, and having some white spots edged with black towards the front. Beneath it is shining white.

IN the family of the CHIROCOLIDÆ there is likewise only one species, called the CHIROCOLE (*Heterodactylus imbricatus*), a native of Brazil. This creature has a double collar, and the ears are hidden beneath the skin. The scales of the back, the sides and the tail, are six-sided, rather sharp, arranged in regular rings, and furnished with keels. Those of the abdomen are squared and arranged longitudinally in six rows. There are four short legs, with five toes on each foot, the thumb of the fore-limbs being only rudimentary. The color of the Chirocole is brown, with a pale streak on each side.

THE fourth family is the CERCOSAURIDÆ, containing two genera. These animals have the ears distinct, the throat with a double series of shields, and the collar distinct. On the back and upper part of the tail the scales are large, boldly keeled, and arranged into a regular longitudinal series. The scales of the under portions are squared and flat. There are four limbs, each with five unequal toes. A good type of this family is afforded by the EYED CERCOSAURUS (*Cercosaura ocellata*). The body of this creature is long and rather cylindrical. Its color is black, with four white streaks, the head and the under parts are yellowish, and the sides are sprinkled with green, and variegated with eight or nine white spots edged with black.

OUR last example of the Cyclosaurian reptiles is the ANGUINE LIZARD, or CHAMESAURA, the only representative of its family.

The Anguine Lizard is a native of Southern Africa, and is obtained from the Cape of Good Hope. Of its habits there is but little known. It is a curious-looking creature, exceedingly snake-like in general appearance, its four limbs being of the most rudimentary character, small, delicate, feeble, not even separated into toes at the extremity, but ending in a single claw, as if the whole limb were only composed of one small joint. These imperfect limbs are wholly useless for progression, those of the anterior extremity being hardly larger than the long, narrow scales with which the body is covered, and the hinder pair exhibiting but very little more development.

So perfectly serpentine is the form of this creature, that the mark of separation between the tail and body is so slightly defined that the precise line of junction is almost invisible; whereas, in the common blind-worm, itself a most snake-like reptile, the line of demarcation is plainly shown by a decided diminution in the diameter. The tail is very long and slender, measuring more than twice the length of the body.

The head of the Anguine Lizard is covered with regular, many-sided shields, and the temples, and the whole of the body and tail are clothed with scales, their edges projecting boldly, and arranged in a series of regular rings, or "whorls." Along the back there are six rows of broad scales, and on the sides and abdomen the scales are long, narrow, and with a decided keel running along their central line. There is no groove along the sides, which are rounded. Upon the head the plates are rather long, keeled, and project very slightly over each other. The ears are distinct. The color of the Anguine Lizard is brown, and along each side runs a long yellow streak.

GEISSOSAURI.

A SECOND tribe of Lizards now comes before our notice. These are the GEISSOSAURI, a title derived from two Greek words, the former signifying the eaves of a house, and the latter a Lizard. As in this tribe there are many families, and more than eighty genera, it will be

impossible to give more than a very slight account of these reptiles, or even to mention more than a small number selected as types of the large or small groups which they represent.

Indeed, the lower we descend in the scale of creation, the more numerous the species seem to become, and the more perplexing is the task of selecting those species which are worthy of mention on account of their scientific characteristics, and yet possess sufficient individuality to interest the general reader.

To watch the greater number of reptiles in their wild state, is a task simply impossible for any human being to achieve. Many reptiles live in dry and thirsty lands, where no creatures but the white ant and the Lizard seem to acquire moisture, and through which the traveller can only pass with hasty steps, dreading the delay of each minute, lest his precious store of water should fail, and leave him to perish by the most terrible of deaths.

Others reside on the sides of precipitous rocks, over which the enterprising traveller can only pass at hazard of life and limb, and in any case would not be able to watch the proceedings of the shy and timid Lizards that find their home among these craggy recesses, and retreat into them on the slightest alarm. But the chief residence of the reptile race is to be found in hot climates, and in low, swampy ground, where the morasses are ever filled with decaying vegetable matter, and exhale a soft, thick, miasma, as deadly to the white man as the fumes of arsenic, and injurious even to the dark-skinned native, who can breathe unharmed a fetid atmosphere that would smite down his white master as quickly and surely as if he were struck with a bullet, and who only attains his fullest development under these conditions.

In these dread regions, their seething putridity concealed by all the luxuriant vegetation of tropical climes, like a royal mantle flung over a festering corpse, the reptile race abound, the poisoned air being to these creatures the very breath of life, and the surrounding decay the sustaining power of their existence. Indeed, the object of their lives seems to be, by individual transmutation of poisons into living flesh, to destroy by slow but certain degrees the mass of decaying vegetation, and so to prepare an abiding place for beings of a higher order than themselves.

On placing ourselves even in imagination amid such scenes, we seem to be transported back into the former ages of our earth, when man could find no resting-place for his foot, and no atmosphere in which he could breathe and live; when the greater part of the soil was little more than soft mud, the air thick, dank, heavy, and overcharged with decomposition, and the multitude of strange reptiles that bored their slimy way through the deep ooze, crawled lazily upon the slowly hardening banks, or urged their devious course through the turbid waters, were the physically ruling though morally subservient powers of the world.

Little is wanting to complete the illusion, except to give to every object an increase of dimensions; for the vegetation of those days was rank and luxuriant to a degree that is now well indicated, though on a smaller scale, by the foliage of the tropics, and the huge forms of the ancient and now extinct reptile race are closely reproduced by the more familiar inhabitants of the swamp before us.

As the expanse of putrefaction was greater in those epochs, so the miasma destroyers were larger. Frogs and toads as big as calves, reptilian quadrupeds as large as elephants, and reptilian bats expanding leathery wings as wide as those of the pelican, were fit inhabitants of the atmosphere which they breathed, and in which their mission was consummated. Now that the marshy districts are smaller and less poisonous, the reptile race that inhabits them is of smaller dimensions.

The earth has now been so far purified by successive generations and regenerations of life and death, added to human ingenuity and industry, that its harmful districts occupy but a comparatively small portion of its surface, the greater part of the world being suitable for human habitations, the black man settling as a pioneer, a hewer of wood and drawer of water, where the white man cannot yet abide. But in all those localities where the miasmatic exhalations impall the land with their pestilential mantle, and scatter the seeds of death on every breeze, the reptiles may be found luxuriating amid the deadly elements, and thriving in spots where the foot of man dares not tread, and his inquiring eye ventures not to penetrate.

Testimonials to the "Tafeln" of Brehm's Thierleben.

The late CHARLES DARWIN writes:—"The illustrations are the best I ever saw in any work. I find it superfluous to enter here into particulars, as I already, in the 'Descent of Man,' have willingly and openly confessed how much I have profited by Mr. Brehm's book, and how highly I esteem it."
 Sir JOHN LUBBOCK, Bart., D.C.L.:—"You have, I think, done good service in publishing them. They are certainly very admirable."
 W. B. CARPENTER, M.D., LL.D., writes:—"I can quite endorse the favorable opinions already given by distinguished zoologists as to the high character of the illustrations generally."

WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston, who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet, etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield, and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities. Our endeavor has been to find an author whose work would be noted for its fund of anecdote and vitality rather than for merely anatomical and scientific presentation, and we arrived at the conclusion that we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work—a work most popularly approved by speakers of the English language. It would be superfluous to say one word concerning the standard character of his book, from the pages of which old and young at the other side of the Atlantic have obtained so much instruction and rational amusement. Avoiding the lengthened dissertations and minute classifications of specialists, he presents to his readers in popular terms a complete treatise on the Animal Kingdom of all climes and countries. The one objection that could be urged against it was, that animal life in America might be treated more fully and American forms given more consideration. In order to obviate this drawback and to do full justice to the creatures of our own country, we secured the aid of Dr. J. B. HOLDER, of the American Museum of Natural History in New York, an undoubted American authority, who has adapted Wood's work to American wants and given prominence to American forms of Animal life.

The splendid work on Rodentia, by Allen, Coues, and others, will be fully consulted. The valuable work on North American Birds, by Baird, Brewer, and Ridgway, will be the guide in the treatment of birds. The late arrangement of the classification and nomenclature of North American Birds, by Mr. Ridgway, and the Committee on that subject of the Ornithologists' Union, will be utilized in full. The arrangement of Mammals will be after the latest classification by Professor Flower, of the Zoological Society of London. So that this will be the first popular Natural History worthy of the name that has made its appearance here, which gives due and full recognition to the animate world surrounding us.

Terms of Publication.

The extent of the work will be 68 parts of 28 pages, at the price of 25 cents each. The entire publication will contain 34 Oleographs and 68 Full Page Engravings on Wood, besides many hundreds of exquisite Illustrations interspersed through the text. The parts will be issued every two weeks, and are payable only as delivered. No subscriber's name will be received for less than the entire work, and anyone removing, or not regularly supplied, will please address the Publisher by mail.

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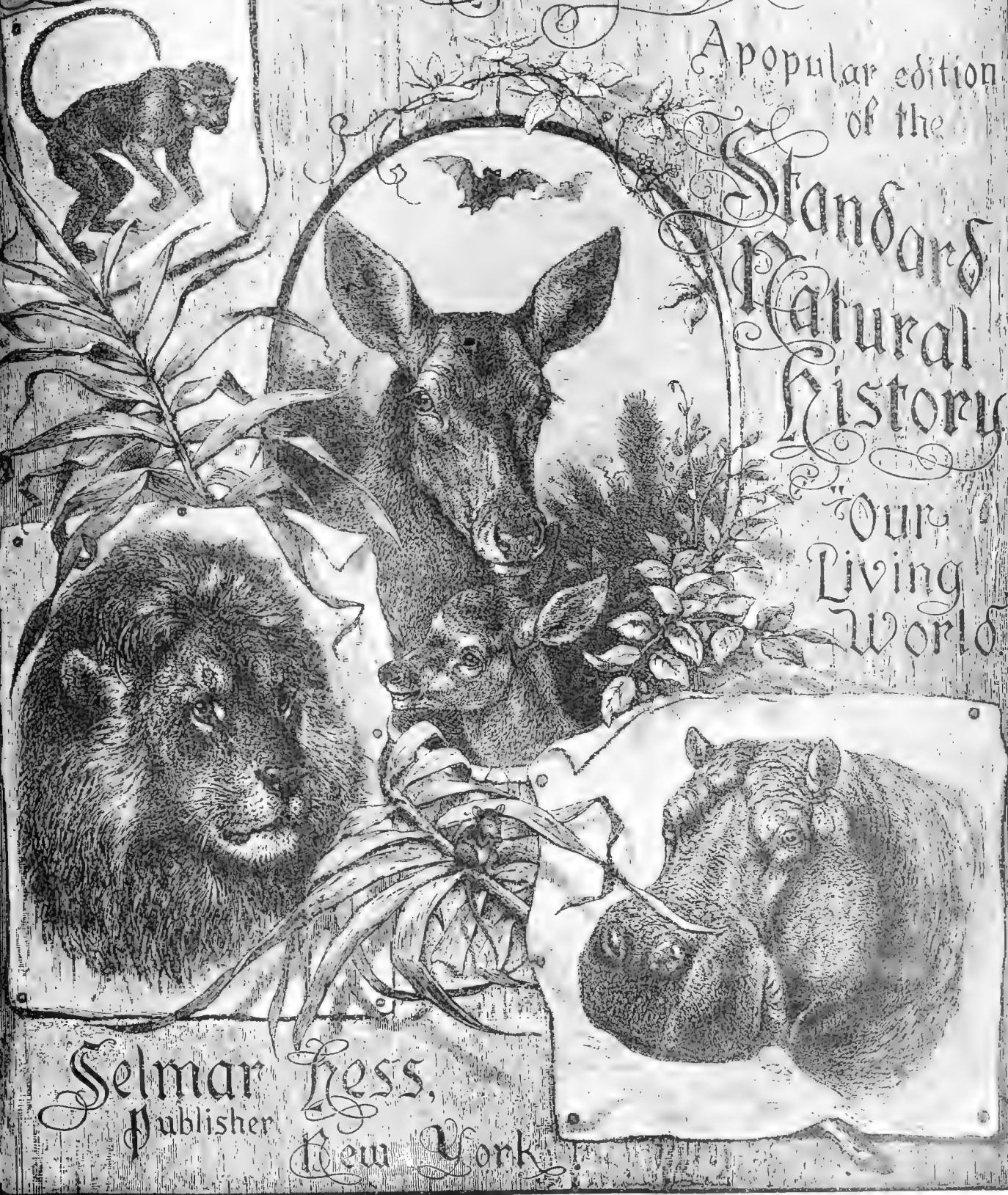
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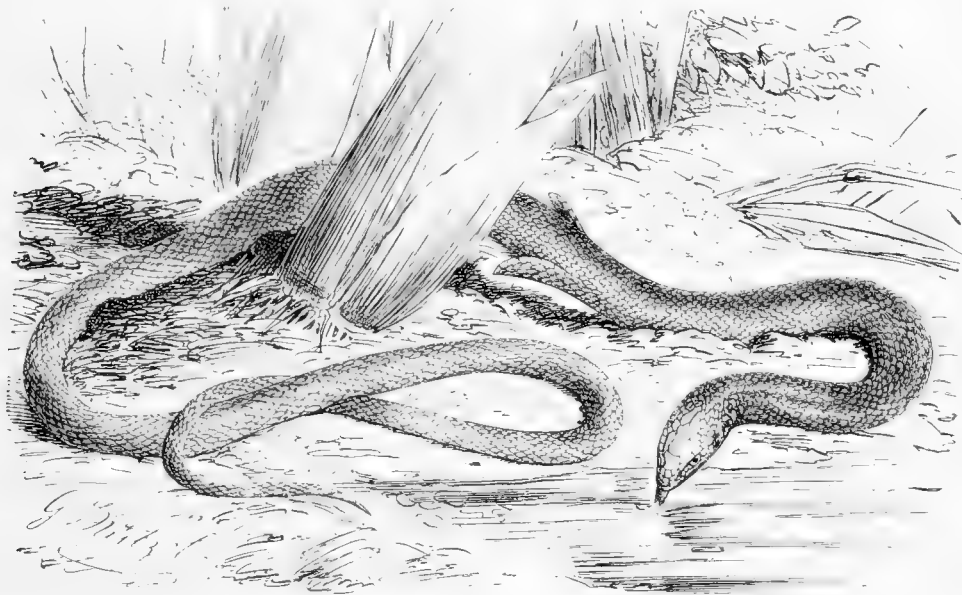


Selmar Hess,
Publisher
New York

THE first family of this tribe is distinguished by the apparent absence of eyelids, those organs being only rudimentary and scarcely visible, so as to give to the eyes a superficial resemblance to those of the serpents. On account of this peculiarity, the reptiles belonging to this family are termed the Gape-eyed Skinks. Their bodies are spindle-shaped, their tongues are scaly, nicked at the tip, their teeth are conical, and their limbs are four in number, and very feeble.

These creatures are found in various parts of the globe, but Australia seems to be their favorite home. The PETE, or AUSTRALIAN TILIQUA (*Cryptoblepharus boutonii*), is a good example of the Gape-eyed Skinks, or GYMNOPHTHALMIDÆ, a long name derived from two Greek words signifying naked-eyed. As its name imports, this reptile is a native of Western Australia, but it is also found in other parts of the world, specimens having been taken in Timor and the Mauritius. The color of the Pete is olive, sometimes with a wash of bronze, mottled with brown, and variegated with little black streaks. Sometimes there is a bright yellow streak on each side. Its eyelid is circular and scaly, and the three upper scales are the largest.

THE next family is well represented by the PYGOPUS, or NEW HOLLAND SCHELTOPUSIC, a curious reptile that inhabits Australia.



PYGOPUS.—*Pygopus lepidopus*. (Two-thirds natural size.)

This creature might easily be mistaken for the snake-like Lizard called the Scheltopusic, which has already been described on page 52, as the two fore-legs are entirely absent, and the hinder pair are very small, rudimentary, and set so closely against the body that they would escape a casual glance. They are flattish, covered with scales, and are not even divided into joints or toes, so that they are wholly useless for progression, the Pygopus creeping along after the ordinary fashion of snakes.

If the creature be turned on its back, a curious arrangement of scales is seen. Between the bases of the lower limbs, several large, shield-like scales are seen, and just above them is a row of rather long and arched scales, extending in a semicircular form from one limb to the other, and looking much like the stones that are set upon the summit of an arched doorway. Each of these scales is pierced with a circular pore, so that the general effect is very striking. The whole body of this reptile is very long in proportion to its width, and it has altogether a very serpentine aspect.

The head of the Pygopus is rather short, and is covered above with some rather large shields, that upon the top of the head being equal to any two others in size. The scales

of the back are keeled, and its color is coppery gray, with five rows of rather oblong white spots with black centres, and a few black streaks drawn obliquely upon the sides of the neck.

THE DELMA (*Delma fraseri*) is very like the Pygopus, but may be distinguished from it by the scales of the back, which are smooth and without keels, by the shorter hinder limbs, the absence of the pores, and the elliptical shape of the pupil of the eye, that of the Pygopus being circular.

Two more small families of reptiles are worthy of a passing notice. The first is that which is represented by a single species, the APRASIA (*Aprasia pulchella*), and remarkable for being destitute of limbs, and having none of the pores which have just been mentioned. The body is lengthened, and covered with six-sided scales on the upper surface and flanks. The scales are quite smooth, and their color is pale brown, with a dot of dark hue in the centre of each scale, giving a sort of variegated aspect. Along the flanks these dots become longer, so that they almost join each other, and form imperfect streaks on the sides. The lips are yellow. This reptile inhabits Western Australia.

THE next family contains only one genus, which, like the preceding creature, inhabits Australia. In these reptiles the head is long and flattened, the pupil of the eye elliptical and upright, the scales are oval, smooth, and overlap each other, and the curious pores are present, each set in the front edge of a scale. BURTON'S LIALIS (*Lialis burtoni*) may be taken as an example of this family. The color is olive above, with five imperfect brown streaks, and gray below, with large whitish spots.

THE large and important family of the Skinks contains between forty and fifty genera, nearly each of which possesses one or more species, concerning which there is something worthy of notice. In these reptiles the head is rather squared than rounded, and covered regularly with horny shields. The body is mostly spindle-shaped, though sometimes of a cylindrical form, and very much elongated, in which case the legs are generally rudimentary, and sometimes altogether wanting externally. The common blind-worm is a familiar example of this structure. The tail suits the form of the body, being cylindrical in the long-bodied species, and tapering in those of a more spindle-like shape.

The genus in which the COMMON, or OFFICIAL SKINK is placed, is now so restricted, that it only contains a single species; but in the earlier times of zoological science, its rules were so greatly relaxed, that many species were admitted within its limits.

In this genus the muzzle is wedge-shaped, the scales are thin and smooth, and the tail conical and pointed. The toes are rather flattened, and fringed on the side. The eyes are guarded by distinct eyelids, the lower of which is covered with scales. The palate is furnished with teeth, and has a longitudinal groove, and the ears are small, and toothed in front. There are four short and rather stout limbs, tolerably strong, and enabling the creature to make its escape from its enemies by rapidly sinking below the sandy soil on which it is usually found.

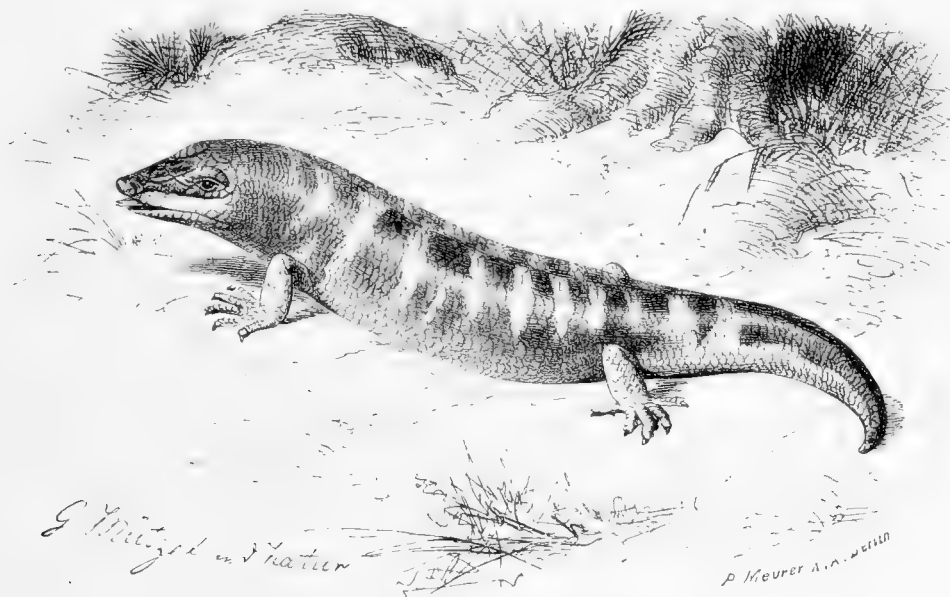
The Skink is a native of Northern Africa, and is very common in some localities. Specimens are said to have been found in some portions of Asia, and it seems to be clearly proved to inhabit Syria and several parts of India.

It is a tolerably active little Lizard, not running fast or far, but contenting itself with hanging about the same locality, and feeling itself more secure on the sandy soil of its native districts, than if wandering at large on the plains. Indeed, unless it is alarmed, or except when it is aroused to short exertions by the presence of its prey, the Skink seldom troubles itself to hurry its pace beyond a slow crawl; and not even when most startled, does it attempt to seek safety in flight. No sooner does it perceive the approach of danger, than it slips below the sand with such singular speed and adroitness, that those who have witnessed this performance, say that it seems rather to be gliding into some hole already excavated, than

to be engaged in the labor of sinking a tunnel for the purpose of aiding its escape. Several travellers have seen the Skink thus bury itself, and have all carried away the same opinion of its powers.

If quietly approached, it may often be detected sleeping in the hot sunbeams, lying stretched at length upon the stones or rocks, and so far steeped in slumber, that it may be approached quite closely without taking alarm.

The name of Official Skink has been given to this reptile on account of the high place which it formerly held among the medical profession, and the extreme value which it was thought to possess when dried, pounded, made up neatly into draughts or boluses, and used as a medicine. There is hardly a disease to which the human race is liable, which was not thought curable by the prepared body of this reptile, certainly not the least repulsive of all the disgusting substances which the early physicians delighted to choose from the animal, vegetable, and mineral kingdom, to fill their multitudinous boxes and bottles, and to inflict upon their patients. Sometimes a physician would even evince his belief in the efficacy of his medicine by taking it himself, and would swallow, with full belief in its



COMMON SKINK.—*Scincus officinalis*.

healing powers, the burnt liver of a hyena, the moss from a dead man's skull, the grated flesh of a mummy, or the remains of a pounded Lizard, together with many other substances too revolting to mention.

Did a warrior receive a wound from a poisoned arrow, or was a woodman bitten by a venomous snake, there was nothing so effectual for the cure as the dried flesh of the Skink, sometimes called El Adda, and sometimes known by the name of Dhab. He who provided himself with this all-powerful medicine was secure against fits of all kinds, which never attacked the system fortified by a dose of powdered Skink, or were speedily driven away if the sufferer had not previously partaken of this panacea. All skin diseases were cured by the Skink, and even the fearful elephantiasis yielded to its potent sway.

Were the system too inexcitable and lethargic, and did the blood course too slowly through the veins, a little Skink powder would restore the natural powers to their full vigor. Or, on the contrary, if the patient happened to be feverish, restless, with a burning forehead, a parched skin, and a hurried pulse, a dose of the same useful medicine would cool the system, cure the headache, and bring the pulse to its normal state. It is an infallible remedy for worms, eradicates cancer, and removes cataract. In fine, a satisfactory estimate of its valuable properties may be gained by perusing, in the daily journals, any

advertisement of any patent medicine, together with the list of maladies for which it is a certain remedy.

Even in the present day, this medicine is in great vogue among the sages of the Eastern Hemisphere. Should the reader happen to travel into eastern lands, and fall sick of a fever, be afflicted with a sunstroke, find himself suddenly smarting with a nettle-rash, catch a cold, or suffer from sand-blindness, the remedy which will, in all probability, be offered to him, will consist of this universal panacea. In the time of the ancients, the Skink was in much favor as a medicine, and was imported largely to Rome, ready prepared in white wine. The heads and feet were considered the most efficient portions of the animal, and were relied upon as infallible renovators of a constitution broken by age, or shattered by excess.

Wherever modern civilization has most penetrated, the Skink has, happily for itself, fallen greatly in medical estimation, and in some places is entirely rejected from the pharmacopeia; though there are not wanting some European physicians who assert that the creature really does possess some valuable properties, but that it has fallen into disrepute through the over-estimate which had been formed of its powers, and which naturally created a reaction in the opposite direction.

In Southern Egypt it still commands the firm belief of the people, and is hunted down with the greatest zeal, as it not only can be applied to the personal ailings of the captors, but can be quickly dried in the burning sunbeams, and sent to Cairo and Alexandria, where it commands a ready sale.

In its habits, this Skink much resembles the generality of terrestrial Lizards of its size and locality. As it seeks for safety below the sand, it is generally to be seen upon the hillocks of fine loose sand which are collected by the south wind, at the foot of any tree which may manage to survive in so ungenial a soil, or are blown against the hedges of the more cultivated land. It generally lies quietly upon the sand, but occasionally starts into vigorous action when it perceives an insect passing within easy reach, makes a sudden rush, captures its prey, and subsides again into its former inactive repose. Beetles are its favorite food, and of these insects it will eat a considerable quantity, but can preserve life for a lengthened period without taking any food at all.

Should it be disturbed, it instantly sinks below the sand, with almost magical quickness; and, according to M. Lefebvre, who collected a great number of these Lizards, a few seconds suffice it for constructing and retiring into a burrow several feet in depth. Although armed with tolerably strong teeth and claws, it does not attempt to bite when captured, and any scratch inflicted on the hand of the captor is merely caused by its struggles while endeavoring to effect its escape.

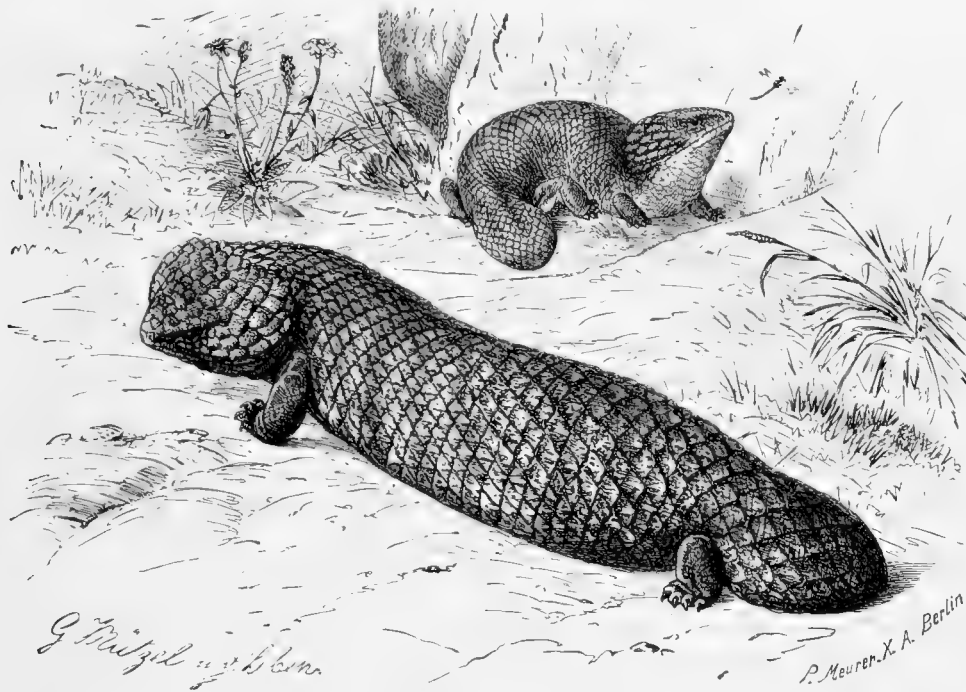
The general color of the Official Skink is reddish dun, crossed with bands of a darker hue above. Below and upon both the flanks, it is of a silvery whiteness. It is, however, liable to considerable variations, of which the most important may be briefly denoted as follows: In one variety, the upper parts are yellow, or silver-gray, with seven or eight large brown spots on the sides. In another, the head is yellow, the upper parts are chestnut-brown, profusely sprinkled with little white spots, each scale having two, or even three, white dots upon the surface. The back is marked with a series of broad white bands, generally five or six in number, and having a black patch at either extremity of each band. In another variety, the upper parts are silvery-gray, splashed with pure white, and variegated with irregular brown spots. But however great may be the variations, they are all confined to the upper surface, the abdomen, flanks, and under surface retaining their beautiful silvery whiteness. The banded variety is the most common. The Official Skink is by no means a large reptile, seldom exceeding eight inches in length, and being generally about six or seven inches long. The specimen shown in our illustration is drawn of its natural size.

The Skinks form a family of which fifty genera and one hundred and fifty species are enumerated, distributed throughout all parts of the world. Of these the BLUE-TAILED SKINK (*Eumeces fasciatus*) is very abundant in the Southern States, east of the Rocky Mountains. It is black, with fine yellow streaks, the middle one forked on the head. The tail is mostly blue.

WESTERN SKINK (*Eumeces septentrionalis*) is found in Nebraska and Minnesota. The COAL SKINK inhabits the Alleghaues, from Pennsylvania southward. The GROUND LIZARD, or SKINK, Mocoa so called, also, is abundant in the Southern States.

THE RED-HEADED SKINK (*Plestiodon erythrocephalus*), according to Dr. Dekay, inhabits Pennsylvania, and extends southward to Florida. Its length is twelve inches. Two other Skinks are recorded by Holbrook, the Five-lined Skink, and the Striped Skink. Both are exceedingly pretty creatures, inhabiting the Gulf States.

PASSING by one or two genera of considerable extent, such as *Hinulia* and Mocoa, the members of which are mostly found in Australia, though there are species which inhabit



HINULIA AND MOCOA.—*Trachysaurus rugosus*.

China, Java, the Philippines and New Zealand, we come to a reptile very well known by the popular title of the SCORPION LIZARD, and called more scientifically, as well as more correctly, the BROAD-HEADED PLESTIODON.

In spite of the rather alarming name which the terrors of the ignorant have caused them to bestow upon it, the Scorpion Lizard is one of the most harmless, as well as one of the most useful little creatures that inhabit the earth.

It is a native of Northern America, and is spread over a very large tract of country. This curious Lizard is one of the species that delights in trees, and of which we shall see more in a future page. It generally resides in some tree buried in the depths of the forest, and remains at a considerable elevation above the ground, never liking to make its home less than thirty or forty feet above the earth, and often placing itself at a much greater height.

The domicile in which this reptile most delights is the deserted home of a woodpecker, which has brought up her little family, and forsaken the burrow which had taken such time and trouble to hollow from the decaying wood. Here the Scorpion Lizard takes up its residence, and here it remains snugly concealed unless it is alarmed by an enemy at the gate of its wooden fortress, when it runs nimbly to the entrance, and pokes out its red head with so threatening a gesture, that its intending assailant, thinking it must possess a store of poison to assume so resolute an aspect, retreats from the spot and leaves the reptile in quiet possession of its abode.

Happily for the Lizard, the belief in its venomous propensities is widely diffused and deeply engrained in the popular mind, so that without having a single dangerous property except that of undaunted courage when driven to bay, it has established a reputation for ability to avenge itself when injured, which is of no less service to reptiles than men. Not that it is wholly destitute of offensive weapons, for its teeth are strong and sharp, its feet powerful, and its claws are sufficiently pointed to scratch rather deeply.

The Scorpion Lizard is naturally a very timid and retiring creature, and on the approach of danger slips quietly out of the way, wisely preferring flight to combat. But if seized, the captor will have no small struggle before he can fairly secure his small but determined quarry, for the creature bites so fiercely with its sharp teeth, retains its hold with such bull-dog tenacity, and kicks and scratches with such hearty good will, that the non-zoological populace may well be excused for thinking it to be venomous in tooth as well as in temper. The bite, indeed, is so severe, and the creature has such power of jaw, that the wounds inflicted are always exceedingly painful for an hour or two, and might give rise to the idea that the teeth were poisonous like those of the rattlesnake.

The Scorpion Lizard is seldom seen except upon trees, where it can mostly find a sufficiency of food among the insects that always haunt the branches of trees, and of drink in the dew-drops that collect at morning and evening. When, however, it needs a more abundant diet, it descends to the ground for a short visit, but after satisfying its wants, it returns to its tree, runs easily up the trunk, and again establishes itself in its burrow.

The head of the Scorpion Lizard is very broad at the base, and narrows rather suddenly to the snout, which is slightly elongated. The upper part of the head is of a bright red color. The body is olive-brown above, and the throat, abdomen, and whole of the under parts, are yellowish-white. Just in front of the ear is a series of oblong tubercles, and the temples are smooth and covered with rather large shields. The feet are large in proportion to the size of the body, and the toes are rather compressed and exceedingly delicate, in fact almost thread-like in form. The length of the Scorpion Lizard is generally about eleven or twelve inches.

THERE is a closely allied species, also common in North America, popularly called the BLUE-TAIL, and scientifically the FIVE-LINED PLESTIODON (*Plestiodon quinquelineatum*).

Like the preceding species, the Blue-tail inhabits the deepest forests, but is not one of the arboreal reptiles, being always found upon the earth, usually remaining within a short distance of its home, which is made in one of the numerous decaying tree-stumps which are found in these vast forests. Its food consists of insects, which it catches principally upon the ground.

The head of this Lizard is red, like that of the scorpion, but of a much paler quality. The body is olive, with five longitudinal white streaks, the central stripe being forked in front, and with two black bands. The tail is brownish, with a decided wash of blue during the life of the animal, a coloring which has earned for it the popular name of Blue-tail. It is, however, subject to slight variations in the color and shape of the markings. There are several little lobes in front of the ears. The length of the Blue-tail is about eight or ten inches.

A REPTILE which bears some resemblance to the scorpion Lizard is found in Jamaica and the West India Islands, where it seems to take the place of that creature, and to enjoy a reputation almost as bad, with as little cause. The negroes call it by the name of MABOUYA (*Mabouya ágilis*), but as they apply that term to anything which is, or which they consider to be venomous, and as there are very many really poisonous creatures in those countries, and many more which are falsely thought to be so, the word is rather vague in its application.

The Mabouya is a good climber, running up trees with perfect facility, and having a tendency to traverse the huts of the negroes, much to the consternation of the inmates. Its usual habitation, however, is made in the holes of old, decaying trees, and except during the very hot weather, it mostly remains at home. There is another reptile, inhabiting the same country and to which the same title is applied, and which will be mentioned in a future page.

The lower eyelid of the Mabouya is remarkable for a little transparent disc in the centre, the palate is without teeth, and the scales are smooth. Along the back run four black streaks,

the two central stripes extending only to the middle of the body, while the two external lines are prolonged nearly to the insertion of the hinder limbs.

THE great family of the Skinks finds a familiar representative in the common BLIND-WORM, or SLOW-WORM, which, from its snake-like form and extreme fragility, might well deserve the title of the glass snake. In this reptile there is no external trace of limbs, the body being uniformly smooth as that of the serpent, and even more so than in some of the snakes, where the presence of the hinder pair of limbs is indicated by a couple of little hook-like appendages. Under the skin, however, the traces of limbs may be discovered, but the bones of the shoulders, the breast, and the pelvis are very small and quite rudimentary.

This elegant little reptile is very common throughout Europe, and is also spread over some portions of Asia, not, however, being found in the north. It is plentiful along hedge-rows, heaths, forest lands, and similar situations, where it can find immediate shelter from its few enemies, and be abundantly supplied with food. It may often be seen crawling leisurely over a beaten footpath, and I have once captured it while crossing a wide turnpike road.

Why the name of the Blind-worm should have been given to this creature I cannot even conjecture, for it has a pair of conspicuous though not very large eyes, which shine as brightly as those of any animal, and are capable of good service. Indeed, all animals which prey upon insects, and similar moving things, must of necessity possess well-developed eyes, unless they are gifted with the means of attracting their prey within reach, as is the case with some well-known fishes, or chase it by the senses of hearing and touch, as is done by the mole. Moreover, the chief food of the Blind-worm consists of slugs, which glide so noiselessly that the creature needs the use of its eyes to detect the soft mollusk as it slides over the ground on its slimy course. Speed is not needful for such a chase, and the Blindworm accordingly is slow and deliberate in all its movements except when very young, when it twists and wriggles about in a singular fashion as often as it is touched.

The great fragility of the Blind-worm is well known. By a rather curious structure of the muscles and bones of the spine, the reptile is able to stiffen itself to such a degree, that on a slight pressure, or trifling blow, or even by the voluntary contraction of the body, the tail is snapped away from the body, and on account of its proportionate length, looks just as if the creature had been broken in half. The object of this curious property seems to be to insure the safety of the animal. The severed tail retains, or rather acquires, an extraordinary amount of irritability, and for several minutes after its amputation, leaps and twists about with such violence, that the attention of the foe is drawn to its singular vagaries, and the Blind-worm itself creeps quietly away to some place of shelter.

Even after the movements have ceased, they may be again excited by touching the tail with a stick, or even with the finger, when it will jump about with a vigor apparently undiminished. On frequently repeating the process, however, the movements become perceptibly less active, and after awhile the only sign of movement will be a slight convulsive shiver. Half an hour is, as far as my own experience goes, the limit to which this irritability endures.

I well remember meeting with an incident of this nature. I had come suddenly upon a reptile among the rank grass and underwood, that I at first took for a viper, and at which I aimed a thrust with a little twig of decaying wood, which broke at once. Immediately after the thrust, something began to hop and plunge about most violently just by my feet, and having a very wholesome dread of a viper's fangs, I jumped back a step or two, to the great indignation of a swarm of bees, which had settled themselves in the ruins of an old wooden hut close to the spot. They at once intimated their displeasure in that wing-language so expressive to all bee-owners, so hastily tossing the writhing object to a distance with the shattered remnant of the stick, I got away from the bees, and experimented for some time on the tail of the Blind-worm, as it proved to be. Even the flight through the air, and the heavy fall, seemed to have little or no effect upon the irritability of the severed member, and when I reached it after its fall, I found it hopping about quite merrily.

When the tail of the Blind-worm is thus snapped off, the scales of the body project all

round the fractured portion, forming a kind of hollow into which the broken end of the tail can be slipped.

According to popular notions, the Blind-worm is a terribly poisonous creature, and by many persons is thought to be even more venomous than the viper, whereas it is perfectly harmless, having neither the will nor the ability to bite, its temper being as quiet as its movements, and its teeth as innocuous as its jaws are weak. I fancy that the origin of this opinion may be found in the habit of constantly thrusting out its broad, black, flat tongue with its slightly forked tip; for the popular mind considers the tongue to be the sting, imagining it to be both the source of the venom, and the weapon by which it is injected into the body, and so logically classes all creatures with forked tongues under the common denomination of poisonous animals.

It is said that this reptile will bite when handled, but that its minute teeth and feeble jaws can make no impression upon the skin; and also that when it has thus fastened on the hand of its captor, it will not release its hold unless its jaws be forced open. For my own part, and I have handled very many of these reptiles, I never knew them attempt to bite, or even to assume a threatening attitude. They will suddenly curl themselves up tightly, and snap off their tails, but to use their jaws in self-defence is an idea that seldom appears to occur to them.

The pertinacity with which the notion of the Blind-worm's venomous properties is implanted in the rustic mind is really absurd. During the summer of this year, I passed some little time in a forest, and having gone round to the farms in the neighborhood, as distances of several miles are euphuistically called, begged to have all reptiles brought to me that were discovered during the haymaking. In consequence, the supply of vipers and snakes was very large, and on one occasion a laborer came to the house, bare-headed, his red face beaming with delight, and his manner evincing a proud consciousness of deserving valor. Between his hands he held his felt hat tightly crumpled together, and within the hat was discovered, after much careful manœuvring, the head of a Blind-worm emerging from one of its folds.

As I put out my hand to remove the creature, the man fairly screamed with horror, and even when I took it in my hand, and allowed it to play its tongue over the fingers, he could not believe that it was not poisonous. No argument could persuade that worthy man that the reptile was harmless, and nothing could induce him to lay a finger upon it; the prominent idea in his mind being, evidently, not that the Blind-worm had no poison, but that I was poison-proof. To add to his alarm, the creature had snapped off its tail during the rough handling to which it had been subjected—a proceeding which, by his peculiar process of reasoning—only corroborated its venomous properties.

In its wild state the Blind-worm feeds mostly on slugs, but will also eat worms and various insects. Some persons assert that it devours mice and reptiles; but that it should do so is a physical impossibility, owing to the very small dimensions of the mouth and the structure of the jaw, the bones of which are firmly knitted together, and cannot be separated while the prey is being swallowed, as is the case with the snakes.

In captivity it seems to reject almost any food, except slugs; but these molluscs it will eat quite freely. I have kept a specimen in my possession for about four months, which has proved a very interesting creature. After keeping it for a fortnight, I procured six or seven white garden slugs, and placed them in the glass vessel, together with the Blind-worm.

The reptile instantly saw its prey, but did not move from its place, merely following with a slow movement of the head the course of one of the slugs that crawled within an inch or two of its nose. Presently it raised its head very deliberately, and hovered over the slug as it glided along, and, after following it for an inch or two, quickly opened its mouth to the full extent, lowered its head, and grasped the slug just behind the head, squeezing it with some force, and causing a great commotion among the muscles of the foot.

Presently it relaxed its hold a little, again opened its mouth and took a fresh grasp, and after three or four of these movements, it contrived—how, I cannot comprehend, though I have watched the creature over and over again—to get the head of the slug down its throat.

The process of swallowing was then very easy, and, after a few more efforts, the whole of the mollusc had disappeared. After resting for a few minutes, it attacked another slug precisely in the same manner; but I have seldom seen it eat more than two or three at one meal. By degrees it caught and ate all the slugs, and it will finish a dozen in a week or ten days.

After a short time my Blind-worm unexpectedly became the mother of a numerous progeny, nine little Blind-worms having made their appearance in the world during the night. They were remarkably pretty little creatures, and so unlike their parent, that few persons would attribute them to the same species. They are much more serpentine in their general aspect, their heads being considerably wider than their necks, whereas in the adult the head and neck are as nearly as possible of the same width.

Their color is shining creamy-yellow above, and jetty-black below, the line of demarcation running along the flanks, and being very sharply defined. Along the back runs a narrow black line, which upon the head is expanded, and then divides so as to form a letter Y. Just above the nose is another forked, black mark, looking like an inverted V, and both these letters have a notable circular enlargement at the angle. As the creature grows, the V mark becomes gradually uncertain, and finally disappears; but the black line down the back, and its Y-like termination, retain their position through life, though they are not so conspicuous as in the young, owing to the darker coloring of the surface.

How these little things feed I cannot make out. Though the little creatures born in my house had lived for about five weeks, had grown considerably, and had always been very lively, they had taken no food so far as I could discover. For the first three weeks of their life, they lived in a glass jar closed at the top, and with an inch or so of dry earth at the bottom, in which there could be no nourishment. A little milk was poured on the mould now and then; and they perhaps may have licked the moistened earth, and so have obtained some little nourishment, though they were never seen to do so, and indeed appeared perfectly indifferent to the milk.

When I introduced the slugs, the odd little reptiles acted just as their mother was doing, followed the slugs about with their heads, hovered over them, made believe to eat them, and then were quietly walked over by their intended prey, which, being nearly twice as big as themselves, proceeded on its course without paying the least regard to the tiny reptiles, whose bodies were not larger than ordinary knitting-needles, and easily glided over them, or put them to ignominious flight.

After they had been in the jar for some time, I fitted up an old aquarium in a manner intended to imitate as far as possible their natural home, building a bank of earth and stones at either end, laying turf in the middle, and planting ferns upon the banks, with moss round their roots. They enjoyed the change very greatly, immediately proceeded to burrow in all directions through the earth and among the stones, until they established a whole series of tunnels through which they can glide at will, and seem to take great pleasure in permeating their establishment at all hours, especially delighting in pushing their way through the moss and then retreating into their burrows.

On a cold day they bury themselves below the mould; but the first gleam of sunshine that plays among the green fern-leaves brings them from their recesses, and causes them to glide about the moss and turf most merrily. Sometimes, when they are coiled asleep within their home, their bodies are pressed against the glass, and it is curious to see how immovable they will lie, in spite of tapping the glass, but how soon they wake up and brisk they become when the glass is warmed. Even a few warm breaths upon the glass suffice to awake them.

I think that I have discovered another kind of subsistence for the young; but that has only been possible since they have been placed in the aquarium, or rather, the fernery, as it is now. Sundry very minute insects of the dipterous order may be seen flitting about within the glass, probably having been introduced with the turf and ferns; and it is possible that the young Blind-worms may contrive to catch and eat these creatures, and derive some nutriment from them, in spite of their diminutive size.

When wild, the Blind-worm generally retires to its winter-quarters towards the end of August, or even sooner, should the weather be chilly. The localities which it chooses for this

purpose are generally dry and warm spots, where the dried leaves and dead twigs of decayed branches have congregated into heaps, so as to afford it a safe refuge. Sometimes it bores its way into masses of rotten wood ; and on heathery soils, where the ground slopes considerably, it selects a spot where it will be well sheltered from the winter's rains and snows, and burrows deeply into the dry loose soil.

It is singular to see the creature emerging from the ground when the least touch will soil the fingers, and to see how totally free from earth stains is the bright glittering skin of the reptile, upon which not a particle of mud can cling. I once detected upon the head of my specimen a projection which I thought was a little lump of mud, I having just watered the ferns and turf, greatly to the discomfiture of the Blind-worms, both old and young ; but, upon close examination, I found it was only a little pebble which had lodged upon the head, as the reptile came hastily out of its burrow to avoid the water. So quietly did the Blind-worm move, that the stone retained its place upon the head for several minutes, and did not fall off until I startled the creature, and caused it to turn its head rather sharply.

The Blind-worm would be a most useful inhabitant of a garden—not at all repulsive, and, indeed, very seldom seen, its instinct teaching it to remain within some dark recess during the day, and only to come out at night when the slugs leave their earthy hiding-places, and commence feeding. Moreover, it is very prolific, and needs no special appliances, as is the case with the frog and toad, which require the presence of water to produce and hatch their young, and for the little reptiles to come to maturity. Sometimes the number of young is twelve or thirteen, and sometimes there are only seven or eight. The usual average is, however, nine or ten ; and they are very hardy little things, requiring no care whatever.

Being one of the earliest to retire into its winter quarters, the Blindworm is one of the first reptiles to leave them, appearing before either the snake or the viper. The reason for this early appearance is simple enough. Neither creature can venture into action when it can find no food, the active powers of the body causing a waste which must be restored with nutriment. The snake feeds upon frogs, and therefore cannot leave its winter's home until it finds the frogs ready for it. The frogs, again, which feed upon insects, must wait until the vegetation has attained sufficient luxuriance to afford food for their insect prey ; but the Blind-worm, which finds its nourishment among the mollusks which devour the earliest leaves, is able to leave its winter quarters as soon as the vegetation begins fairly to sprout, and the slugs to devour it.

Even during the winter, a warmer sunbeam than usual will tempt the Blind-worm to come to the mouth of its burrow, poke out its head, and enjoy the temporary, but cheering warmth. My own specimens have not yet made any preparations toward retiring to winter quarters, though the usual time has passed away nearly two months ago, a circumstance which is probably due to the warmth of their home, and the occasional supply of slugs which I now and then put into the case.

Like the snakes, the Blind-worm casts its skin at regular intervals, seeming to effect its object in various modes, sometimes pulling it off in pieces, but usually stripping it away, like the snakes, by turning it inside out, just as an eel is skinned. Some persons, who have witnessed the process, state that this eversion is only extended to the base of the tail, and that the entire tail is drawn out of the skin like a hand out of a glove. Mr. G. Daniel mentions, that a Blind-worm in his possession cast its skin in so many pieces, that the largest portion was only two inches in length. The process began by a split along the abdomen, and the head was the last part extricated from the rejected integument. This mode of shedding the skin was, however, owing, in all probability, to some weakness in the individual, or to the want of the usual aids, such as the stems of grass, heather, and other vegetation, against which the reptile contrives to rub itself, so as to assist its efforts in peeling off the cuticle. The color of the Blind-worm is rather variable. In my own specimen, now crawling over the paper on which I write, and blotting it sadly, the color is dark olive-brown above, with a shining silvery lustre, and diversified with a narrow black line along the back, and a broader black line down each side. The flanks are grayish-white, mottled with black, and the under parts are nearly black, variegated with a little gray. The Y-like mark on the head is still apparent, but there is

no trace of the inverted V. On the sides of the head, the mottlings of gray and black are very bold, and round the neck runs a collar of black. This mark, however, may have been caused by the stupidity of the captor, who was so frightened at the contortions of the reptile, that he tied a string round its neck to form a safe handle with which to carry it.

Mr. Bell, in his volume on reptiles, states that the tail is obtuse, but that it rather varies in length, in some cases being not more than half the length of the body, while in others it nearly equals the head and body together. In my own specimen, the tail is by no means obtuse, but very slender and well pointed, and can be so tightly curled at its extremity as not to be removable without damage to the creature. While held in the hand, it generally twists the tip of the tail firmly round one of the fingers, not in a spiral position, but so as to make one complete circle, the extremity of the tail just touching the spot where the circle commences. The total length of this specimen now lying flat against a two-foot rule, towards which I have just succeeded in coaxing it by a judicious arrangement of light and shade, and an occasional touch with the finger, is thirteen inches and a half. The body and head occupy precisely six inches, and the remaining seven inches and a half are given to the tail. The spot where the body ends and the tail begins is very evident, the diameter of the body diminishing slightly but suddenly.

THE family of the Skinks contains so many interesting creatures, that it is difficult to make a satisfactory selection, and impossible to avoid a feeling of regret at the necessity for passing so many species without even a cursory notice. Before, however, proceeding to the next family, we must give a short notice of one or two rather conspicuous species.

The first is the SPINE-BACKED LIZARD of New Guinea (*Tribolonotus novæ guineæ*), a very remarkable creature, notable for the singular formation of the scales which cover the back, and in allusion to which the creature has been placed under the generic name *Tribolonotus*. This long word is of Greek origin, signifying calthrop-backed—calthrops being certain horrible instruments thrown on the ground to check the advance of cavalry, and consisting of four iron spikes, set round a ball in such a manner, that when flung on the ground, three points rest on the earth, and the other projects perpendicularly into the air.

Though really harmless, the Spine-backed Lizard is a most formidable looking creature, the whole of the back being covered with long and sharply pointed spikes, formed by a modification of the scales, that project boldly in all directions, and fully justify the generic name. Even on the tail the scales, which are arranged in whorls, are long, pointed, and project over each other, so as to give a very formidable aspect to this member. Even the head is armed with these pointed scales, which become larger and larger as they approach the neck. The color of this Lizard is brown above, and grayish-white below.

ANOTHER notable member of this family is the well-known GALLIWASP (*Celestus occiduus*).

This reptile is a native of the West Indian Islands, and is very common in Jamaica, where it is held in great, but groundless dread, by the inhabitants, and especially by the negroes. It generally haunts damp situations, and is mostly found in marshy lands, near water, or hidden under rocks where moisture is retained by the nature of the ground. It is thought that when the Galliwasp is irritated, its bite is as venomous as that of a poisonous snake, and causes immediate death. On account of the dread in which it is held, the negroes call it by the name of Mabouya, in common with the reptile which has already been described on page 62.

The color of the Galliwasp is brown of various tones, diversified with cross bands of blackish brown. It is about one foot in length. There are several species belonging to this genus, all being found in Jamaica.

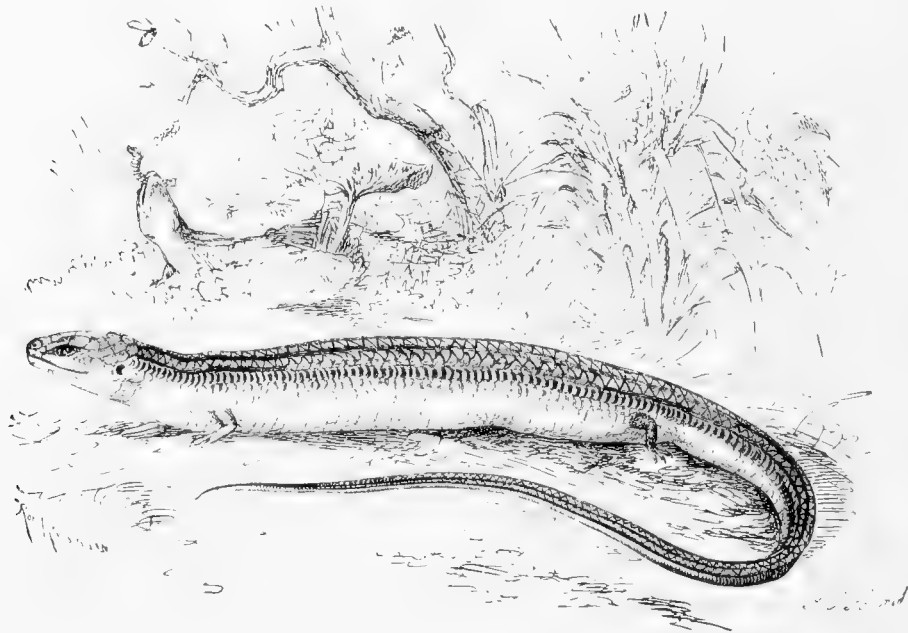
THE last example of the Skinks which can be mentioned in these pages is SAGRA'S DIPLOGLOSSUS, OR DOUBLE-TONGUED LIZARD.

This reptile is a native of Cuba, and is found in localities where the air is cool, and the

soil light and moist. It is an active little creature, and moves from place to place with much agility. In this reptile the tongue is rather large, covered with little scale-like papillæ in front, becoming more thread-like behind. The color is gray, with a bronzy lustre, and a black streak runs along each side.

THE next family of Lizards contains only one species, the OPHIOMORE (*Ophiomorus miliáris*), and is separated from the skinks and the sepsidæ on account of a formation of the scales of the head, which seems to place it in an intermediate position between those two families. There are no external limbs, and the whole body and tail are long, cylindrical, tapering, and serpentine in aspect. The color of the Ophiomore is brown above, covered with numerous tiny black dots arranged in regular lines along the body, and being larger upon the sides. The under parts are white, and the sides are gray. It is a native of Northern Africa, and has been brought from Algiers.

IN the SEPSIDÆ, a family which contains seven genera, there are always external limbs, mostly four in number, but in one genus, *Scelotes*, the front pair of legs are wanting, and the hinder pair are small and divided at the extremity into two toes only.



SEPS, OR CICIGNA. *Seps tridactylus*.

The typical species of this family is the common SEPS, or CICIGNA, a curious snake-like Lizard, found in various parts of the world, and not uncommon in many portions of Europe. Specimens have been taken in the south of France, in Italy, Sardinia, Syria, and the north of Africa. The name of Seps is of Greek origin, and signifies corruption. From ancient times to the present day, this harmless little reptile has been held in great dread by the natives of the country wherein it dwells, being considered as a deadly enemy to cattle, biting them at night during their sleep, and filling their veins with corruption. Horses, and especially mares, were thought to be the most frequent sufferers from the bite of this reptile.

The legs of the Seps are very weak, and are set far apart, so that the creature trusts but little to the limbs for its powers of locomotion, and wriggles itself along after the fashion of the snakes. The food of the Seps consists of worms, small snails, slugs, insects, spiders, and similar creatures, its general habits seeming to resemble those of the blindworm. Like the lizard, when the winter approaches, it burrows deeply in the loose soil, and remains hidden until the succeeding spring.

The teeth of the Seps are small, conical, and simple, and there are no teeth on the palate, which is grooved longitudinally. The eyelids are scaly, and the lower has a transparent disc. The toes are three in number on each foot, and very feeble; the tail is conical and pointed. The color of the common Seps is grey, with four longitudinal brown streaks, which, on a closer inspection, are found to consist of a succession of brown dots.

Two members of the Sepsidæ deserve a passing notice before we pass to the next family. The first is the CAPISTRATED SPILENOPS (*Sphænops sepsoides*).

This reptile is a native of Northern Africa, but seems to have a rather restricted range, being seldom, if ever, found out of Egypt. In some parts of that country it is very plentiful, being found in the rice grounds, under hedges, and on the roads where the wheels of passing vehicles have worn deep ruts. Indeed, it appears to have a predilection for ridged ground, over which it passes with considerable speed, and is not to be captured without the exercise of some agility. It is quite harmless, and even when caught, struggles with all its might to escape, but does not attempt to bite the hand that holds it. Like many other reptiles of similar form, it burrows in the ground, but makes its tunnel so near the surface of the ground, and in so horizontal a direction, that the foot of a traveller will often lay open the superficial retreat and render its inmate homeless for a time.

The ancient Egyptians seem to have held this little reptile in religious veneration, as there are several known instances where it has been honored with the ceremony of embalming, and placed in the sacred tombs, together with other creatures formerly revered as types of divinity.

The Sphænops has four legs, moderately well shaped, but rather weakly formed, and the feet are divided into four toes, each of which is furnished at the extremity with a claw. The head is wedge-shaped, rounded in front, the palate is without teeth, and the lower eyelid is transparent. The general color of the Sphænops is pale brown, with a longitudinal series of black dots, and a black streak on each side of the muzzle.

OUR last example of this family is the TILIGUGU (*Gongylus ocellatus*), or EYED TILIGUGU, another of the numerous reptiles classed under the common title of Mabouya by the ignorant and fearful.

It inhabits the countries bordering the Mediterranean, and is found in Sardinia, Malta, Egypt, and even in Teneriffe. Like the preceding species, it is quick and active in its movements, and when seized does not attempt to bite. It is a lover of dry and elevated spots, where the sand is loose, and there are plenty of stones under which it may hide itself. The food of this reptile consists of insects. Besides the names which have already been mentioned, it is also called LACEPEDE'S GALLIWASP and the OCELLATED SKINK.

In coloring it is one of the most variable of reptiles, but the general tints are gray, with a bronze gloss, diversified by a number of white spots edged with black. It has four legs, the toes are five on each foot, the head is conical, with a rounded muzzle, and the lower eyelid has a transparent disc.

THE ACONTIADÆ form the next family, which contains three genera. The head is small, the upper eyelid is either very small or altogether absent, the body is cylindrical, and the limbs, when present, are very weak and small. In two of the genera, Nessia and Evesia, there are four limbs, in the former with three toes, and in the latter with the feet small, imperfect, and not divided into toes. The upper eyelid is distinct though small.

IN the ACONTIAS, OR JAVELIN SNAKE, the limbs are absent externally, and the upper eyelid is rudimentary. The body of this reptile is elongated and cylindrical, not unlike that of the common blindworm. The name Acontias is derived from a Greek word signifying a javelin, and has been given to this creature on account of the shape of the head, which bears some resemblance to the point of a spear. Some writers think that the name is given in allusion to its quick movements when seizing its prey. As in shape, so in habits it resembles the blind-

worm, and like that reptile is very common in the fields and under hedges. It is a South African reptile, and is found abundantly at the Cape of Good Hope.

In its coloring this is a very handsome little creature, being sometimes called the Painted Acontias (by the French writers *La Peintade*), in allusion to the variegated tints with which it is bedecked. Like many other reptiles, especially those which are lightly colored, it is susceptible of much variation. Generally, however, it is rich chestnut-brown above, profusely dotted with bright yellow, the spots being arranged in series of varying number, one specimen having eight rows of spots, while another has only six. The scales are smooth, the teeth are conical and rather blunt, the eyes are very small, and the tail is short and rather rounded at the tip.

ANOTHER curious family of reptiles possesses only two limbs at the most, the front pair being always, and the hinder pair sometimes, wanting. There is a curious, cup-like shield on the chin, the body and tail are cylindrical, and both eyes and ears are apparently absent, but may be found hidden under the skin, where the greater part, if not the whole, of their functions must be in abeyance. In consequence of this remarkable privation, they are classed together under the very appropriate name of Typhlinidæ, a term derived from the Greek, and which signifies blindness.

In the typical species, the TYPHLINE, or BLIND ACONTIAS as it is sometimes, but rather erroneously called, the limbs are entirely absent, and the creature looks about as helpless a being as can well be imagined, having no apparent legs, feet, eyes nor ears. The Typhline inhabits Southern Africa, and is found at the Cape of Good Hope. In its coloring it is rather variable, being generally of a brownish hue, with spots of purple upon the hinder part of the scales of the back, and sometimes of a yellowish tint, with violet spots.

THERE are so many reptiles scattered over the world, and they are divided by modern systematic zoologists into so many families, that it is only possible to give a short description of one or two examples of each family, while to supply illustrations would be wholly impracticable without nearly doubling the amount of space that can be allotted to them.

The next family is called by the name of Typhlopsidæ, or Blind Reptiles, a title which has been given to them because their eyes are either very small, or altogether wanting externally. In all these animals the head is broad, rather flattened, and has a large, erect plate near the muzzle. The mouth is small, semilunar in shape, and placed under the muzzle in a manner somewhat resembling that of the sharks. The tail is cylindrical, and has a large shield or plate at the tip, sometimes conical and sometimes spine-shaped.

In the TYPHLOPS, the typical species, the head is nearly covered by a single, very large shield, which is rather bent downwards in front. The tail is very short and tapers suddenly, and the scales of the body are small and uniform. It inhabits India, where it is not uncommon, though, in consequence of its earth-loving habits, it is not very often seen except by those who know its localities, and search purposely for the hidden reptile. It moves over the ground with some rapidity, and burrows easily, penetrating to a depth of three or four feet during the rainy season. At other times it is mostly content with the shelter of large stones and similar places of refuge.

Owing to the small size and the rather remarkable position of the mouth, the Typhlops is unable to act on the offensive, and when captured, although it attempts to glide through the fingers, does not even offer to bite. It is wonderfully tenacious of life, and according to Dr. Russell, will live for some time even when immersed in spirits of wine. The general color of the Typhlops is yellowish-white.

This family contains also the Clawed Snake (*Onychophis*)—so called because the bony shield on the muzzle is erect, keeled, and bent over into a claw-like shape—and the Silver Snakes (*Argyrophis*), a small group of reptiles, deriving their popular name from the silvery lustre of their scales.

THE last family of the sub-order Leptoglossæ, or Slender-tongued Lizards, is the group of reptiles termed the Rough-tailed Lizards, or UROPELTIDÆ. In these Lizards the head is rather compressed, flat above, and sharp towards the muzzle. The eyes are of moderate size, and without eyelids, a bony scale answering the purpose. The body is cylindrical, and covered with regular, six-sided scales, sometimes ridged, but mostly smooth. The tail is also cylindrical, and abruptly terminated, as if cut off obliquely. There are no external limbs, and by most systematic naturalists the Rough-tails have been placed among the serpents, which they very closely resemble, except in the arrangement of certain scales, and the short, abruptly truncated tail.

The Rough-tailed Lizards are divided into three genera, separated from each other by the formation of the scales that cover the tail. While moving, the Rough-tails aid themselves by pressing the truncated tail against the ground. As a typical species, we may select the PHILIPPINE SHIELD-TAIL (*Uroplatis philippinus*), a reptile which, as its name imports, inhabits the Philippine Islands. In this creature the tail is rather flattened, and covered above with a curious "flat, roundish, radiating, granular shield." On the lower side of the tail the scales are arranged in six rows. The color of the Philippine Shield-tail is brown above and white beneath, the line of demarcation being very distinct, and regularly waved.

THICK-TONGUED LIZARDS; PACHYGLOSSÆ.

A NEW sub-order now comes before our notice, the members of which are distinguished by the formation of their tongues, which, instead of being flat and comparatively slender, as in the preceding Lizards, are thick, convex, and have a slight nick at the end. On account of this structure, the species of this sub-order are termed PACHYGLOSSÆ, or Thick-tongued Lizards.

These reptiles are divided into sundry groups, the first of which is termed the NYCTISAUURA, or Nocturnal Lizards. These creatures have eyes formed for seeing in the dusk, circular eyelids which, however, cannot meet over the eye-ball, and in almost every case the pupil is a long narrow slit like that of the cat. The body is always flattened. The limbs are four in number, tolerably powerful, and are used in progression.

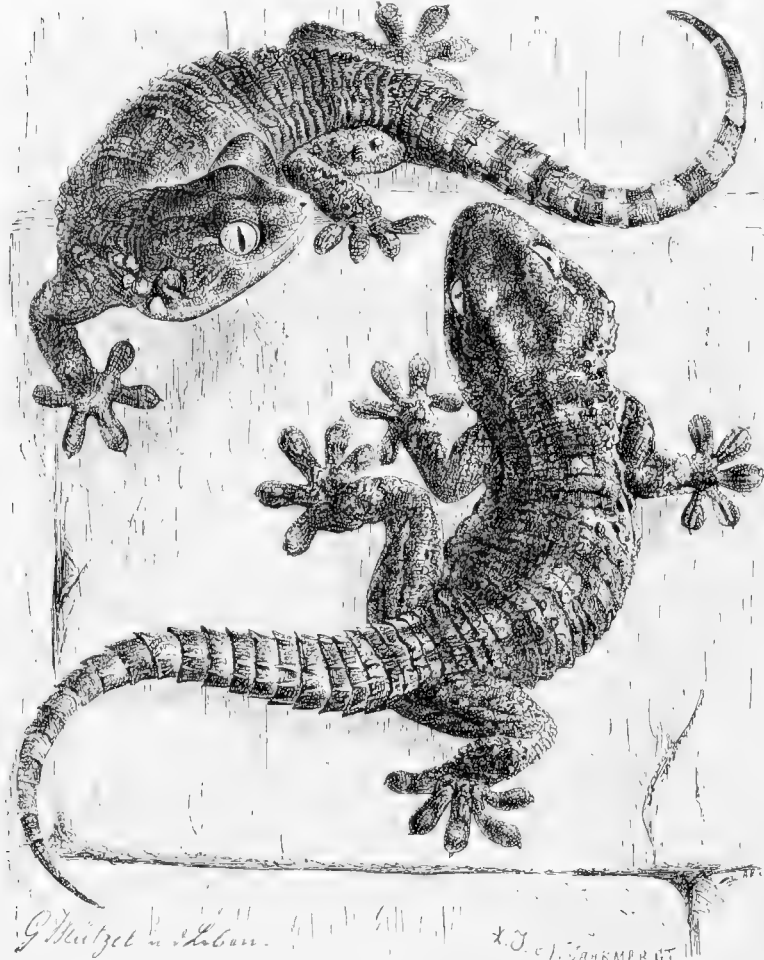
Of these Lizards, the first family is the GECKOTIDÆ, or Geckos, a very curious group of reptiles, common in many hot countries, and looked upon with dread or adoration by the natives, sometimes with both, where the genius of the nation leads them to reverence the object of their fears, and to form no other conception of supreme power than the capability of doing harm.

THE FAN-FOOT, or HOUSE GECKO, is a native of Northern Africa, and is very common in Egypt, and is found, as its name imports, in houses, traversing the floor and walls with astonishing address, in search of its food, which consists of worms, insects, and similar creatures. The natives have a very great dread of this creature, asserting that it is extremely poisonous—the poison not being injected by the teeth, but exuding from the lobules of the toes. The generic title *Ptyodactylus*, or Toe-spitter, is given to the reptile in allusion to this idea. It is said by Hasselquist, that if a Gecko is taken in the hand, the poisonous matter which is immediately shed over the skin from the feet of the captive, causes an instantaneous eruption, similar to that produced by the sting of a nettle. The same traveller proceeds to relate an incident which is hardly so much in accordance with probability, namely, that two women and a girl were lying at the point of death from having eaten some cheese over which one of these reptiles had walked.

So great is the dread inspired by this creature, that in Cairo it is popularly termed Abouburs, or father of the leprosy. The people fancy that it purposely poisons their provisions, and that it is especially fond of communicating the venom to salted meat of all kinds. In former times the Fan-foot was endowed with even greater powers of offence, its teeth being added to its weapons, and asserted to be capable of leaving their impression even on steel,

though in point of fact, the jaws of the Geckos are rather feeble, and their teeth very small, and hardly able to pierce even the human skin.

The Geckos are indebted for their power of traversing perpendicular walls to the formation of their feet, which, although greatly varied in the different genera, have the same essential qualities in all. In this genus the toes are expanded at their extremities, into a round disc, and furnished with claws which are sheathed in a notch cut in the front of the disc. The color of the Fan-foot is reddish brown spotted with white.



FAN-FOOT.—*Ptyodactylus gecko*.

THE COMMON GECKO, OR RINGED GECKO, is an Asiatic species, being as common in India as the preceding species in North Africa. It may be easily known from the Fan-foot by the large tubercles upon the back.

This reptile has much the same habits as the Fan-foot, and possesses equally the ability to run over a perpendicular wall. During the day-time it conceals itself in some chink or dark crevice, but in the evening it leaves its retreat, moving rapidly and with such perfectly silent tread that the ignorant natives may well be excused for classing it among supernatural beings.

The Gecko occasionally utters a curious cry, which has been compared to that peculiar clucking sound employed by riders to stimulate their horses, and in some species the cry is very distinct and said to resemble the word Geck-o, the last syllable being given smartly and sharply. On account of this cry, the Geckos are variously called, Spitters, Postilions, and Claqueurs.

During the cold months of the year the Geckos retire to winter quarters, and are thought to retain their condition during this foodless season by means of two fatty masses at the base of the abdomen, which are supposed to nourish them as the camel is nourished by the hump. The male is smaller than the female, and the eggs are very spherical, and covered with a brittle chalky shell. The color of the Gecko is reddish gray with white spots. The scales of the back are flat and smooth, and there is also a series of rather large tubercular projections arranged in twelve rather distinct rows.

CLOSELY allied to these two reptiles is the SPOTTED GECKO, OR SPOTTED HEMIDACTYLE, a rather pretty species of Gecko found in various parts of Asia, and tolerably common in India, China and Ceylon. Sir Emerson Tennent, in his valuable work on Ceylon, gives a very interesting account of this little creature, and relates two curious anecdotes, exhibiting the readiness with which even a Gecko can be tamed by kind treatment.

“In a boudoir where the ladies of my family spent their evenings, one of these familiar and amusing little creatures had its hiding place behind a gilt picture-frame, and punctually as the candles were lighted, it made its appearance on the wall to be fed with its accustomed crumb; and if neglected, it reiterated its sharp quick call of *chic-chic-chit*, till attended to. It was of a delicate gray color, tinged with pink, and having by accident fallen on a work-table, it fled, leaving its tail behind it, which, however, it reproduced within less than a month. This faculty of reproduction is doubtless designed to enable the creature to escape from its assailants; the detaching of the limb is evidently its own act.

“In an officer’s quarters in the fort of Colombo, a Gecko had been taught to come daily to the dinner-table, and always made its appearance along with the dessert. The family were absent for some months, during which the house underwent extensive repairs, the roof having been raised, the walls stuccoed, and ceilings whitened. It was naturally surmised that so long a suspension of its accustomed habits would have led to the disappearance of the little Lizard, but on the return of its old friends, at their first dinner it made its entrance as usual the instant the cloth had been removed.”

ANOTHER rather curious species is the TURNIP-TAILED GECKO (*Thecodactylus rapicaudus*), so called from the odd shape of its tail, which, when reproduced, is very much swollen at the base, and, with its little conical extremity, has an almost absurd resemblance to a young turnip. It is worthy of mention, that all the Geckos possess the faculty of reproducing their tails when those members have been lost by some accident, and that the second tail is mostly very unlike the original. Before the creature has suffered (if it does suffer) this mutilation, the tail is covered with scales of the same structure and form as those of the back; but when the tail is reproduced, it is generally supplied with little squared scales arranged in cross series. In examining a Gecko therefore, it is necessary to ascertain whether the tail be in its normal condition or only a second and altered edition of that member.

The color of the Turnip-tailed Gecko is brown, mottled boldly with a darker tint, and speckled with tiny dots of dark brown. The scales of the back are six-sided, and on each side of the base of the tail there is a prominent conical tubercle. This species inhabits Tropical America.

A VERY remarkable reptile is the FRINGED TREE GECKO, or SMOOTH-HEADED GECKO. It is a native of Java, and especially worthy of notice on account of the broad membranous expansions which fringe the sides of the head, back, limbs and tail. On the body this membrane is covered with scales, and waved on its edges, but on the tail the waves become suddenly deepened, so as to form bold scollops. The toes are webbed to the tips, and, with the exception of the thumb-joint, are furnished with claws at the swollen extremity. The scales of the back are smooth and flat, and even the membranous fringes are covered with scales.

Formerly this creature was thought to be aquatic in its habits, but it is now known to live on trees, and to employ the membranous expansions in aiding it in its passage from branch to branch, much after the well-known fashion of the flying squirrels. The generic title, *Ptychozoon*, is composed of two Greek words, the former signifying a fold of a garment, and the latter a living being. The general color of the Fringed Tree Gecko is brown above, with a slight yellowish tinge along the spine, and crossed with small dark brown lines, very narrow and deeply waved. A line of similiar appearance and of a bold zig-zag form encircles the top of the head, looking as if a dark brown string had been tied at the ends, formed into a rude circle, and then pinched at intervals so as to cause deep indentations. Below it is of a whitish gray color.

THE curious and rather interesting little Lizard called the CAPE TARENTOLA, is an inhabitant, as its name signifies, of the Cape of Good Hope, and is found spread over a considerable portion of Southern Africa.

This reptile is of slower habits than the generality of the Geckos, and moves along with deliberate and apparently purposeless steps. It is almost invariably seen upon or near decayed wood, and is frequently found under the bark of dead trees, clinging tightly to the trunk, and shielded by the bark from the unwelcome glare of daylight. In all probability, it finds abundance of food in the same locality, for the space between the bark and wood of a decaying or dead tree, is generally filled with insects of various kinds and in their different states of existence, beside being the chosen home of millipedes, spiders, and similar creatures.

Although a slow mover, the Cape Tarentola can, after the manner of its kin, ascend smooth and perpendicular objects with perfect ease and noiseless motions, and can even traverse and cling to a ceiling or a cross-beam without difficulty, and there remain motionless for hours. Like the generality of the Gecko family, it detests the daylight, and the bright beams of the sun are a torture to this dweller in darkness, which, if overtaken by daylight while out of its refuge, crawls away to the nearest cranny and there buries itself until the evening hours bring with them the desired shades, and restore the animal to its wonted activity. It is extremely shy, and even in the dusk it will avoid the dangerous approach of an intruder by silently slipping under the cover of the loose bark, or hiding itself among the decaying wood.

It is quite a little creature, rarely measuring more than four inches in length, and often not reaching even those moderate dimensions. As is the case with many Lizards, it is liable to certain variations in coloring, but its general tints are as follows: The back and upper portions of the body are yellowish-brown, with a decided yellow wash, and banded with several dark brown bars, rather curved. Scattered over the body are certain protuberant scales of a lighter hue. The tail is a pale brownish-purple with a reddish gloss, and speckled with warm chestnut-brown. The abdomen, and the under portions of the body and limbs are ochry yellow, and the eyes are, although devoid of expression and of a passionless brightness, like polished stone, very shining and of a bright orange-brown. The whole form of this Lizard is rather thick and clumsy.

As this family contains at least forty genera, it is manifestly impossible to mention more than a few species, which can be accepted as types of the family, and serve as links to render the chain of nature complete. Passing, therefore, several series of genera, we will give a short time to one or two species of Gecko before proceeding to the next family.

The WOODSLAVE, as the reptile is popularly termed by the natives of the country where it resides, or the BANDED SPHERODACTYLE (*Spharodactylus sputator*), as it is more scientifically called by zoologists, is a small species of Gecko found in most of the American islands, and is spread over many portions of South America; and is held in great dread by the white and dark population. It is generally supposed to possess a store of venomous saliva, causing the part of the body on which it falls to swell grievously, and to eject this poisonous substance from some distance upon those who chance to vex its irascible temper. The specific term *sputator* signifies a spitter, and has been given to the reptile on account of this supposed propensity. The poisonous saliva is said to be black.

The Woodslave has no claws on its toes, the pupil of the eye is round, and the eyelid circular. The back and tail are covered with small scales. The color is generally black and yellow, arranged in cross bands, and there is a white streak on each side of the head. There are several species belonging to this genus, all inhabiting similar localities.

The reader will remember that in the turnip-tailed Gecko, mentioned on page 73, the tail is curiously swollen at the base after its reproduction. In the LEAF-TAILED GECKO, otherwise called WHITE'S PHYLLURE (*Phyllurus platyrus*), the tail is always rather long, flattened considerably, very broad, with a deep notch at its junction with the body, and a shallower double notch in the centre. Along the middle there also runs a shallow groove, and the entire aspect is so quaint, not to say ludicrous, that on seeing a specimen of this odd-looking Lizard, the first impression on the mind is that the tail has been cleverly manufactured and attached to the body by artificial means. This Gecko is a native of New Holland.

Both the scientific names of the Leaf-tailed Gecko refer to the singular formation of its tail, the one signifying Leaf-tail, and the other Broad-tail. The head of this reptile is very broad at the base, very sharp at the snout, and the skin adheres so closely to the bone as to exhibit the form of the skull through its substance. The toes are long, slender, and rather compressed. Along the sides runs a fold of skin, very slight, but sufficiently conspicuous. The tail is very thin and leaf-like; along the edge runs a series of spiny scales, and its surface is covered with rather long conical tubercles arranged in cross rows. The color is brown, and a number of little spiny tubercles are scattered over the back.

In taking leave of the Geckos, we must cast a hasty glance at their feet. In many of their movements the Geckos bear a curious likeness to the common fly, and when one of these reptiles is seen gliding along a perpendicular wall with noiseless step, or clinging with perfect ease to an overhanging beam, quite regardless of the fact that it is hanging with its back downwards, the resemblance is irresistible. And on inspecting the foot and its structure, the resemblance which this member bears in many species to the well-known foot of the fly, is remarkably close and worthy of attention.

STROBILOSAURA.

WE now arrive at an important tribe of Lizards, called by the name of Strobilosaura, a title derived from two Greek words, one signifying a fir-cone and the other a lizard, and given to these creatures because the scales that cover their tails are set in regular whorls, and bear some resemblance to the projecting scales of the fir-cone. In all these reptiles the tongue is thick, short, and very slightly nicked at the tip. The eyes have circular pupils, and are formed for day use.

THE first family of these Lizards consists of those creatures which are grouped together under the general title of IGUANA. This word is employed extremely loosely, as the name of Iguana is applied to many species of Lizards, such as the monitors and the varans, which in reality have little in common with the true Iguanas. These reptiles can mostly be distinguished from the rest of the tribe by the formation of their teeth, which are round at the roots, swollen and rather compressed at the tip, and notched on the edge. There are generally some teeth on the palate. All the true Iguanas inhabit the New World. As the family of Iguanas is extremely large, and contains more than fifty genera, we can only examine a few of the most interesting species, the first of which is the COMMON IGUANA.

This conspicuous, and in spite of its rather repulsive shape, really handsome Lizard, is a native of Brazil, Cayenne, the Bahamas, and neighboring localities, and was at one time very common in Jamaica, from which, however, it seems to be in process of gradual extirpation.

In common with those members of the family which have their body rather compressed, and covered with squared scales, the Iguana is a percher on trees, living almost wholly among the branches, to which it clings with its powerful feet, and on which it finds the greater part of its food. It is almost always to be found on the trees that are in the vicinity of water, and especially favors those that grow upon the banks of a river, where the branches overhang the stream.

Though not one of the aquatic Lizards, the Iguana is quite at home in the water, and if alarmed, will often plunge into the stream, and either dive or swim rapidly away. While swimming, it lays its fore legs against the sides, so as to afford the smallest possible resistance to the water, stretches out its hinder legs, and by a rapid serpentine movement of its long and flexible tail, passes swiftly through the waves. It has considerable power of enduring immersion, as indeed is the case with nearly all reptiles, and has been known to remain under water for an entire hour, and at the end of that time to emerge in perfect vigor.

From the aspect of this long-tailed, dewlapped, scaly, spiny Lizard, most persons would rather recoil than feel attracted, and the idea of eating the flesh of so repulsive a creature would not be likely to occur to them. Yet in truth, the flesh of the Iguana is justly reckoned

among one of the delicacies of the country where it resides, being tender, and of a peculiarly delicate flavor, not unlike the breast of a spring chicken. There are various modes of cooking the Iguana, roasting and boiling being the most common. Making it into a fricassee, however, is the mode which has met the largest general approval, and a dish of Iguana cutlets, when properly dressed, takes a very high place among the delicacies of a well-spread table.

The eggs, too, of which the female Iguana lays from four to six dozen, are very well flavored and in high repute. It is rather curious that they contain very little albumen, the yellow filling almost the entire shell. As is the case with the eggs of the turtle, they never harden by boiling, and only assume a little thicker consistence. Some persons of peculiar constitutions cannot eat either the flesh or the eggs of the Iguana, and it is said that this diet is very injurious to some diseases. The eggs are hid by the female Iguana in sandy soil near rivers, lakes, or the sea-coast, and after covering them with sand, she leaves them to be hatched by the heat of the sun.

In consequence of the excellence of the flesh and eggs, the Iguana is greatly persecuted by mankind, and its numbers considerably thinned. Those who hunt the animal for sport, or merely to supply their own homes, generally employ a noose for the purpose, which they cast dexterously round the neck of the reptile as it sits on a branch, and then by a sudden and sharp jerk loosen its hold, and secure it. The creature is very bold, having but little idea of running away, and in general is so confident of its capability of frightening away its antagonist by puffing up its long dewlap, and looking ferocious, that it is captured before it discovers its mistake. Even when caught, it has no notion of yielding without a struggle, but bites so fiercely with its sharp, leaf-like teeth, and lashes so vigorously with its long whip-like tail, that it is not secured without some trouble and risk. It is also very tenacious of life, and does not readily die even from repeated blows with heavy sticks, so that the spear or the pistol are often employed to kill it.

Those, however, who hunt the Iguana for sale, are obliged to have recourse to other expedients, such as nets, and dogs, the latter being trained to secure the Iguana without killing it. Many persons set out on regular expeditions of this sort, embarking in a little vessel and visiting numbers of different islands and inlets in chase of the Iguana. Those which they can succeed in taking alive, have their mouths carefully secured to prevent them from biting, and are then stowed away in the hold, where they will live for a considerable time without requiring any nourishment. Those which are killed, they either eat on the spot, or salt them down in barrels for winter consumption. Were the Iguanas quick of foot, they would seldom be captured, but, fortunately for the hunters, they cannot run fast, and according to the quaint language of Catesby, who visited the Bahamas about 1740, "their holes are a greater security to them than their heels."

The food of the Iguana seems to consist almost entirely of fruits, fungi, and other vegetable substances, and it is known that in captivity it feeds upon various leaves and flowers. Yet it has been said by some persons, who have seen the Iguana in its native state, that it eats eggs, insects, and various animal substances. Perhaps these creatures were not the true Iguanas, but belonged to the monitors, varans, or similar carnivorous Lizards.

The Iguana is capable of domestication, and can be tamed without much difficulty by those who are kind to it and accustom it to their presence. It will even permit itself to be carried about in its owner's arms, though it will not permit a stranger to approach.

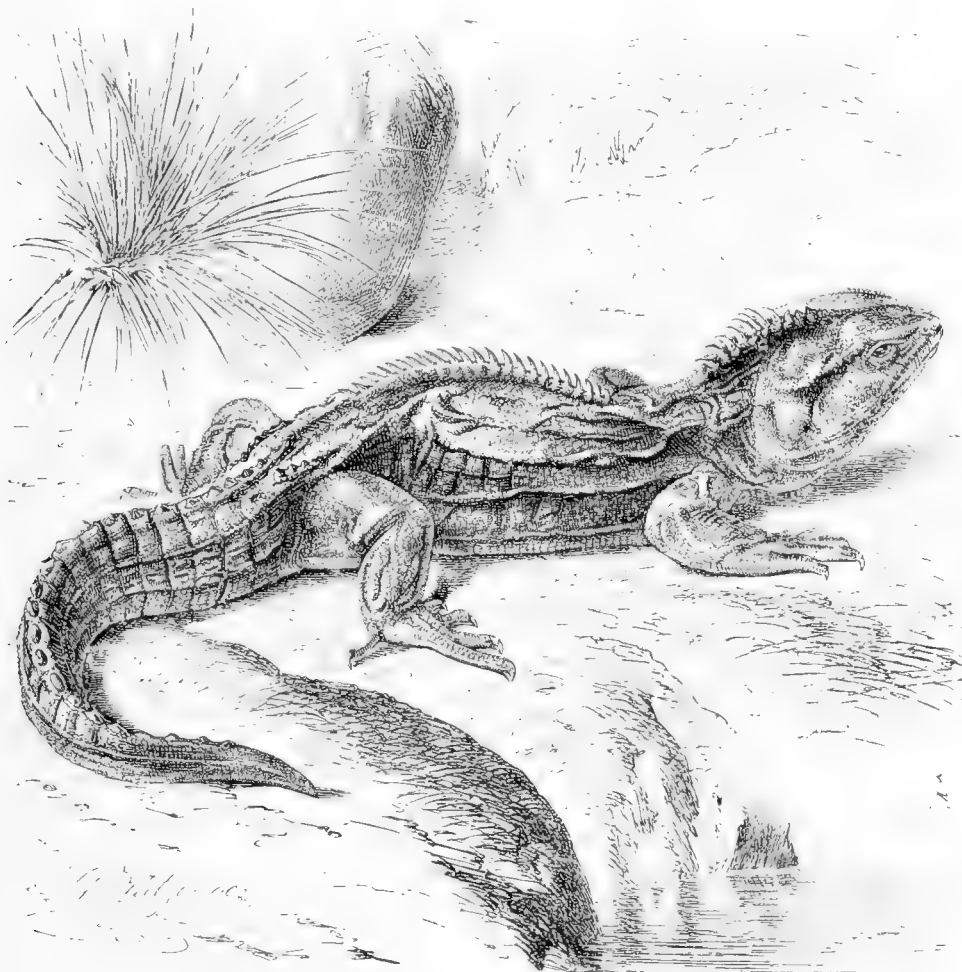
The general aspect of the Iguana is most remarkable, and can perhaps be better understood by reference to the illustration than by any lengthened description. Suffice it to say that the head is rather large, and covered above with large scales. The mouth is enormously wide, and studded around the edge with those singularly shaped teeth which have already been described. About the angles of the jaw there are generally some large, solitary, rounded scales. The chin is furnished with a kind of dewlap, large, baggy, and capable of being inflated at the will of the animal, scaly, and edged in front with a row of bold, tooth-like projections. The sides of the neck are covered with tubercles. The tail is extremely long, and very thin and tapering. The usual color of the Iguana is dark olive-green, but is



IGUANA.

rather variable even in the same individual, being affected by change of weather, or locality, or temper. On the sides a few brown bands are generally seen, and the tail is marked with brown and green of various tones, the two colors being arranged in alternate rings. The average length of the Iguana is about four feet, but it often attains a much greater size, reaching a length of six feet or a little more.

The NAKED-NECKED IGUANA was long confounded with the preceding species, bearing a great resemblance to that reptile in color, form, and habit, and being found in the same localities. It can, however, be readily distinguished from the common Iguana by the absence of tubercles upon the sides of the neck. Along each side of the lower jaw runs a series of



HATTERIA.—*Hatteria punctata*. ($\frac{1}{3}$ Natural size. See next page.)

large strong scales. The general color of this species is bluish-green, darker on the back than on the abdomen. Its flesh is esteemed equally with that of the preceding species.

BESIDES these Iguanas, there are one or two which deserve a short notice. One of these animals is the MARBLED IGUANA or CAMALEAO (*Polychrus marmoratus*), also a native of Brazil and Central America. This species has the throat compressed into a small dewlap, and the scales of the back and sides equal. There is no crest upon the back and tail. Its color is brown, mottled with bold marblings and diverging lines of a darker hue, and sometimes having a slight purple gloss.

The APLONOTE (*Aloponotus ricardi*) is another species of Iguana, having its head covered with small equal many-sided plates, and its throat dilated into a small pouch without the toothed projections in front. A shallow crest runs along the back and tail, and the back

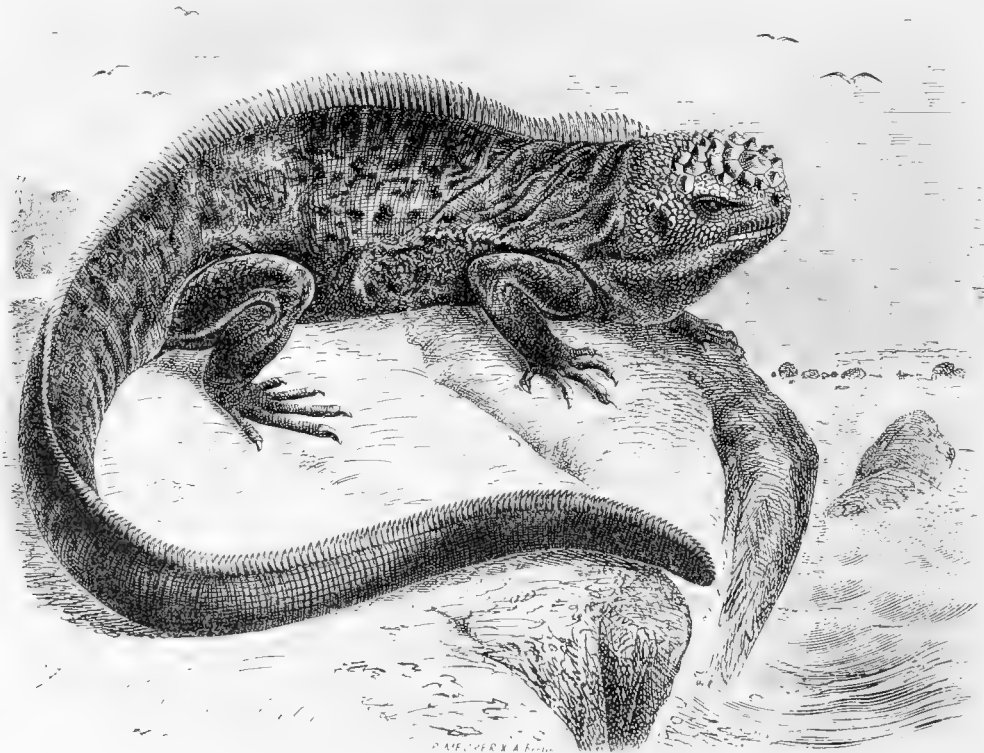
is without scales, but covered with multitudinous granular tubercles of a very small size. The tail is compressed. The color of this species is blackish-brown, variegated with many spots of tawny brown.

Another curious species is appropriately called the HORNED IGUANA (*Metopóceros cornútus*), deriving its name from the horn-like projections upon its head. Upon the forehead there is a large horn-like tubercle, and two pairs of large horny plates between the nostrils. There is a crest upon the back, but it is very low between the shoulders, and upon the loins it is not continuous. It inhabits St. Domingo.

THE next family, termed Rhynchocephalia, which is represented in the illustration on page 77, contains only one species, the *Hatteria punctata*. This reptile inhabits New Zealand where the natives regard it with fear, though without any reason, as the animal is quite inoffensive. They nevertheless like the flesh of the "Guana," "Tuatera," or "Narara," as they call this great Lizard. A specimen caught in Wellington, New Zealand, was brought to Europe and has lived there in captivity for many years. It has fed on meal-worms and other scaled insects.

The general color of the HATTERIA is a dark olive-green, the sides and limbs are variegated with many yellow sprinkles. There is a conspicuous crest of sharp scales which runs along the head and the back, while the tail shows rather flattened projections. The scales of the head and back are of a yellow color, those of the tail being brown.

It has already been mentioned that the Iguana possesses the power of swimming to a large extent, and that it is capable of sustaining a long submersion without suffering any injury.



MARINE OROCEPHALE *Orocephalus cristatus*.

There is a curious species of Iguana, the MARINE OROCEPHALE, which exists upon the seashore, and passes a considerable portion of its time in the water. This creature was first made known to science by Mr. Darwin, who found it on the coasts of the Galapagos islands, and describes its habits in the following words :—

“It is a hideous-looking creature, of a dirty-black color, stupid and sluggish in its movements. The usual length of a full-grown one is about a yard, but there are some even four feet long. I have seen a large one which weighed twenty pounds. These lizards are occasionally seen some hundred yards from the shore swimming about, and Captain Collnett in his voyage says that they go out to sea in shoals to catch fish. With respect to the object I believe he is mistaken, but the facts stated on such good authority cannot be doubted.

When in the water, the animal swims with perfect ease and quickness by a serpentine movement of its body and flattened tail, the legs during this time being perfectly motionless and closely collapsed on its sides. A seaman on board sunk one with a heavy weight attached to it, thinking thus to kill it directly, but when, an hour afterwards, he drew up the line, the Lizard was quite active. Their limbs and strong claws are admirably adapted for crawling over the rugged and fissured masses of lava which everywhere form the coast. In such situations, a group of six or seven of these hideous reptiles may oftentimes be seen on the black rocks, a few feet above the surf, basking in the sun with outstretched legs.”

In this reptile the throat is not formed into a pendent pouch, but the skin is much crumpled, so that the animal can dilate it at will. The whole body is covered with sharp, rough, tubercular scales, and a crest of longer scales runs along the back. The teeth are sharp and three-lobed, and although, when the wide mouth is opened, they present a very formidable array of weapons, the creature is quite harmless, and feeds on vegetable diet, seaweeds forming the chief part of its subsistence. The middle toes are united by a strong web, and the claws are large. There is some difference in the aspect of the young and adult, this distinction being most obvious in the head, where the scales are rather convex in the young, but in the adult are enlarged into unequal and rather high tubercular shields.

Of the family *Iguanida* there are about sixty genera, and one hundred and fifty species, all of North and South America and the Antilles. According to Holbrook, four genera of this family are known in the United States.

IN the earlier ages of science, when a few facts were struggling their way through the superincumbent mass of fiction that had so long caused Natural History to be little more than a collection of moral fables, the BASILISC was a creature upon whose wondrous properties the inventive pens of successive narrators were never tired of dilating. Crowned with a royal diadem, emblematical of its sovereign rule, the Basilisc held supreme sway over the reptile race, and derives its name of Basilisc, or kinglike, “because he seemeth to be the King of Serpents, not for his magnitude or greatnesse. For there are many serpents bigger than he, as there be many four-footed beasts bigger than the lyon, but because of his stately face and magnanimous minde.”

The Basilisc was thought to be an occasional *lusus nature*, having during his life no companion of his own kind, and to derive his existence from an egg laid by a cock when he was very old, and sat upon by a snake. Some scientific writers, however, better informed than the more popular zoologists, said that the egg was not incubated by a snake, but by a toad.

Before the Basilisc all living creatures but one were forced to fly, and even man would fall dead from the glance of the kingly reptile's eye. “This poyson,” says Topsel, “infecteth the air, and the air so infected killeth all living things, and likewise all green things, fruits and plants of the earth: it burneth up the grasse whereupon it goeth or creepeth, and the fowls of the air fall down dead when they come near his den or lodging. Sometimes he biteth a man or beast, and by that wound the blood turneth into choler, and so the whole body becometh yellow or gold, presently killing all that touch it or come near it.” Even a horseman who had taken into his hand a spear which had been thrust through a Basilisc, “did not only draw the poyson of it into his own body and so dyed, but also killed his horse thereby.”

The only creature that could stand before the Basilisc and live, was said to be the cock, whose shrill clarion the bird-reptile held in such terror, that on hearing the sound it fled into the depths of the desert and there concealed itself. Travelers, therefore, who were forced to

pass through the sandy deserts of Libya, were advised always to carry with them a supply of strong, lively, loud-voiced cocks, by whose vigorous crowings they would be protected from the Basilises haunting those parts.

There is an old proverb, "No smoke without fire," and this saying is verified in the present case. In some parts of Tropical America there is a perfectly harmless Lizard of no great dimensions, belonging to the family of the Iguanas, and having a bold crest on the back of its head. It is probable that one of these reptiles was imported into the Old World at some time now forgotten, and that its rather odd shape and the crest on its head were seized upon by the first describers, and reported with continually increasing exaggerations by succeeding writers.

Like the rest of the Iguanas, this animal is a good climber of trees, it can swim well, and its food consists apparently of insects and the various little creatures which frequent the water and the foliage of its banks.

Although quite innocuous, it certainly is rather forbidding, and when it obtains its greatest length of three feet, presents a sufficiently formidable appearance to warrant in some degree the wild and fabulous tales which were deduced from its strange shape. Along the back, instead of the row of pointed spines which generally cross the back of the Iguanas, runs a broad crest-like membrane, another broad membrane occupying the upper surface of the tail. These curious appendages are supported by a series of slender bones, formed by elongations of the vertebræ of the back and tail, so that the animal looks exactly as if the fins of a fish had been grafted on the body of a reptile. There is a slight pouch on the throat, and the palate is toothed.

MANY species of the Lizard tribe are called by the name of Anolis, but are divided by systematic zoologists of the present day into several distinct genera. The CRESTED ANOLIS inhabits some of the hotter portions of America and the neighboring islands.

The chief point of interest in this Lizard is the curiously expansile throat, which, in common with others of the same genus, it is able to expand at will. When terrified, it tries to escape, but if it finds itself deprived of all means of eluding its antagonist, it turns to bay, and by puffing out the throat until it assumes a very great size, endeavors thereby to intimidate the foe. While thus engaged, the creature has the faculty of continually altering its color; the hues of the body to a certain degree, but more especially those of the throat, changing with a rapidity that is said even to surpass the famed powers of the chameleon.

It is an active little creature, traversing perpendicular objects with nearly as much ease as the Gecko, and to aid it in these movements the last joint but one of the toes is swollen, so as to form a pad, and is covered below with cross ridges, so as to enable the creature to take a firm hold of the object to which it is clinging. The food of the Anolis consists chiefly of insects, which are captured by means of singular address on the part of the Lizard. The Anolis can run up and down trees, walls, or rocks, with such rapidity, and leap so boldly from one spot to another, that at a little distance its movements might easily be mistaken for those of a bird.

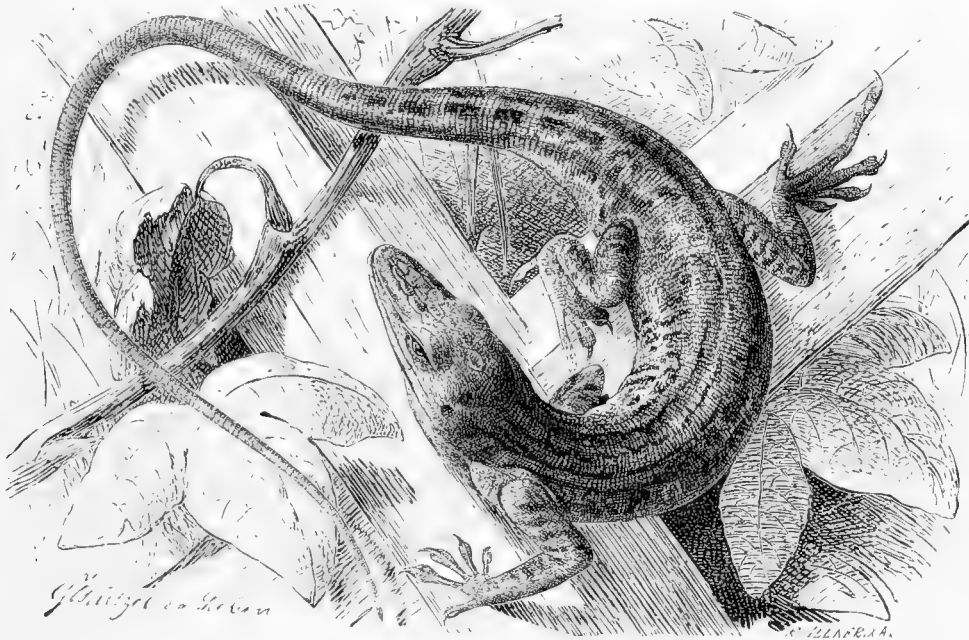
Though not aquatic in its habits, and apparently not taking willingly to the water, the Anolis is mostly to be found in the woods and thickets that are in the close neighborhood of a stream or lake. It is a timid, yet a restlessly inquisitive animal; for although it hides itself with instinctive caution on hearing the approach of a footstep, it is of so curious a nature that it must needs poke its head out of its hiding-place, and so betray itself in spite of its timidity. So absorbed, indeed, is the Anolis in gratifying its curiosity, that it will allow itself to be captured in a noose, and often falls a victim to the rude and inartificial snares made by children. Its voice is a little sharp chirruping sound; and by imitating these notes, the children decoy it within reach of the fatal noose.

The usual resting-place of the Crested Anolis is within the hollow of some decaying tree, where also the female deposits her eggs.

The color of the Crested Anolis is dark, ashen blue, a blackish spot being apparent on

each side. Along the nape of the neck and the back runs a series of long compressed scales, forming a toothed crest, and on the basal half of the tail is a fin-like crest, strengthened by bony rays. The throat-pouch is extremely large, and when inflated gives to the reptile quite an ungainly appearance. The greatest known length of the Crested Anolis is about eighteen inches, but the other species are generally of much smaller dimensions. The name *Xiphosurus* is of Greek origin, and signifies Sword-tail.

OF the restricted genus *Anolis*, we take two examples. In this genus the back and nape of the neck are either smooth, or have a low crest formed by two series of short scales. The scaly plate at end of the muzzle is erect. All these Lizards are very active, inhabiting trees, and jumping about from branch to branch with wonderful skill, and clinging even to the pendent leaves by means of their curiously formed feet.



GREEN CAROLINA ANOLIS.—*Anolis carolina*.

This GREEN CAROLINA ANOLIS is, as its name imports, a native of North America, where it is tolerably common. It is a pretty lively little creature, specially brisk and active in its movements.

This Lizard is, according to Holbrook, "a bold and daring animal, haunting outhouses and garden fences, and in new settlements it even enters the houses, walking over the tables and other articles of furniture in search of flies. It is very active, climbing trees with great rapidity, and leaping with ease from branch to branch and from tree to tree, securing itself even on the leaves by means of the oval disks of the fingers and toes, which enable it also to walk easily on glass, and on the sides and ceilings of rooms. It feeds on insects, and destroys great numbers, seizing them suddenly and devouring them, unrestrained even by the presence of man."

Towards the spring, the Green Anolis becomes quarrelsome, and is so exceedingly pugnacious, that the adult males hardly ever meet without a fight, the vanquished usually coming off with the loss of his tail—a misfortune, however, that sometimes occurs to both the combatants. This Lizard is seldom seen in all its beauty except when engaging in battle, for at the sight of its antagonist it remains stationary for a moment, nods its head up and down two or three times, as if to work itself into a proper state of fury, puffs out its dewlap, which then becomes of a light scarlet, and having gone through all these preliminaries, it leaps on its foe, and the struggle begins. As the summer draws on the irascibility of its temper diminishes,

and during the whole summer and early autumn these pretty Lizards may be seen amicably associating together. They are fond of basking in the sun, and will then dilate their dewlaps, at the same time assuming the most brilliant emerald hues.

The color of this reptile is extremely variable, altering even in the same individual according to the season of the year, the temperature, the health, or even the present state of the creature's temper. Generally the whole upper surface is beautiful golden green, and the abdomen white, with a tinge of green. The dewlap, or throat-pouch, is white, with a few little spots and five bars of red, which color, when the pouch is inflated, spreads over its whole surface. The total length of this reptile is, according to the figure in our illustration, nearly seven inches.

THE GREEN LIZARD (*Anolis principalis*), also called CHAMELEON, is an attractive creature, quite in contrast to the latter-named. It is of very graceful shape and movements, and is a beautiful green in color. It inhabits along the Gulf and Atlantic shores southward; length, six to eight inches.

THE second species, the RED-THROATED ANOLIS, is a native of America and the neighboring isles.

It is a brisk and lively little creature, darting about the ground, over rocks, among the branches, or upon the leaves, with equal address. It is, perhaps, a little too fond of fighting, and terribly apt to quarrel with others of its own kind. Those who have witnessed a combat between two of these Lizards say that it is remarkable for ferocity, courage, and endurance. They face each other with expanded throats and glaring eyes, their skin changing its lustrous coloring, and their whole being instinct with fury.

As during each combat one or two females are generally spectators of the fight, it is probable they may be the cause of war, and that the victor may receive his reward from one of the female witnesses of his prowess. So furious do they become, that the conqueror is said to devour the vanquished, who, however, sometimes runs away as fast as he can, and escapes with the loss of his tail, which is left writhing in the victor's mouth and soon swallowed. Those who have thus lost their tails seem to be greatly affected by the mutilation, and are timid and languishing afterwards.

The inflated throat part of the angry animal has a very curious effect, as it becomes of a bright cherry-red, due probably to the excited state of the creature.

Mr. Bell, in his work on reptiles, mentions a curious anecdote of one of these Lizards which was worsted in combat with a common garden-spider. "The activity of the smaller insectivorous Lizards, when in pursuit of their food, is exceedingly curious and interesting. They watch with all the caution of a cat, and dart upon their prey with the quickness of lightning.

"In the act of seizing their food, however, they must necessarily be exposed to some danger from the noxious qualities of the insects which they indiscriminately attack. The following fact would seem to indicate that, even in our own temperate climate, an insect not generally recognized as poisonous may inflict a fatal injury on its saurian enemy.

"Some years since, I had in my possession two living specimens of the beautiful little green Anolis of the West Indies, a Lizard about the size of our smallest species. I was in the habit of feeding them with flies and other insects; and, having one day placed in the cage with them a very large garden-spider (*Epeira diadema*), one of the Lizards darted at it, but seized it only by the leg. The spider instantly ran round and round the creature's mouth, weaving a very thick web round both jaws, and then gave it a severe bite on the lip, just as this species of spider usually does with any large insect which it has taken. The Lizard was greatly distressed; and I removed the spider and rubbed off the web, the confinement of which appeared to give it great annoyance, but in a few days it died, though previously in as perfect health as its companion, which lived for a long time afterwards."

With regard to the injury produced by the bite of the spider, I can say from personal experience that even to human beings, especially those who are tender-skinned, the bite of the

common garden-spider is extremely painful. I have suffered for some hours from the bite of one of these creatures, and I have seen the arm of a young lady flushed and swollen, because a garden-spider had bitten the back of her hand. The pain is something like that produced by the sting of a wasp, but more dull, and seeming to throb with the pulse.

The color of the Red-throated Anolis is greenish blue, excepting on the throat when the creature is excited. There is no crest on the nape and back, but the tail is slightly toothed above. When full-grown, it is about the size of our sand Lizard.

Our last example of this large and interesting family is the CROWNED TAPAYAXIN, one of the singular North American reptiles which are popularly known by the name of Horned Toads, their general form and mode of sitting being extremely toad-like.

This animal is not at all uncommon in California, and is said when at liberty in its wild state to move with much rapidity over the ground, in search of its insect prey. Its habits in



CROWNED TAPAYAXIN.—*Phrynosoma orbiculare*.

confinement, however, do not carry out this statement, as it is then sluggish to a degree, remaining for many consecutive hours in precisely the same attitude, heedless of the falling rain or the burning rays of the sun, and scarcely changing its position even when pushed with the finger. It is quite harmless, in spite of its very formidable looks, and does not attempt to avenge itself upon its captor, however roughly it may be handled. After a while it can be made to know its owner, and will even take flies and other insects out of his hand. Little red ants seem to be its favorite food; but it lives on beetles and insects of various kinds.

The head of this curious reptile is armed with long, pointed, conical spines, set around its edge and directed backward. Shorter and stouter spines, but of a triangular shape, are scattered over the back, and extend even over the odd, short, and pointed tail. Each edge of the tail is armed with a strong row of spines, giving it a regularly toothed appearance. The general color of the Crowned Tapayaxin is gray, variegated with several irregular bands of rich chestnut-brown. The head is light brown, blotched with a darker hue, and the under parts are ochry-yellow, marked with sundry blotches of dark gray.

THE HORNED LIZARD (*Phrynosoma douglassi*). This strangely armed creature is found in Central America, and in western portions of the United States. Holbrook records three other species, which inhabit the region about the Columbia River.

THE family which comes next in order is that in which are included the AGAMAS, a group of Lizards which have been appropriately termed the Iguanas of the Old World. In the members of this family the teeth are set upon the edge of the jaws, and not upon their inner side, as in the true Iguanas of the New World. Between thirty and forty genera are contained in this family, and some of the species are interesting as well as peculiar beings.

PERHAPS the most curious of all this family, if not, indeed, the most curious of all the reptiles, is the little Lizard which is well known under the title of the FLYING DRAGON.

This singular reptile is a native of Java, Borneo, the Philippines, and neighboring islands, and is tolerably common. Some writers believe that this creature was the original source from which the many fables respecting the formidable dragon of ancient and modern mythology were derived. Perhaps, however, the real clue to the various fables that were once so common respecting the formidable dragon may be found in one of the huge saurians of the ancient days, which had survived its comrades, and preserved its existence upon the earth after man had been placed upon this planet.

The most conspicuous characteristic of this reptile is the singularly developed membranous lobes on either side, which are strengthened by certain slender processes from the first six false ribs, and serve to support the animal during its bold leaps from branch to branch. Many of the previously mentioned Lizards are admirable leapers, but they are all outdone by the Dragon, which is able, by means of the membranous parachute with which it is furnished, to sweep through distances of thirty paces, the so-called flight being almost identical with that of the flying squirrels and flying fish.

When the Dragon is at rest, or even when traversing the branches of trees, the parachute lies in folds along the sides; but when it prepares to leap from one bough to another, it spreads its winged sides, launches boldly into the air, and sails easily, with a slight fluttering of the wings, towards the point on which it had fixed, looking almost like a stray leaf blown by the breeze. As if in order to make itself still more buoyant, it inflates the three membranous sacs that depend from its throat, suffering them to collapse again when it has settled upon the branch. It is a perfectly harmless creature, and can be handled with impunity. The food of the Flying Dragon consists of insects.

The color of this reptile is variable, but is usually as follows: The upper surface is gray, with a tinge of olive, and daubed or mottled with brown. Several stripes of grayish-white are sometimes seen upon the wings, which are also ornamented with an angular network of dark, blackish-brown. Sometimes the black is rather plentiful upon the wings, forming four or five oblique bands near the edge. It is a small creature, measuring only a few inches in length.

THE FRINGED DRAGON is mostly found in Sumatra, where it seems to be tolerably common. In habits, and in general appearance, this reptile bears a great resemblance to the preceding species, from which, however, it may be known by the conspicuous black spots on its wings, each spot being surrounded with a ring of white. The head is grayish-white, covered with an irregular network of dark brown, and on the throat are a number of circular specks covered with granular scales. Upon the under parts of the male, the scales are rather large and keeled, and upon the wing are a number of rather short, white dashes of a partly triangular shape. Along the sides runs a series of small, triangular, keeled scales.

Besides these species there are several other flying Dragons, all inhabiting similar localities. They are divided into genera on account of the different structure of the ear, and the position of the nostrils. The tail of all the Dragon Lizards is extremely long, and very slenderly formed.

A VERY curious reptile of this family deserves a passing notice. This is the TIGER LIZARD, or GONTOCEPHALE (*Gonyocéphalus chameleontina*), a native of Java. This creature is remarkable for the high and deeply-toothed crest which runs along the nape of the neck, like the crest of an ancient helmet, and far overtops the head, although the upper part of the skull is much raised by an enlargement of the orbits. A large but compressed pouch hangs from the

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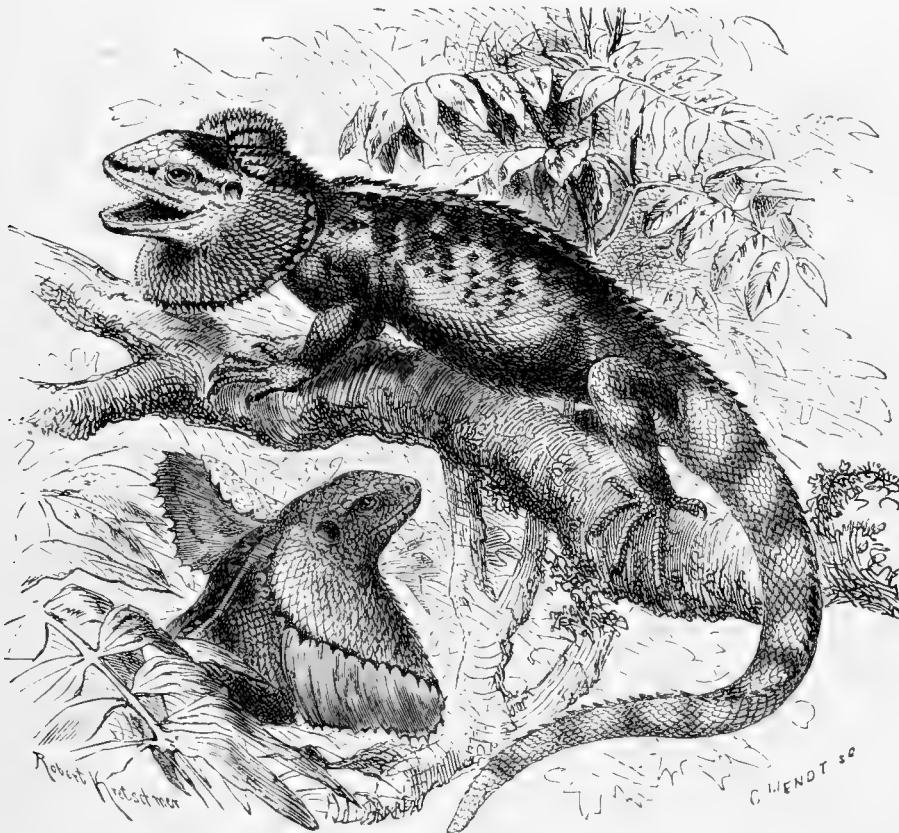
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lower jaw and throat, and is prolonged so as to form an angular fold just before the shoulder. A toothed crest runs along the back, but is barely one quarter the height of that which passes over the nape, and the tail is long and compressed. The color of this Lizard is green, with variable streaks and scribblings of black, and the legs are deeply banded. The Tiger Lizard sometimes attains a length of three feet.

THE Lizards of this family are remarkable for the extraordinary modifications of form which they exhibit. In one species, such as the tiger Lizard, a row of long, spike-like scales is raised upon the neck, in the dragons the skin of the sides is dilated to an enormous extent, and even the ribs are drawn out like wire and turned out of their usual course to support the membranous expansion, and in the FRILLED LIZARD the neck is furnished with a large, plaited



FRILLED LIZARD.—*Chlamydosaurus kingii*.

membrane on each side, forming a most remarkable appendage to the animal without any apparent object.

The Frilled Lizard is a native of Australia, and, like most of the family, is generally found on trees, which it can traverse with great address. It seems to be a bold and courageous animal, trusting to its formidable teeth and generally ferocious aspect as a means of defence. "As we were pursuing our walk in the afternoon," writes Captain Gray, "we fell in with a specimen of the remarkable Frilled Lizard. It lives principally in trees, though it can run very swiftly along the ground. When not provoked or disturbed, it moves quietly about, with its frill lying back in plaits upon the body; but it is very irascible, and directly it is frightened, it elevates the frill or ruff, and makes for a tree, where, if overtaken, it throws itself upon its stern, raising its head and chest as high as it can upon the fore-legs; then, doubling its tail underneath the body, and displaying a very formidable set of teeth from the concavity of its large frill, it boldly faces an opponent, biting furiously whatever is presented to it, and even venturing so far in its rage as to fairly make a charge at its enemy.

“We repeatedly tried the courage of this Lizard, and it certainly fought bravely whenever attacked. From the animal making so much use of its frills as a covering and means of defence for its body, this is probably one of the uses to which nature intended the appendage should be applied.”

This remarkable Lizard was discovered by Mr. Allan Cunningham, who caught the first specimen as it was perching on the stem of a small decayed tree.

The general color of the Frilled Lizard is yellow-brown mottled with black, and it is remarkable that the tongue and the inside of the mouth are also yellow. The frill, which forms so conspicuous an ornament to this creature, is covered with scales, and toothed on the edge. It does not come to its full size until the animal has attained maturity, and increases in regular proportion to the age of its owner. In the young the frill does not even reach the base of the fore limbs, while in the adult it extends well beyond them. The head is somewhat pyramidal in shape, and four-sided. There is no pouch on the throat. A small crest runs along the nape of the neck, but does not extend to the back. The tail is long and tapering, and like the back, is devoid of a crest. The eyes are rather prominent during the life of the reptile, and the tongue is thick, short and nicked at the end. It is rather a large species, measuring when full grown nearly a yard in total length.

IN the genus *Grammatophora*, the head is three-sided, and rather flattened, with a sharpish muzzle. There is no throat-pouch, but the skin of the chest is folded into a kind of cross plait. The tail is long, conical, rather flattened at the base, and covered with overlapping keeled scales. All the members of this genus inhabit Australia.

THE MURICATED LIZARD, OR GRAMMATOPHORE, is a native of New Holland. It is almost arboreal in its habits, being seldom if ever seen except on trees, which it traverses with remarkable agility, being quick, sharp, and dashing in its movements. It feeds on insects, and is enabled to catch them as they settle on the leaves or branches. It also eats caterpillars, grubs, and other larvæ, which it can find in profusion among the boughs.

The coloring of this Lizard is rather variable. Generally the back is brownish-gray, traversed by sundry brownish bars, running longitudinally on the body and transversely upon the legs and tail. Upon the nape of the neck and the back run a crest composed of triangular compressed scales, having two or three similar rows of pointed scales at each side. Upon the sides of the nape are rows of triangular keeled scales, and the sides are covered with little compressed scales intermixed with large keeled shields. The toes are long, and the two central ones are much longer than the others. This is a small Lizard, only measuring when full grown about fourteen inches.

THE STELLIO, sometimes called the HARDIM by the Arabs, is a well-known Lizard inhabiting Northern Africa, Syria, and Greece.

It is a very active little creature, haunting the ruins of ancient dwellings, heaps of stones, rocks, and similar localities, among which it flits from spot to spot with ceaseless activity. It has a curious habit of bending or nodding its head downwards, a movement which is greatly resented by the stricter Mahometans, who are pleased to consider the Lizard as offering an insult to their religion by imitating them in their peculiar actions of prayer. The more religious among them, therefore, take every opportunity of killing the Stellio, blending amusement, piety, and destructiveness with a happy appreciation of their several merits, earning a good position in Paradise on easy terms, and consoling themselves for the present dearth of infidel heads by slicing off those of the unbelieving Lizards.

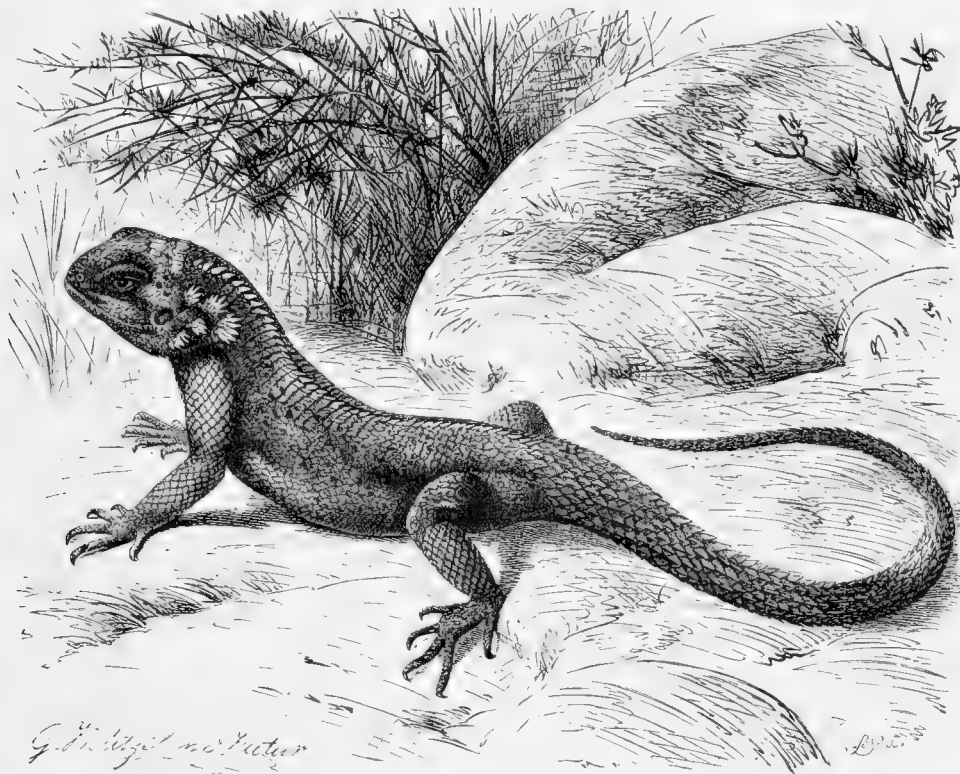
The Stellio lives almost entirely on the various insects that flit about the sand, and its quick, rapid movements are needed to secure its prey. A kind of cosmetic was anciently made from this reptile, and even at the present day the Turks employ it in the offices of the toilet.

The color of the Stellio is olive-green above, clouded with black, and the under parts are yellow, sometimes tinged with green. There is no crest upon the nape of the neck, and the scales of the tail are rather large, and arranged in distinct whorls. There is no decided throat-

pouch, but the skin of the throat is loose and plaited into a single cross fold towards its base. The body is rather flattened, and there is a longitudinal plait on each side. The tail is round and conical.

IN the restricted genus AGAMA—a word, by the way, which is not derived from any classical source, but is simply the popular name among the natives of Jamaica—the scales of the back are flat and keeled, and the third and fourth toes are nearly equal in length. The throat is marked with one longitudinal fold, and one, or sometimes two transverse folds towards its base. Upon the sides of the neck and near the ears are curious groups of spiny scales. There is a slight crest along the back, the body is rather flattened, and the tail is long, tapering, and is covered with whorls of boldly projecting scales.

In a very old work on natural history, it is stated that the Lizards which have their tails thus armed with sharp, spiny scales, make use of them in a rather singular fashion. They feed, according to these old writers, on cattle and other animals, and judging that from their small size they cannot bring an ox or a cow home after they have killed it, they jump on its back, cling tightly there with their feet, and by judicious lashing of the sharp tail, guide the animal to their home, where they give the fatal bite.



SPINOSE AGAMA.—*Agama colonorum*.

THE SPINOSE AGAMA (*Agama colonorum*) is a well-known example of this genus, residing in Northern Africa, and plentiful in Egypt. The color of this reptile is brown; the scales on the sides of the neck are very long and sharp, and those of the back are broad, boldly keeled, and sharply pointed, so that the creature presents rather a formidable appearance. The tail is long and powerful.

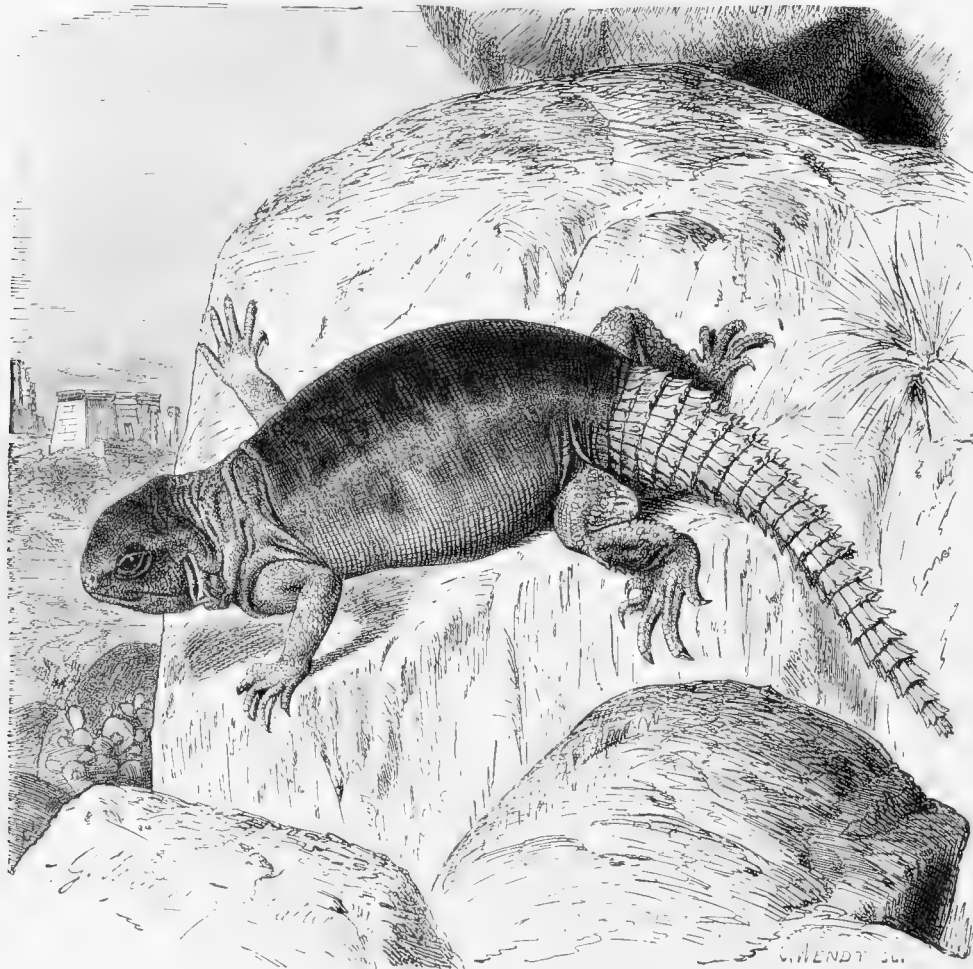
THERE is a very remarkable Lizard belonging to this family, called the EARED MEGALOCHEILE, or sometimes, though wrongly, the EARED AGAMA.

This curious creature is found in Russia. In this genus, containing, as far as is at present known, only one species, the head is flat and round, the eyes large, and the ears sunken and

concealed under the skin. On the angle of the mouth at each side is placed a large membranous fold of skin, curved so as to bear a close resemblance to a large external ear, and boldly toothed on its edge. The neck is rather contracted, as if pinched, and has a cross fold below. The back has no crest, the tail is much flattened throughout its length, and the toes are long and very strongly toothed on the edge. The color of this reptile is gray and brown, with a slight green wash upon the top of the head.

THE EGYPTIAN MASTIGURE, or SPINE-FOOTED STELLIO, is a native of Northern Africa, and was said, though wrongly, to be the reptile spoken of by the ancients as the land-crocodile. Our figure of this creature is of one-third natural size.

This species attains a rather large size, a full-grown specimen sometimes measuring a yard in length. It is an inhabitant of desert spots, preferring old ruins, rocky ground, and similar

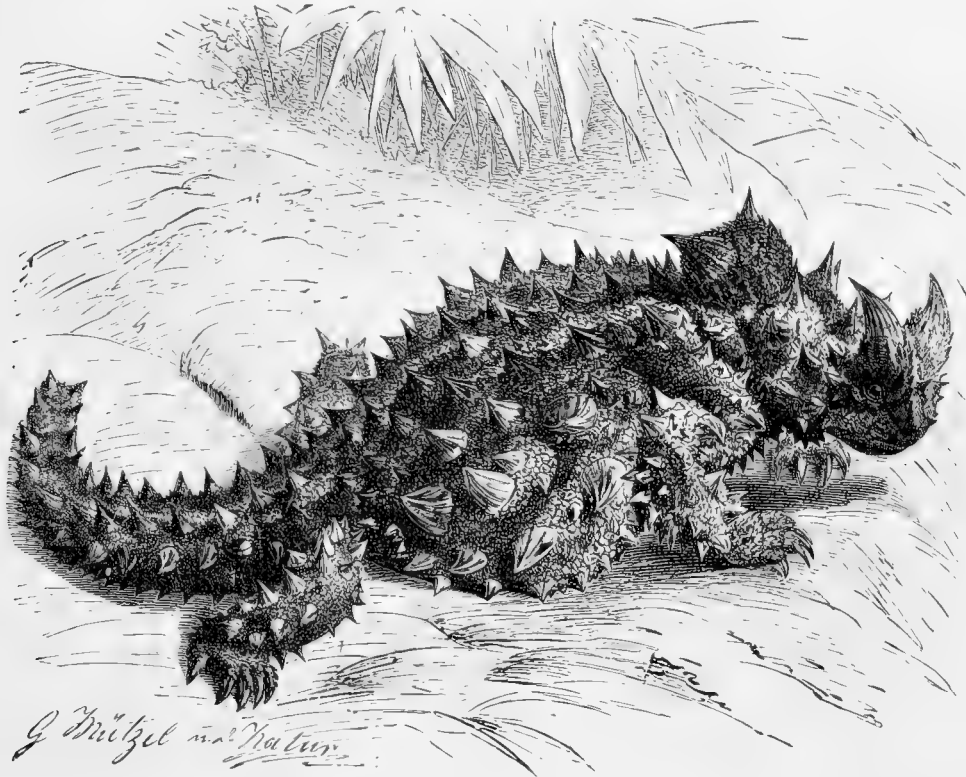


EGYPTIAN MASTIGURE.—*Uronastix spinipes*.

localities, where it can obtain instant refuge in case of alarm. The color of this reptile is bright grass-green during life, but, as is generally the case with all these animals, the brilliant colors fade soon after death, and change to dingy blackish-brown if the skin be stuffed, or to mottled grays, browns, and blacks, if preserved in spirits. The head of this creature is rounded, the back without a crest, the skin of the throat so folded as partly to cover the ears, and the ears themselves are oblong, and toothed in front. The tail is rather flattened, and furnished with transverse rows of large scales, boldly keeled, and sharply pointed. A few conical spines are scattered upon the upper part of the thigh, the sides, and loins.

THE last example of the Agamidæ which can be figured in these pages, is the most ferocious-looking of the whole family, and were its dimensions much enlarged, would be

universally allowed to be the most terrible-looking creature on the face of the earth. Many reptiles are spiny in different parts of their bodies, but this creature, appropriately termed the MOLOCH, bristles like a hedgehog with sharp spikes, which project both above and below in such profusion, that this Lizard almost seems to have been formed for the purpose of testing the number of effective spikes that can be planted on a given space. The creature is all spikes, and thorns, and projections. Upon the top of the head two very large spikes are seen, projecting from each eyebrow, and on the back of the neck is a large rounded protuberance, covered with little spiny scales, and having one long projecting spine on each side. On the back, the arrangement is very curious. A number of long spines are scattered at intervals



MOLOCH.—*Moloch horridus*.

over the surface, each of which is surrounded by a circle of lesser spines. It is worthy of notice that these large spines are hollow, and fit upon protuberances of the skin much in the same way that a cow's horn is sheathed on its core. The whole head and limbs are covered with spines similar in formation, but smaller in size. The tail is covered with long, sharp, spiny scales, arranged in whorls, and boldly radiating from their centre; and even the toes are covered as far as the long, sharp claws, with boldly keeled scales. The general color of this reptile is palish yellow, spotted regularly with brown above, and below with dark red blotches edged with black. The Moloch is a native of Australia. The natural size of this creature is given in our engraving.

TREE LIZARDS; DENDROSAURA.

THE last tribe of the Lizards contains but one genus and very few species. From their habit of constantly living on trees, these creatures are called DENDROSAURA, or TREE LIZARDS. In these, the scales of the whole body are small and granular, and arranged in circular bands. The tongue is very curious, being cylindrical and greatly extensible, reminding the observer of a common earth-worm, and swollen at the tip. The eyes are as peculiar as the tongue, being

very large, globular, and projecting, and the ball is closely covered with a circular lid, through which a little round hole is pierced, much like the wooden snow-spectacles of the Esquimaux. The body is rather compressed, the ears are concealed under the skin, and the toes are separated into two opposable groups, so that the creature can hold very firmly upon the boughs. All the *Dendrosauræ* are inhabitants of the Old World. The tail is very long and prehensile, and is almost invariably seen coiled round the bough on which the reptile is standing.

The most familiar example of the *Dendrosauræ* is the common CHAMELEON, a reptile which is found both in Africa and Asia.

This singular reptile has long been famous for its power of changing color, a property, however, which has been greatly exaggerated, as will be presently seen. Nearly all the Lizards are constitutionally torpid, though some of them are gifted with great rapidity of movement during certain seasons of the year. The Chameleon, however, carries this sluggishness to an extreme, its only change being from total immobility to the slightest imaginable degree of activity. No one ever saw a Chameleon even walk, as we understand that word, while running is a feat that no Chameleon ever dreamed of.

When it moves along the branch upon which it is clinging, the reptile first raises one foot very slowly indeed, and will sometimes remain foot in air for a considerable time, as if it had gone to sleep in the interim. It then puts the foot as slowly forward, and takes a good grasp of the branch. Having satisfied itself that it is firmly secured, it leisurely unwinds its tail, which has been tightly twisted round the branch, shifts it a little forward, coils it round again, and then rests for a while. With the same elaborate precaution, each foot is successively lifted and advanced, so that the forward movements seem but little faster than the hour-hand of a watch.

The extreme slowness and general habits of this animal are well depicted in an account of a tame Chameleon, kindly presented to me by Captain Drayson :—

“I once owned a Chameleon, which was a very quaint creature. He had been captured by some Kaffir boys, whom I found laughing immoderately at the animal, a practice which I found very common amongst these people whenever they saw one of these reptiles. For a trifle the creature became my property, and I carried him to a little wattle and daub house in which I then resided. Being anxious to watch the private habits of my visitor, I drove a stick into the wall, and placed him upon it. The stick was about four feet in length, and half an inch in diameter, so that the locomotion of the Chameleon was rather limited.

“The first peculiarity I remarked about him was the very slow, methodical way in which he moved. To turn to the right about would occupy him several minutes, whilst to move from one end of the stick to the other was a recreation of which he was sparing, a whole day being devoted to this performance. There was something rather antique in his general appearance, both as regards his form and movements; the long, independent-moving, swivel eyes, giving him the characteristics of an Egyptian production, whilst the habit of puffing himself out occasionally, and of hissing, made him seem old-fashioned in the extreme.

“I was disappointed when I found how slight was the variation in his color. I had been led to believe that if placed on a scarlet, blue, or black ground-work, he would soon assume the same hue; this I found was a delusion. His usual color was a light yellowish-green, and this he could alter to a dark blue, or brown-green, and he could make several dark brown spots become very prominent on his skin.

“The method I used to adopt to make him show off, was to rub his side with my finger. He objected to this treatment, and used to puff away pompously, and vary his tints, as it appeared to me, by means of contracting or expanding his muscles under the skin. He looked very lantern-like, as though he were merely skin and ribs, and he was never found guilty of eating anything. Sometimes I saw flies settle upon him, a liberty which he did not resent. He merely turned one of his swivel eyes towards the delinquent and squinted calmly at it. Occasionally I put a fly in his mouth, and forced him to keep it there; he took the affront very coolly, and the fly was seen no more. So hollow did he appear, that I frequently listened to hear if the flies were buzzing about inside him, but all was



CHAMELEON.

quiet. He stayed on the stick during two months. I then gave him a run out of doors, but having left him a few minutes, he took advantage of my absence and levanted, after which I saw him no more."

The food of the Chameleon consists of insects, mostly flies, but, like many other reptiles, the Chameleon is able to live for some months without taking food at all. This capacity for fasting, together with the singular manner in which the reptile takes its prey, gave rise to the absurd fable that the Chameleon lived only upon air. To judge by external appearance, there never was an animal less fitted than the Chameleon for capturing the winged and active flies. But when we come to examine its structure, we find that it is even better fitted for this purpose than many of the more active insect-eating Lizards.

The tongue is the instrument by which the fly is captured, being darted out with such singular velocity that it is hardly perceptible, and a fly seems to leap into the mouth of the reptile as if attracted by magnetism. This member is very muscular, and is furnished at the tip with a kind of viscid secretion which causes the fly to adhere to it. A lady who kept a Chameleon for some time, told me that her pet died, and when they came to examine it, they found that its tongue had in some strange way got down its throat, an accident which they took to be the cause of its death. Its mouth is well furnished with teeth, which are set firmly into its jaw, and enable it to bruise the insects after getting them into its mouth by means of the tongue.

The eyes have a most singular appearance, and are worked quite independently of each other, one rolling backwards while the other is directed forwards or upwards. In connection with this subject some very curious and valuable remarks will be found on the next page. There is not the least spark of expression in the eye of the Chameleon, which looks about as intellectual as a green pea with a dot of ink upon it.

Owing to the exceeding slowness of its movements, it has no way of escaping when once discovered, and as a French writer well says, "un Caméléon aperçu est un Caméléon perdu." Great numbers of these creatures fall victims to enemies of every kind, and were it not that their color assimilates so well with the foliage on which they dwell, and their movements are so slow as to give no aid to the searching eye of their foes, the race would soon be extinct. The Chameleon has an odd habit of puffing out its body for some unexplained reason, and inflating itself until it swells to nearly twice its usual size. In this curious state it will remain for several hours, sometimes allowing itself to collapse a little, and then reinflating its skin until it becomes as tense as a drum and looks as hollow as a balloon.

The Chameleon is readily tamed, if such a word can be applied to the imperturbable non-chalance with which it behaves under every change of circumstance. It can be handled without danger, and although its teeth are strong, will not attempt to bite the hand that holds it. It is, however, rather quarrelsome with its own kind, and the only excitement under which it has been seen to labor is when it takes to fighting with a neighbor. Not that even then it hurries itself particularly, or does much harm to its opponent, the combatants contenting themselves with knocking their tails together in a grave and systematic manner.

A few words on the change of color will not be out of place. The usual color of the Chameleon when in its wild state is green, from which it passes through the shades of violet, blue and yellow, of which the green consists. In moderate climates, however, it rarely retains the bright green hue, the color fading into yellowish-gray, or the kind of tint which is known as *feuille-morte*. One of the best and most philosophical disquisitions on this phenomenon is that of Dr. Weissenbaum, published in the "Magazine of Natural History." The writer had a living Chameleon for some time, and gives the result of his observations in the following words:—

"The remote cause of the difference of color in the two lateral folds of the body, may be distinctly referred to the manner in which the light acts upon the animal. The statement of Murray that the side turned towards the light is always of a darker color, is perfectly true; this rule holds good with reference to the direct and diffused light of the sun and moon as to

artificial light. Even when the animal was moving in the walks of my garden, and happened to come near enough to the border to be shaded by the box edging, that side so shaded would instantly become less darkly colored than the other.

“Now the light in this way seldom illumines *exactly* one half of the animal in a more powerful manner than the other, and as the middle line is constantly the line of demarcation between the two different shades of color, we must evidently refer the different effects to two different centres, from which the nervous currents can only radiate, under such circumstances, towards the organs respectively situated on each side of the mesial line. Over these centres, without doubt, the organ of vision immediately presides; and, indeed, we ought not to wonder that the action of light has such powerful effects on the highly irritable organization of the Chameleon, considering that the eye is most highly developed. The lungs are but secondarily affected, but they are likewise more strongly excited on the *darker side, which is constantly more convex than the other.*

“Many other circumstances may be brought forward in favor of the opinion that the nervous currents in one half of the Chameleon are going on independently of those in the other; and that the animal has two lateral centres of perception, sensation and motion, besides the common one in which must reside the faculty of concentration.

“Notwithstanding the strictly symmetrical construction of the Chameleon as to its two halves, the eyes move independently of each other, and convey different impressions to their different centres of perception; the consequence is, that when the animal is agitated, its movements appear like those of two animals glued together. Each half wishes to move its own way, and there is no concordance of action. The Chameleon, therefore, is not able to swim like other animals; it is so frightened if put into water, that the faculty of concentration is lost, and it tumbles about as if in a state of intoxication.

“On the other hand, when the creature is undisturbed, the eye which receives the strongest impression propagates it to the common centre, and prevails on the other eye to follow that impression, and direct itself to the same object. The Chameleon, moreover, may be asleep on one side and awake on the other. When cautiously approaching my specimen at night with a candle, so as not to awake the whole animal by the shaking of the room, the eye turned toward the flame would open and begin to move, and the corresponding side to change color, whereas the other side would remain for several seconds longer in its torpid and changeable state, with its eye shut.”

It seems probable that the change of color may be directly owing to the greater or less rapidity of the circulation, which may turn the Chameleon from green to yellow, just as in ourselves an emotion of the mind can tinge the cheek with scarlet, or leave it pallid and death-like. Mr. Milne Edwards thinks that it is due to two layers of pigment cells in the skin, arranged so as to be movable upon each other, and so produce the different effects.

The young of the Chameleon are produced from eggs, which are very spherical, white in color, and covered with a chalky and very porous shell. They are placed on the ground under leaves, and there left to hatch by the heat of the sun, and the warmth produced by the decomposition of the leaves. The two sexes can be distinguished from each other by the shape of the tail, which in the male is thick and swollen at the base.

THERE are nearly twenty species of Chameleons known to zoologists at the present day, all presenting some peculiarity of form or structure. One of the most remarkable species is the LARGE-NAPED CHAMELEON, or Fork-nosed Chameleon, as it is sometimes called.

This creature inhabits Madagascar, that land which nourishes so many strange forms of animal life. It is also found in India, the Moluccas, and Australia. When full grown, the muzzle of the male is very deeply cleft, or forked, the two branches diverging from each other. The female has no horns, and in the male they are short and blunt while the creature is young, not obtaining their full length and sharpness until it has attained full age. These curious forked projections belong to the skull, and are not merely a pair of prolonged scales or tubercles.

SNAKES; OPHIDIA.

THE large and important order at which we now arrive, consists of reptiles which are popularly known as SNAKES, or more scientifically as OPHIDIA, and to which all the true serpents are to be referred.

Almost every order is bordered, so to speak, with creatures so equally balanced between the characteristics of the orders that precede and follow it, that they can be with difficulty referred to their right position. Such, indeed, is the case with the Ophidia, from which are excluded, by the most recent systematic zoologists, the amphibænians and many other footless reptiles, now classed among the lizards. The greater number of the Snakes are without any vestige of limbs, but in one or two species, such as the pythons, the hinder pair of limbs are represented by a pair of little horny spurs placed just at the base of the tail, and are supported by tiny bones that are the undeveloped commencements of hinder limbs. Indeed, several of the true lizards, the common blind-worm, for example, are not so well supplied with limbs as these true Snakes.

The movements of the serpent tribe are, in consequence, performed without the aid of limbs, and are, as a general rule, achieved by means of the ribs and the large cross scales that cover the lower surface. Each of these scales overlaps its successor, leaving a bold horny ridge whenever it is partially erected by the action of the muscles. The reader will easily see that a reptile so constructed can move with some rapidity by successively thrusting each scale a little forward, hitching the projecting edge on any rough substance, and drawing itself forward until it can repeat the process with the next scale. These movements are consequently very quiet and gliding, and the creature is able to pursue its way under circumstances of considerable difficulty.

Oftentimes the Snake uses these scales in self-defence, offering a passive resistance to its foe when it is incapable of acting on the offensive. Any one may easily try this experiment by taking a common field Snake, letting it glide among the stubble or into the interstices of rocky ground, and then trying to pull it out by the tail. He will find that even if the reptile be only half concealed, it cannot be dragged backward without doing it considerable damage, for on feeling the grasp, it erects all the scales and opposes their edges so effectually to the pull that it mostly succeeds in gliding through from the hand that holds it. I have often lost Snakes by allowing them to insinuate themselves into crevices, and have been fain to let them escape rather than subject them to the pain, if not absolute damage, which they must have suffered in being dragged back by main force.

The tongue of the Snake is long, black, and deeply forked at its extremity, and when at rest is drawn into a sheath in the lower jaw. In these days it is perhaps hardly necessary to state that the tongue is perfectly harmless, even in a poisonous serpent, and that the popular idea of the "sting" is entirely erroneous. The Snakes all seem to employ the tongue largely as a feeler, and may be seen to touch gently with the forked extremities the objects over which they are about to crawl or which they desire to examine. The external organs of hearing are absent.

The vertebral column is most wonderfully formed, and is constructed with a special view to the peculiar movements of the serpent tribe. Each vertebra is rather elongated, and is furnished at one end with a ball and at the other with a corresponding socket, into which the ball of the succeeding vertebra exactly fits, thus enabling the creature to writhe and twine in all directions without danger of dislocating its spine. This ball-and-socket principle extends even to the ribs, which are jointed to certain rounded projections of the vertebræ in a manner almost identical with the articulation of the vertebræ upon each other, and as they are moved by very powerful muscles, perform most important functions in the economy of the creature to which they belong.

Sometimes the Snakes advance by a series of undulations, either vertical or horizontal, according to the species, and when they proceed through water, where the scales of the

abdomen would have no hold of the yielding element, their movements are always of this undulatory description. The number of vertebræ, and consequently of ribs, varies much in different species, in some Snakes being about three hundred.

The jaws of the serpents are very wonderful examples of animal mechanics, and may be cited among the innumerable instances where the existing construction of living beings has long preceded the inventions of man. We have already seen the invaluable mechanic invention of the ball-and-socket joint exhibited in the vertebræ of the Snakes, and it may be mentioned that in the spot where the limbs of almost all animals, man included, are joined to the trunk, the ball-and-socket principle is employed, though in a less perfect manner than in the Snakes. It is by means of this beautiful form of joint that posture-masters and mountebanks are able to contort their bodies and limbs into so many wonderful shapes, the muscles and tendons yielding by constant use and enabling the bones to work in their sockets without hindrance. Indeed, a master of the art of posturing is really an useful member of society, at all events to the eye of the physiologist, as showing the perfection of the human form, and the wonderful capabilities of man, even when considered from the mere animal point of view.

In the jaw of the serpents, we shall find more than one curious example of the manner in which human inventions have succeeded, if, indeed, they have not been borrowed from some animal structure.

All the Snakes are well supplied with teeth; but their number, form, and structure differ considerably in the various species. Those Snakes that are not possessed of venomous fangs have the bones of the palate as well as the jaws furnished with teeth, which are of moderate size, simple in form, and all point backward, so as to prevent any animal from escaping which has ever been grasped, and acting as valves which permit of motion in one direction only.

The bones of the jaw are, as has already been mentioned, very loosely constructed, their different portions being separable, and giving way when the creature exerts its wonderful powers of swallowing. The great python Snakes are well known to swallow animals of great proportionate size, and any one may witness the singular process by taking a common field Snake, keeping it without food for a month or so, and then giving it a large frog. As it seizes its prey, the idea of getting so stout an animal down that slender neck and through those little jaws appears too absurd to be entertained for a moment, and even the leg which it has grasped appears to be several times too large to be passed through the throat. But by slow degrees the frog disappears, the mouth of the Snake gradually widening, until the bones separate from each other to some distance, and are only held by the ligaments, and the whole jaw becoming dislocated, until the head and neck of the Snake look as if the skin had been stripped from the reptile, spread thin and flat, and drawn like a glove over the frog.

No sooner, however, has the frog fairly descended into the stomach, than the head begins to assume its former appearance; the elastic ligaments contract and draw the bones into their places, the scales, which had been far separated from each other, resume their ordinary position, and no one would imagine, from looking at the reptile, to what extent the jaws and neck have recently been distended. As many of the Snakes swallow their prey alive—the frog, for example, having been heard to squeak while in the stomach of its destroyer—the struggles of the internal victim would often cause its escape, were it not for the array of recurved teeth, which act so effectually, that even if the Snake wished to disgorge its prey it could not do so. Mr. Bell had in his collection a small Snake which had tried to swallow a mouse too large even for the expansile powers of a Snake's throat, and which had literally burst through the skin and muscles of the neck.

The lower jaw, moreover, is not jointed directly to the skull, but to a most singular development of the temporal bone, which throws out two elongated processes at right angles with each other, like the letter **L** laid horizontally **┐**, so that a curious double lever is obtained, precisely after the fashion of the well-known "throwing-stick" of the aboriginal Australians, which enables those savages to fling their spears with deadly effect to a distance of a hundred yards.

The teeth of the venomous Serpents will be described in connection with one of the species.

The Serpents, in common with other reptiles, have their bodies covered by a delicate epidermis, popularly called the skin, which lies over the scales, and is renewed at tolerably regular intervals. Towards the time of changing its skin, the Snake becomes dull and sluggish, the eyes look white and blind, owing to the thickening of the epidermis that covers them, and the bright colors become dim and ill-defined. Presently, however, the skin splits upon the back, mostly near the head, and the Snake contrives to wriggle itself out of the old integument, usually turning it inside out in the process. This shed skin is transparent, having the shape of each scale impressed upon it, being fine and delicate as goldbeater's-skin, and being applicable to many of the same uses, such as shielding a small wound from the external air. In two very fine specimens of cast skins, formerly belonging to a viper and boa-constrictor, now lying before me, the structure of each scale is so well shown, that the characteristics of the two reptiles can be distinguished as readily as if the creatures were present from whose bodies they were shed. Even the transparent scale that covers the eyes is drawn off entire, and the large elongated hexagonal scales that are arranged along the abdomen, and aid the animal in its progress, are exhibited so boldly that they will resist the movement of a finger drawn over them from tail to head.

THE first sub-order of Snakes consists of those Serpents which are classed under the name of VIPERINA. All these reptiles are devoid of teeth in the upper jaw except two long, poison-bearing fangs, set one at each side, and near the muzzle. The lower jaw is well furnished with teeth, and both jaws are feeble. The scales of the abdomen are bold, broad, and arranged like overlapping bands. The head is large in proportion to the neck, and very wide behind, so that the head of these Snakes has been well compared to an ace of spades. The hinder limbs are not seen.

In the first family of the Viperine Snakes, called the CROTALIDÆ, the face is marked with a large pit or depression on each side, between the eye and the nostril. The celebrated and dreaded FER-DE-LANCE belongs to this family.

This terrible reptile is a native of Brazil, and in some parts is very common, owing to its exceeding fecundity and its habit of constant concealment. It has an especial liking for the sugar plantations, and a field of canes is seldom cut without the discovery of seventy or eighty of these venomous creatures. Martinique and St. Lucia are terribly haunted by this Snake, which is held in great dread by the natives and settlers. In general, the Serpents, even those of a poisonous character, avoid the presence of man, but the Fer-de-Lance frequently takes the initiative, and leaping from its concealment, fastens upon the passenger whose presence has disturbed its irritable temper, and inflicts a wound that is almost invariably fatal within a few hours.

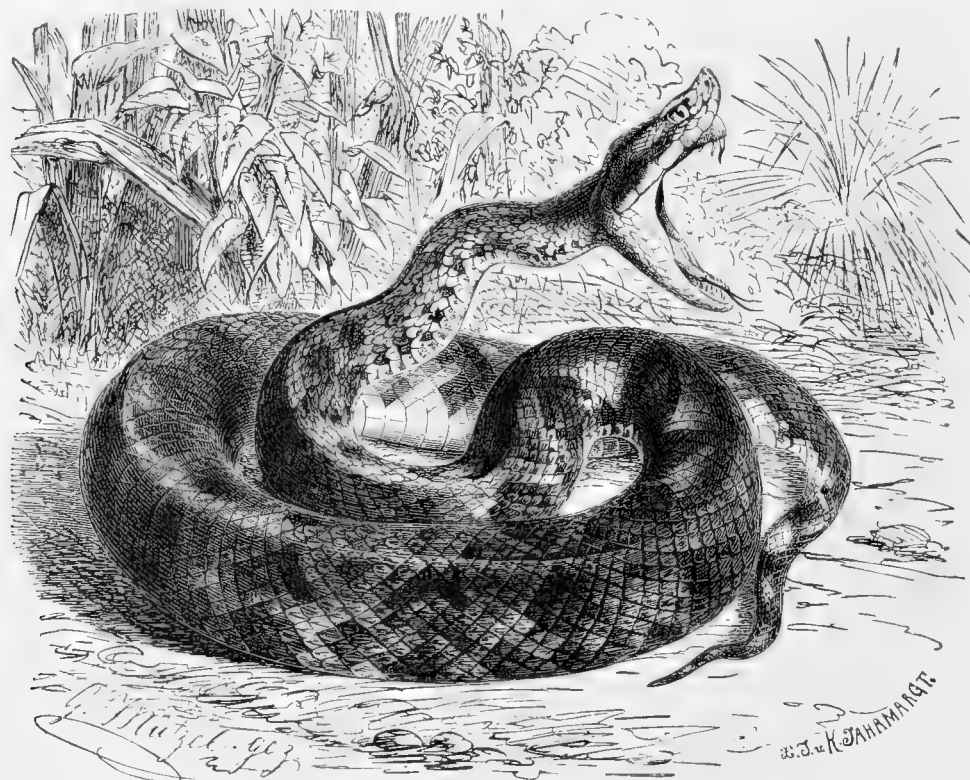
Even in those cases where the sufferer recovers for the time, the system is terribly injured, and the latent virulence of the poison can hardly be eliminated from the frame, even at the cost of painful boils and ulcerations which last for many years. The nervous system is also much affected, as giddiness and paralysis are among the usual consequences of the strong venom which this reptile extracts, by some inexplicable chemistry, from perfectly harmless food. Convulsions, severe pain at the heart, together with distressing nausea, are among the many symptoms produced by this poison.

To escape this creature in its chosen haunts is a matter of very great difficulty, as it is either concealed under dead leaves, among the heavy foliage of parasitic plants, or coiled up in the nest of some poor bird whose eggs or young it has devoured, and from this spot of vantage makes its stroke, swift and straight as a fencer's thrust, and without the least warning by hiss or rattle to indicate its purpose.

All animals dread the Fer-de-Lance; the horse prances and snorts in terror on approaching its hiding-place, his whole frame trembles with fear, and he cannot be induced by spur or whip to pass within striking distance of this formidable reptile. Birds of all kinds have a horror of its presence, and will pursue it from place to place, or hover near the spot on which

it is resting, fluttering their wings, stretching their necks, and uttering hoarse cries of mingled rage and terror. The honey guide is especially fearful of this Serpent, and has often guided a man, not as he supposed, to the vicinity of a hive of wild bees, but to the resting-place of this venomous Snake. The pig, when in good condition, is said to be the only animal that can resist the poison, the thick coating of fat which covers the body preventing the venom from mingling with the blood. It is said, indeed, that a fat hog cares nothing for Fer-de-Lance or rattlesnake, but receives their stroke with contemptuous indifference, charges at them fearlessly, tramples upon them until they are disabled, and then quietly eats them.

Against the effects of this poison there seems to be no certain remedy; but the copious use of spirits has lately appeared to neutralize in some measure the full virulence of a Snake



FER-DE-LANCE.—*Craspedocephalus lanceolatus*. (One-sixth natural size).

bite. The amount of strong spirits which can be drunk under such circumstances is almost incredible, its whole force seeming to be employed in arming the nerves against the enfeebling power of the poison. Some recent and valuable experiments have shown, that if a man, bitten by a venomous Serpent, can be kept in a state of semi-intoxication through the use of spirituous liquors, this rather strange process will give him almost his only hope of escape.

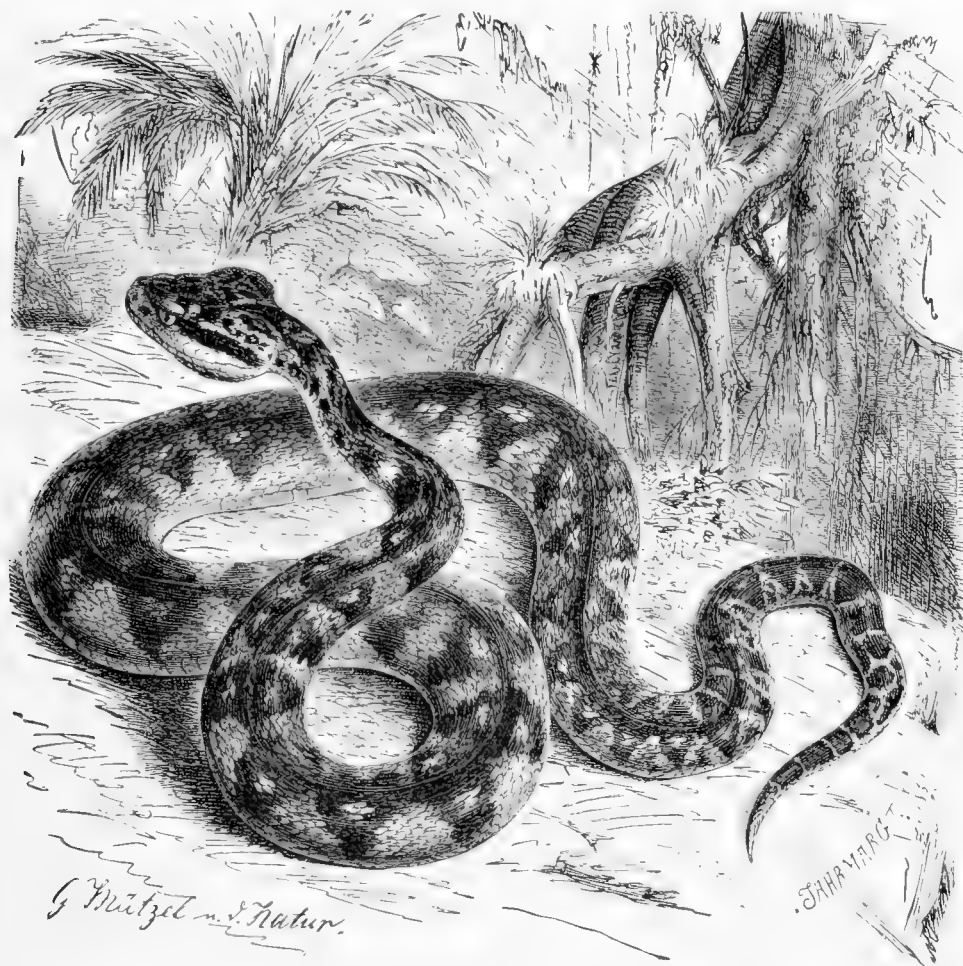
Yet nothing is made in vain, and terrible as is this creature to man, it is of no small use to him even in the localities where it is most dreaded. But for the presence of the Fer-de-Lance and one or two other Serpents closely allied to it, the sugar plantations would be devastated by the rats which crowd to such fertile spots, and on which this Snake chiefly feeds.

As is the case with many Serpents, the color of the Fer-de-Lance is rather variable. Its usual tints are olive above with dark cross bands, and whitish gray below, covered with very minute dark dots. The head is brown. This reptile attains a considerable size, being generally five or six feet long, and occasionally reaching a length of seven or eight feet. The tail ends in a horny spine which scrapes harshly against rough objects, but does not rattle.

CLOSELY allied to the Fer-de-Lance is another poisonous Serpent of Southern America, remarkable for the very large size to which it attains, and the glowing radiance of its fearful

beauty. This is the CURUCUCU, more familiarly known by the popular title of BUSHMASTER, (*Lachesis mutus*.)

Mr. Waterton, who has incidentally mentioned this Snake in his "Wanderings," has kindly sent me the following information about this terrible creature: "The Bushmaster will sometimes reach fourteen feet in length. The Dutch gave it the name of Bushmaster on account of its powers of destruction, and being the largest poisonous Snake discovered. It still continues to have the same name among the colonists of British Guiana. Its Indian name is COUANACOUCHI. It is a beautiful Serpent, displaying all the prismatic colors when alive, but they disappear after death. All these three species (the Bushmaster, Labarri, and



BUSHMASTER.—*Lachesis muta*. (One-sixth natural size.)

Coulacanara) inhabit the trees as well as the ground, but as far as I could perceive, they never mount the trees with a full stomach."

THE WATER MOCCASIN (*Ancistrodon piscivorus*). This reptile is restricted to the region between the Carolinas and the Gulf, and the valleys of the Mississippi River. This is emphatically a Water Snake. This reptile is, perhaps, the most dreaded of any in this country. It has the reputation of attacking unprovoked any one that may be in reach—a circumstance that is true of very few animals throughout the world. The Southern negroes are much exposed to its venom in the wet rice lands, where it abounds. It is very stout, and in color and markings very forbidding; the length being about nineteen inches.

Another species is recorded as a native in Indianola, Texas, called *A. pugnax*. The Black Moccasin (*A. atrofuscus*) is found in the mountains of North Carolina.

THE name of WATER VIPER (*Ancistrodon piscivorum*) is appropriately given to the creature now before us, in consequence of its water-loving habits.

It is a native of many parts of America, and is never seen at any great distance from water, being found plentifully in the neighborhood of rivers, marshes, and in swampy lands. It is a good climber of trees, and may be seen entwined in great numbers on the branches that overhang the water. On the least alarm, the reptile glides from the branch, drops into the water, and wriggles its way into a place of safety. The object of climbing the trees seems to be that the creature delights to bask in the sun, and takes that method of gratifying its inclination where the whole of the soil is wet and marshy. But in those localities where it can find dry banks and rising grounds, the Water Viper contents itself with ascending them and lying upon the dry surface enjoying the genial warmth.

It is a most poisonous reptile, and is even more dreaded by the negroes than the rattlesnake, as, like the fer-de-lance, it will make the first attack, erecting itself boldly, opening its mouth for a second or two, and then darting forward with a rapid spring. At all times it seems to be of an aggressive character, and has been known to chase and bite other Snakes put into the same cage, the poor creatures fleeing before it and endeavoring to escape by clinging to the sides of the cage. But when several other individuals of the same species were admitted, the very Snake that had before been so ferocious, became quite calm, and a box containing four or five specimens has been sent on a journey of many miles without any quarrels ensuing among the inmates.

The food of the Water Viper consists of fishes, which it can procure by its great rapidity of movement and excellent swimming powers, of reptiles and even of birds. Mr. T. W. Wood has favored me with an account of the manner in which a Water Viper devoured the prey that was put before it:—

“A short time ago I had the good fortune to be present when some captured reptiles of this species were fed. Some sparrows and titlarks were put into the apartment containing several specimens of the Water Viper. The sparrows seemed very much terrified, and soon huddled together in a corner, afraid, as I suppose, of the spectators.

“One of the titlarks, however, bolder than the rest, ran about as if at home. One of the Water Vipers perceiving it quiet for a moment, seemed to fix its eye upon the poor little creature. The reptile commenced moving towards the bird slowly but surely, their eyes being intently fixed upon each other. When the Serpent had approached within about half an inch, it opened its mouth and seized the bird by the side, its left wing being grasped in the Snake’s mouth. The ill-fated bird instantly gave two or three convulsive struggles, the head then dropped, the eyes closed, and all was over; a drop of blood oozed slowly out of the bird’s bill. The reptile did not release the bird after it was bitten, but began to swallow it almost immediately.

“Another titlark was then introduced by the keeper. This bird was, when I approached, lying on its side as if dead. Another Water Viper seized its head and commenced swallowing it, the bird struggling violently; at each effort of deglutition the venomous fangs were seen to move forward. In this case the poison did not take such rapid effect, as the bird was evidently alive when it disappeared down the reptile’s throat.”

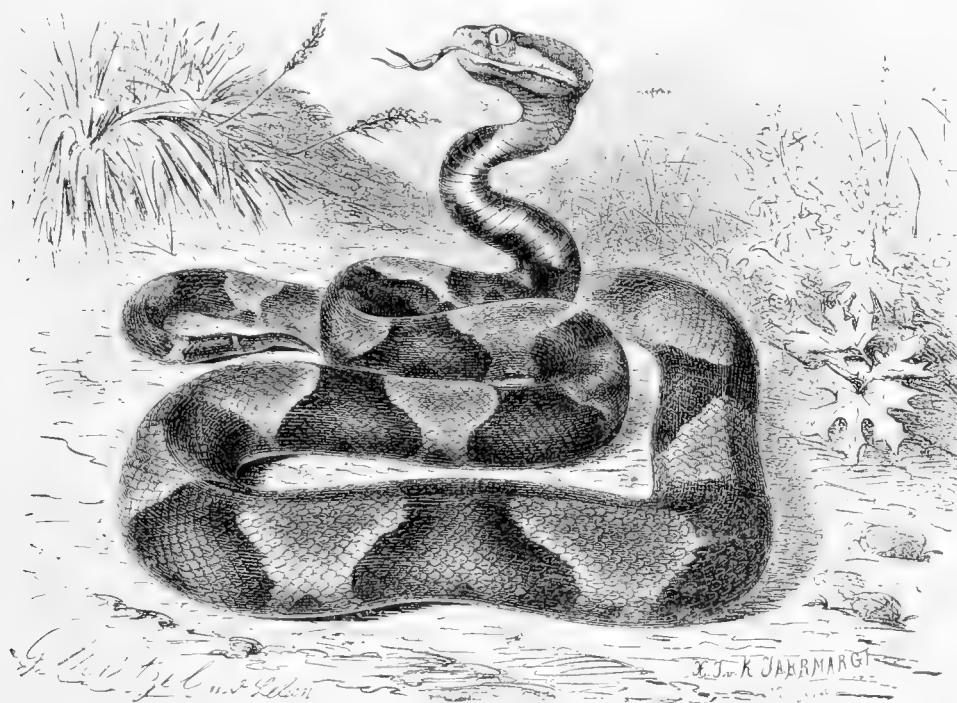
The color of the Water Viper is greenish brown, taking a yellowish tone along the sides, and banded with blackish brown. It seldom exceeds two feet in length. This serpent is also known by the popular names of COTTON-MOUTH and WATER MOCCASIN SNAKE.

THE COPPER-HEAD SNAKE of the same country is closely allied to it. An illustration of it is to be found on next page. This is the dreaded Cotton-mouth of the Southern negroes. It inhabits rather low ground, and extends along the Catskill range as far as the Gulf States. Its color is a hazel-brown, with a light coppery hue upon its head. Its length is about two feet. It is justly dreaded as a most vicious and venomous reptile. Though differing from the preceding in some respects, particularly in having no rattles, it has poison fangs that are quite deadly in application to man or beast. The names Dumb Rattle, Red Adder, Red Viper, Deaf Adder, and Chunk-head, are applied to it in various sections of country.

The well-known and terrible RATTLESNAKE now comes before us.

This dreaded reptile is a native of North America, and is remarkable for the singular termination to the tail, from which it derives its popular name. It has already been mentioned that the fer-de-lance has a long, horny scale at the tip of its tail, and in the Rattlesnake this appendage is developed into a rather complicated apparatus of sound.

At the extremity of the tail are a number of curious loose horny structures, formed of the same substance as the scales, and varying greatly in number according to the size of the individual. It is now generally considered that the number of joints on the "rattle" is an indication of the reptile's age, a fresh joint being gained each year immediately after it changes its skin and before it goes into winter quarters. There is, however, another opinion prevalent among the less educated, which gives to the Rattlesnake the vindictive spirit of the North American Indian, and asserts that it adds a new joint to its rattle whenever it has slain a human being, thus bearing on its tail the fearful trophies of its prowess, just as the Indians wear the scalps of their slain foes.



COPPER-HEAD SNAKE.—*Ancistrodon contortrix*.

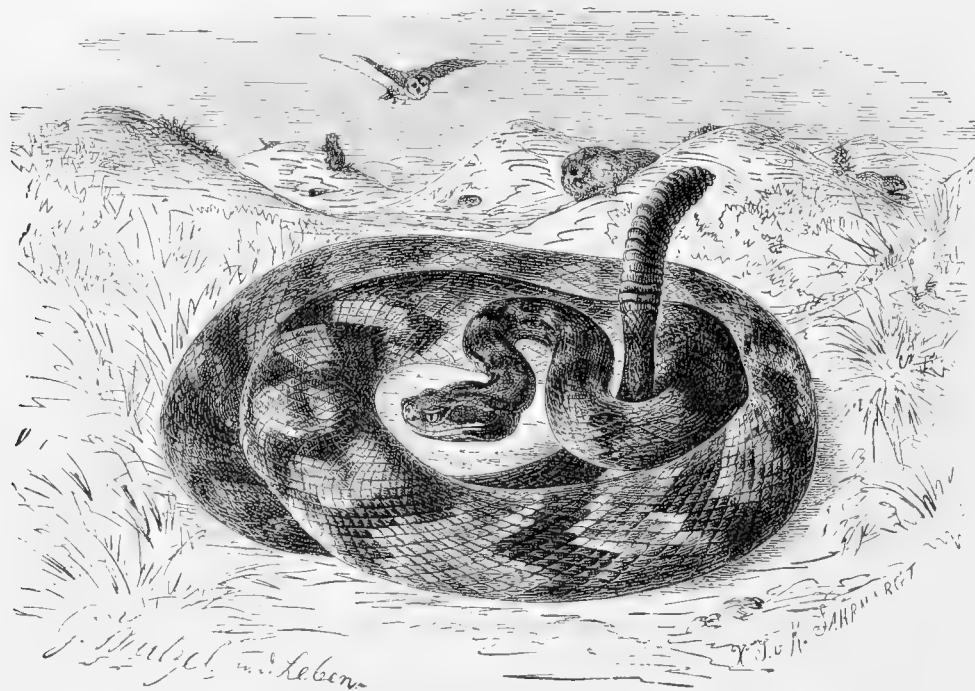
The joints of this remarkable apparatus are arranged in a very curious manner, each being of a somewhat pyramidal shape, but rounded at the edges, and being slipped within its predecessor as far as a protuberant ring which runs round the edge. In fact, a very good idea of the structure of the rattle may be formed by slipping a number of thimbles loosely into each other. The last joint is smaller than the rest, and rounded. As was lately mentioned, the number of these joints is variable, but the average number is from five or six to fourteen or fifteen. There are occasional specimens found that possess more than twenty joints in the rattle, but such examples are very rare.

When in repose the Rattlesnake usually lies coiled in some suitable spot, with its head lying flat, and the tip of its tail elevated in the middle of the coil. Should it be irritated by a passenger, or feel annoyed or alarmed, it instantly communicates a quivering movement to the tail, which causes the joints of the rattle to shake against each other, with a peculiar skirring ruffle, not easily described, but never to be forgotten when once heard. All animals, even those which have never seen a Rattlesnake, tremble at this sound, and try to get out of the way. Even a horse newly brought from Europe is just as frightened as the animal that has

been bred in the same country with this dread Serpent, and at the sound of the rattle will prance, plunge, and snort in deadly fear, and cannot be induced to pass within striking distance of the angry Snake.

It has already been mentioned that swine are comparatively indifferent to the Rattlesnake, and will trample it to death and eat it afterwards. It is certain that they will eat a dead Rattlesnake, though almost any other animal will flee from the lifeless carcase nearly as swiftly as from the living reptile. Perhaps the thick coating of fat that clothes the body of the well-fed swine may neutralize the poison of the venomous teeth, and so enable the hog to receive the stroke with comparative impunity. The peccary is also said to kill and devour the Rattlesnake without injury, and deer are reported to jump upon it and kick its life out with their sharp hoofs.

Fortunately for the human inhabitants of the same land, the Rattlesnake is slow and torpid in its movements, and seldom attempts to bite unless it is provoked, even suffering itself to be handled without avenging itself. Mr. Waterton tells me in connection with these



RATTLESNAKE.—*Crotalus durissus*.

reptiles: "I never feared the bite of a Snake, relying entirely on my own movements. Thus, in presence of several professional gentlemen, I once transferred twenty seven Rattlesnakes from one apartment to another, with my hand alone. They hissed and rattled when I meddled with them, but they did not offer to bite me." The fer-de-lance Snake is, as has already been mentioned, most fierce and irritable in character, taking the initiative, and attacking without reason. But the Rattlesnake always gives notice of its deadly intentions, and never strikes without going through the usual preliminaries. When about to inflict the fatal blow, the reptile seems to swell with anger, its throat dilating, and its whole body rising and sinking as if inflated by bellows. The tail is agitated with increasing vehemence, the rattle sounds its threatening war-note with sharper ruffle, the head becomes flattened as it is drawn back ready for the stroke, and the whole creature seems a very incarnation of deadly rage. Yet, even in such moments, if the intruder withdraw, the reptile will gradually lay aside its angry aspect, the coils settle down in their place, the flashing eyes lose their lustre, the rattle becomes stationary, and the Serpent sinks back into its previous state of lethargy.

It is rather curious that the Rattlesnake varies much in its powers of venom and its irritability of temper, according to the season of the year. During the months of spring it

will seldom attempt to bite, and if it does strike a foe, the poison is comparatively mild in its effects. But after August, and before it seeks its winter quarters, the Rattlesnake is not only more fierce than at any other time of the year, but the venom seems to be of more fearful intensity, inflicting wounds from which nothing escapes with life.

The rapidity of the effects depends necessarily on the part which is bitten. Should the points of the teeth wound a moderately large vein or an artery, the venom courses swiftly through the blood, and the victim dies in a few minutes. But if, perchance, the tooth should pierce some fleshy and muscular part of the body, the poison does not have such rapid effect, and the injured person may be saved by the timely administration of powerful remedies. There seems, indeed, to be no one specific for the bite of this reptile, as the effects vary according to the individual who happens to be bitten, and the state of health in which the sufferer may be at the time. Immediate suction, however, and the unsparing use of the knife appear to be the most efficacious means of neutralizing the poison, and strong ammonia and oil have been employed with good results. Catesby, in writing about this reptile, remarks that he has known instances where death has occurred within two minutes after the infliction of the bite.

The food of the Rattlesnake consists of rats, mice, reptiles, and small birds, the latter of which creatures it is said to obtain by the exercise of a mysterious power termed fascination, the victim being held, as it were, by the gaze of its destroyer, and compelled to remain in the same spot until the Serpent can approach sufficiently near to seize it. It is even said that the Rattlesnake can coil itself at the foot of a tree, and by the mere power of its gaze, force a squirrel or bird to descend and fling itself into the open mouth waiting to receive it.

These phenomena have been strongly asserted by persons who say that they have seen them, and are violently denied by other persons who have never witnessed the process, and therefore believe that the circumstances could not have happened. For my own part I certainly incline to the theory of fascination, thinking that the power exists, and is occasionally employed, but under peculiar conditions. That any creature may be suddenly paralyzed by fear at the sight of a deadly foe is too well known to require argument, and it is therefore highly probable that a bird or squirrel, which could easily escape from the Serpent's jaws by its superior agility, might be so struck with sudden dread on seeing its worst enemy, that it would be unable to move until the reptile had seized it.

Birds, especially, are most sensitive in their nature, and can be fascinated in a manner by any one who chooses to try the experiment. Let any bird be taken, laid on its back, and the finger pointed at its eyes. The whole frame of the creature will begin to stiffen, the legs will be drawn up, and if the hand be gently removed, the bird will lie motionless on its back for any length of time. I always employ this method of managing my canaries when I give them their periodical dressing of insect-destroying powder. I shake the powder well into their feathers, pour a small heap of it on a sheet of paper, lay the bird in the powder, hold my finger over its eyes for a moment, and leave it lying there while I catch and prepare another bird for the same process. There is another way of fascinating the bird, equally simple. Put it on a slate or dark board, draw a white chalk line on the board, set the bird longitudinally upon the line, put its beak on the white mark, and you may go away for hours, and when you return the bird will be found fixed in the same position, there held by some subtle and mysterious influence which is as yet unexplained.

Thus far there is no difficulty in accepting the theory of fascination, but the idea of a moral compulsion on the part of the Snake, and a perforced obedience on the part of its victim, is so strange that it has met with very great incredulity. Still, although strange, it is not quite incredible. We all know how the immediate presence of danger causes a reckless desire to see and do the worst, regardless of the consequences, and heeding only the overpowering impulse that seems to move the body without the volition of the mind. There are many persons who cannot stand on any elevated spot without feeling so irresistible a desire of flinging themselves into the depths below, that they dare not even stand near an open window or walk near the edge of a cliff. It may be that the squirrel or bird, seeing its deadly enemy

below, is so mentally overbalanced that it is forced to approach the foe against its own will, and is drawn nearer to those deadly fangs by the very same impulse that would urge a human being to jump over the edge of a precipice or from the top of a lofty building.

Every squirrel or every bird may not succumb to the same influence, just as every human being does not yield to the insane desire of jumping from heights, and it is probable that a Rattlesnake may coil itself under a tree and look all day at the squirrels sporting upon the branches, or the birds flitting among the boughs, without inducing one of them to become an involuntary victim. Yet it is possible that out of the many hundreds that could see the Serpent, one would be weak-minded enough to yield to the subtle influence, and, instead of running away, find itself forced to approach nearer and nearer the fearful reptile.

Some persons acknowledge the fact that the bird approaches the Snake, and is then snapped up, but explain it in a different manner. They say that the bird is engaged in mobbing or threatening the Snake, just as it might follow and buffet a hawk, an owl, or a raven, and in its eagerness approaches so closely that the Snake is able to secure it by a sudden dart. Such is very likely to be the case in many instances, as the little birds will often hover about a poisonous Snake, and, by their fluttering wings and shrieking cries, call attention to the venomous reptile. But the many descriptions of the fascinating process are too precise to allow of such a supposition in the particular instances which are mentioned.

Even common Snakes can exercise a similar power. I have seen one of these Snakes in chase of a frog, and the intended victim, although a large and powerful specimen of its race, fully able to escape by a succession of leaps such as it would employ if chased by a human being, was only crawling slowly and painfully like a toad, its actions reminding one of those horrid visions of the night, when the dreamer finds himself running or fighting for his life, and cannot move faster than a walk, or strike a blow that would break a cobweb. In such cases, the victim may be taken from the pursuer, but unless it is carried to a considerable distance, it will soon be in the jaws of the Serpent a second time.

It is worthy of notice that in all such instances, a sudden sound will seem to break the spell and snap the invisible chain that binds the victim to its destroyer. If birds are spell-bound by finger or chalk line, as has already been described, a quick movement or a heavy footstep will release them from their bonds, and a sudden shout will in a similar manner enable a bird to break away from the Serpent into whose jaws it was on the point of falling. One of my friends when in Canada saw a little bird lying on the ground, fluttering about as if dusting itself, but in a rather strange manner, and on his nearer approach, a Snake glided from the spot, and the bird gathered its wings together and flew away. The Snake was one of the harmless kind, and being taken to the house of the person who had interrupted it in its meal, served to keep the premises clear of rats and mice. The Serpent is not the only creature to which this singular power is attributed, for the natives of Northern Africa assert that the lion is also gifted with this influence, and can induce certain hapless men and women to leave their homes and follow him into the woods. This, however, is only a popular tradition among the natives, and has met with no corroboration.

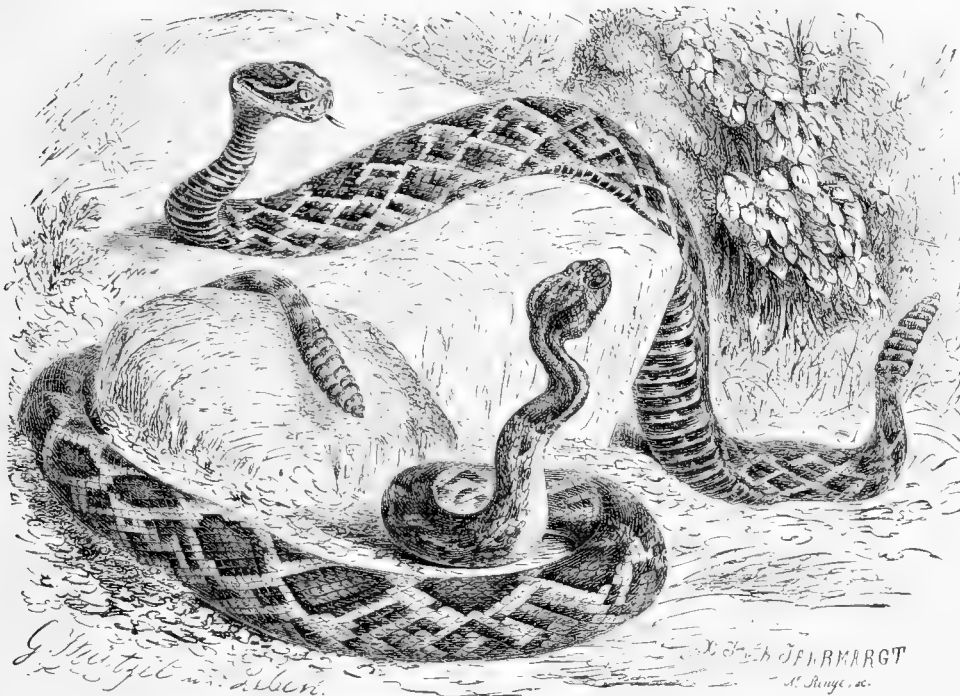
The Rattlesnake retires to its winter quarters as soon as the increasing coldness of the weather gives it warning to seek a home where it can find protection against the frosts. Sometimes the Snake chooses a convenient hole or crevice for this purpose, but in general it prefers the neighborhood of marshy ground, and harbors under the heavy masses of a certain long-stemmed moss (*sphagnum palustre*) which grows plentifully in such situations. In such localities the Rattlesnake may be found during the winter, either coiled up in masses containing six or seven individuals, or creeping slowly about beneath the protecting moss. Many of these fearful Snakes are killed during the cold months by persons who are acquainted with their habits, and surprise them in their winter quarters.

The general color of the Rattlesnake is pale brown. A dark streak runs along the temples from the back of the eye, and expands at the corner of the mouth into a large spot. A series of irregular dark brown bands are drawn across the back, a number of round spots of the same hue are scattered along the sides, upon the nape of the neck and back of the head.

The Rattlesnakes are peculiar to America, embraced in the family *Crotalidæ*, the latter term meaning, in the Greek, rattlers, referring to the characteristic habit of some of the species. They have two fangs on the upper jaw, which are grooved, and suited to deliver the liquid poison which lies in a sac at the roots. Eighteen species of Rattlesnakes are now known in North America.

THE NORTHERN RATTLESNAKE (*Crotalus horridus*), called also the BANDED RATTLESNAKE, is the more common of the few species of this dreaded family of reptiles. It is illustrated together with the *Crotalus adamanteus*, another American Rattlesnake. The Banded Rattlesnake is found in rocky places on dry soil, reaching in its range as far north as the middle of New England and New York State, west as far as the Rocky Mountains, and south to the Gulf States. Along the shores of Lake Champlain it is particularly abundant. Dr. DeKay, the eminent zoologist of the State of New York, gives the following from a local newspaper of the day:—

“Two men in three days killed eleven hundred and four Rattlesnakes on Tongue Mountain, in the town of Bolton, New York.”



THE DIAMOND AND THE NORTHERN RATTLESNAKE.—*Crotalus adamanteus* and *Crotalus horridus*. (One-tenth natural size.)

The popular belief that a rattle is added yearly is not correct. Dr. Holbrook, the author on American Reptiles, says he has known one to add two rattles in a year, and Dr. Bachman observed four added in the same period. Mr. Peale, of the Museum in Philadelphia, kept a Rattlesnake fourteen years. It had, when first confined, eleven rattles. Several were lost annually, and new ones took their place. At its death there were but eleven rattles, though it had increased in length four inches. Holbrook saw one having twenty-one rattles. Accounts are occasionally given of a more numerous series. We have an example of one bearing twenty-four rattles. This is probably about the limit. The pretended powers of “charming” are not credited by naturalists.

THE DIAMOND RATTLESNAKE is strictly a Southern species, being confined to the seaboard below the Carolinas. Its habits differ, in so far that this one inhabits damp, shady places; hence the local name, Water Rattle. In size it exceeds the Banded species, some

specimens attaining the length of eight feet. The common name is suggested by the elegant diamond or lattice-work markings of its body. Several smaller species are enumerated as North American: The *C. atrox*, of Texas; *C. lucifer*, Oregon; *C. confluentus*, Texas; and *C. molossus*, New Mexico.

THE SOUTHERN GROUND RATTLESNAKE (*Caudisona miliaria*), called also the SMALL RATTLESNAKE, is about thirteen inches in length, with a small button, or what appears to be an aborted rattle, on the tail. It ranges from the Carolinas to the Gulf States, and is particularly abundant on the prairies of the Western Territories and States. It is venomous, but its small size is thought to render its poison less potent. This serpent is thought to be even more dangerous than either of the preceding reptiles, because its dimensions are so small that a passenger is liable to disturb it before he sees the deadly creature in his path, and the sound of the rattle is so feeble that it is inaudible at the distance of two or three paces, and can only be heard when special attention is paid to it. It is a prolific species, and still maintains its numbers, in spite of the constant persecution to which it is subjected.

The food of the Miliary Rattlesnake consists of mice, frogs, insects, and similar creatures, which it mostly obtains by darting suddenly upon them as they pass near the spot where the reptile is lying. This serpent is fond of coiling itself on the fallen trunks of trees, decaying stumps, or similar situations. Fortunately, it is very easily killed, a smart blow dealing instant death even from a very small stick. The color of this reptile is brownish olive, darker upon the cheeks, which are diversified by a narrow white streak from the back of the eye. A series of brown spots runs along the centre of the back, and the sides are ornamented with two rows of brown spots, each spot corresponding with a space in the other row. The abdomen is sooty black, marbled with a darker and rather more polished hue. An irregular, dark brown band runs along each side of the nape and the crown of the head.

THE VIPERS.

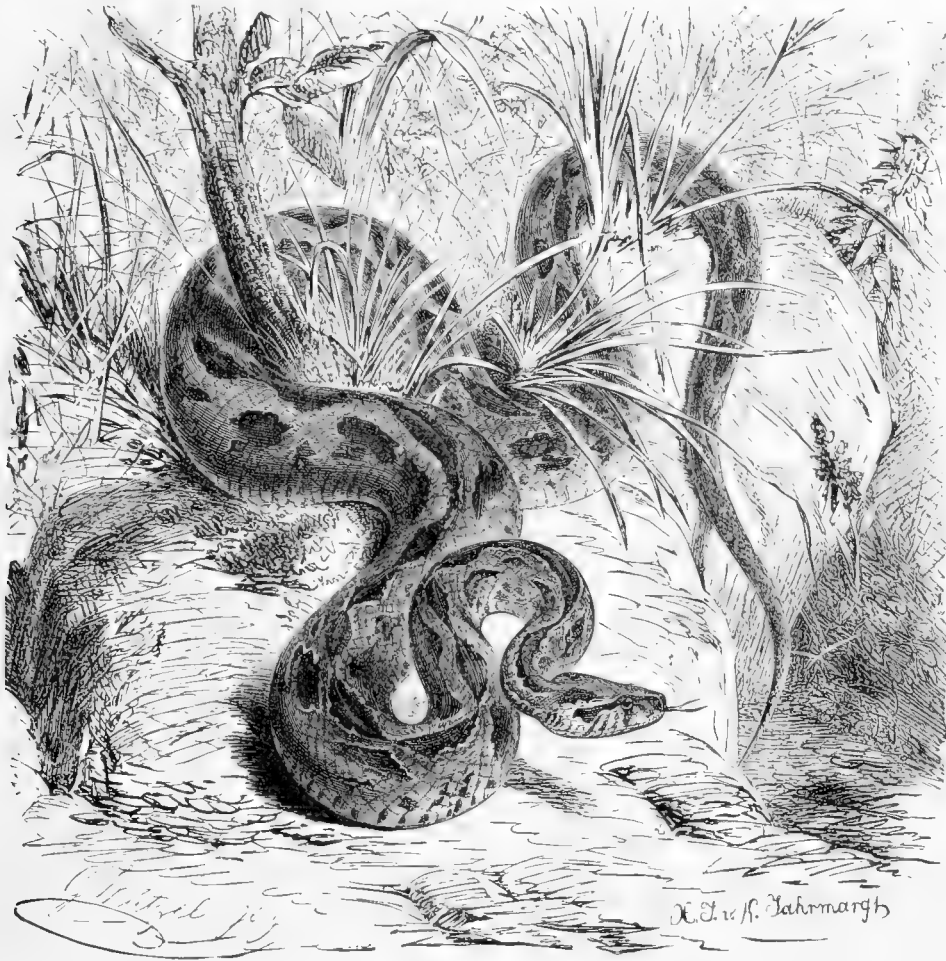
WE now come to the second great family of poisonous Serpents, namely the VIPERS, or VIPERIDÆ. All the members of this family may be distinguished by the absence of the pit between the eyes and the nostrils. There are no teeth in the upper jaw except the two poison-fangs.

A rather celebrated species of these Snakes is the TIC-POLONGA, OR KATUKA (*Daboia elegans*), a native of Asia, and perhaps of Brazil. This Serpent is much dreaded, its poison being of a very deadly character. A chicken that was bitten by a Tic-polonga died in thirty-six seconds, and a dog bitten by the same creature was dead in twenty-six minutes after receiving the injury. It is tolerably common in India and Ceylon, but is not so familiarly known as the cobra and other species, because it is not employed for public exhibition as is the case with those Serpents.

Sir Emerson Tennent, in his well-known "Natural History of Ceylon," writes thus of the Tic-polonga: "These formidable Serpents so infested the official residence of the District Judge of Trincomalie, as to compel his family to abandon it. In another instance, a friend of mine, going hastily to take a supply of wafers from an open tin case which stood in his office, drew back his hand on finding the box occupied by a Tic-polonga coiled within it."

The word Tic-polonga signifies Spotted-polonga, the latter word being a kind of generic title given by the natives to many Serpents, no less than eight species being classed under this common title. It is said that the Tic-polonga and the cobra bear a mortal hatred towards each other, and to say that two people hate each other like the Tic-polonga and cobra is equivalent to our proverb respecting the cat and dog. The Tic-polonga is said always to be the aggressor, to find the cobra in its hiding-place, and to provoke it to fight. There are many native legends in Ceylon respecting the ferocity of this Snake.

Its general color is brown ; there are two dark brown spots on each side of the back of the head, and a yellow streak runs between them. Upon the body are three rows of oblong brown spots, edged with white.



TIC-POLONGA, OR KATUKA.—*Daboia elegans*.

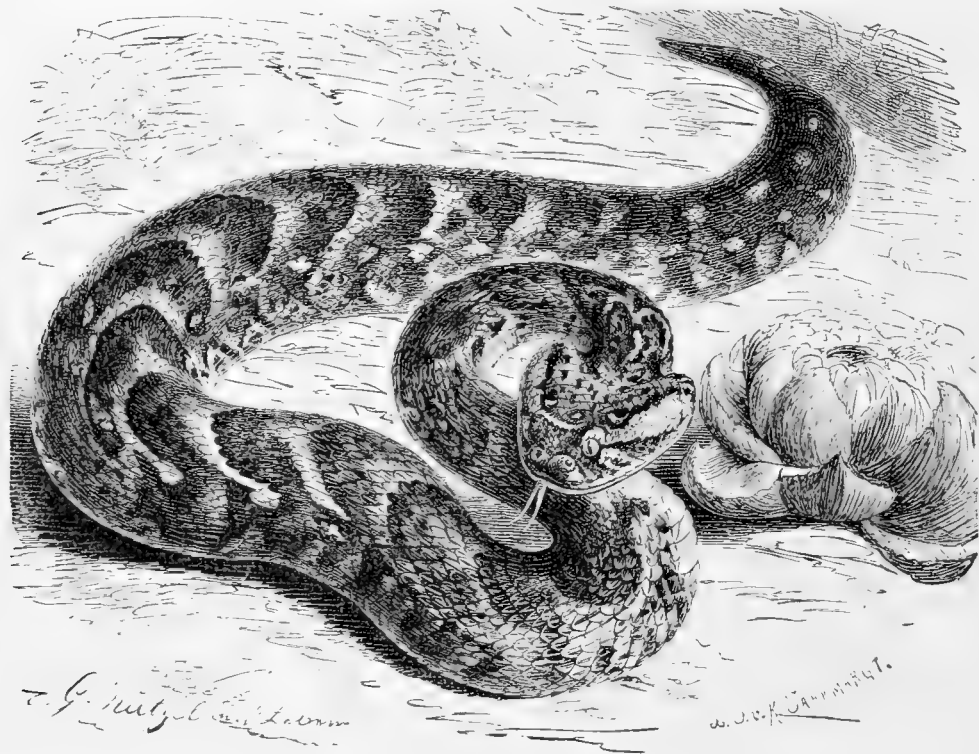
THE terrible PUFF ADDER is closely allied to the preceding species.

This reptile is a native of Southern Africa, and is one of the commonest, as well as one of the most deadly, of poisonous Snakes. It is slow and apparently torpid in all its movements, except when it is going to strike, and the colonists say that it is able to leap backwards so as to bite a person who is standing by its tail. Captain Drayson, who has seen much of this reptile and its habits, has kindly forwarded to me the following short account of this creature :—

“This formidable looking reptile is more dreaded than any other of the numerous poisonous Snakes in Africa, a fact which mainly results from its indolent nature. Whilst other and more active Snakes will move rapidly away upon the approach of man, the Puff Adder will frequently lie still, either too lazy to move, or dozing beneath the warm sun of the south. This reptile attains a length of four feet, or four feet six inches, and, some specimens may be found even longer ; its circumference is as much as that of a man’s arm. Its whole appearance is decidedly indicative of venom. Its broad ace-of-clubs-shaped head, its thick body, and suddenly tapered tail, and its chequered back, are all evidences of its poisonous nature. It derives its popular name from its practice of puffing out or swelling the body when irritated.

“In a country so infested with poisonous Snakes as are some portions of South Africa, it is surprising that there are not more instances of lives having been lost by this means. It is, however, as rare to hear of a person having been bitten and dying from the bite of a poisonous Snake in South Africa as it is to hear of a death in civilized countries from the bite of a mad dog. The fact, however, is that all Snakes will, if possible, make their escape when man approaches them, and it is merely when they are trodden upon, or are oppressed by their own superabundant poison, that they are disposed to bite an animal unsuited for their food.

“An infuriated Puff Adder presents a very unprepossessing appearance. I once saw a female of this species in a most excited state. She had been disturbed in her retreat under an old stump by some Kaffirs, who were widening the highroad through the Berea bush at Natal. She had several young ones with her, and showed fight immediately she was discovered. The Kaffirs were determined to kill the whole family, but were fearful of approaching



PUFF ADDER.—*Vipera arietans*.

her. Happening to pass at the time of the discovery, I organized a ring, and, procuring some large stones, directed the Kaffirs to open fire. After a few minutes the excited lady was killed, and she and her young were carefully buried in a retired locality, lest some bare-footed Kaffir might tread upon her head, and thus meet his death.”

There is certainly in nature no more fearful an object than a full-grown Puff Adder. The creature grovels on the sand, winding its body so as to bury itself almost wholly in the tawny soil, just leaving its flat, cruel-looking head lying on the ground and free from sand. The steady, malignant, stony glare of those eyes is absolutely freezing as the creature lies motionless, confident in its deadly powers, and when roused by the approach of a passenger, merely exhibiting its annoyance by raising its head an inch or two, and uttering a sharp angry hiss. Even horses have been bitten by this reptile, and died within a few hours after the injury was inflicted. The peculiar attitude which is exhibited in the illustration is taken from life, one of the Puff Adders in a collection having been purposely irritated.

It is rather curious that the juice of tobacco is an instant poison to these creatures, even more suddenly deadly to them than their poison to the human beings who can absorb the

tobacco juice with impunity. The Hottentots will often kill the Puff Adder by spitting in its face the juice of chewed tobacco, or making it bite the end of a stick which has been rubbed in the tobacco oil found in all pipes that have been long used without being cleaned.

The Bushmen are in the habit of procuring from the teeth of this serpent the poison with which they arm their tiny but most fearful arrows. In the capture of the Puff Adder they display very great courage and address. Taking advantage of the reptile's sluggish habits, they plant their bare feet upon its neck before it has quite made up its reptilian mind to action, and, holding it firmly down, cut off its head and extract the poison at their leisure. In order to make it adhesive to the arrow point, it is mixed with the glutinous juice of the amaryllis.

There seems to be no certain remedies for the bite of the Puff Adder. Ammonia appears to be the least inefficacious substance for that purpose, and the natives occasionally attempt to heal the injury by splitting a living fowl across the breast, and applying the still palpitating halves to the wound. There is a kind of seed called the "gentleman bean," which is said to have a beneficial effect. If one of these beans be placed on the recently inflicted wound, it adheres with great firmness, and is said to absorb the poison from the system, and to fall off as soon as this object is achieved. The Bushmen are in the habit of swallowing the poison whenever they kill a Puff Adder and do not need its venomous store for their arrows, hoping thereby to render themselves proof against its effects. When examined under the microscope, the poison resolves itself into minute crystalline spiculæ, not unlike those of Epsom salts, which must be kept perfectly dry or they will soon vanish from the glass on which they are placed.

The color of the Puff Adder is brown, chequered with dark brown and white, and with a reddish band between the eyes. The under parts are paler than the upper.

SEVERAL other deadly serpents of the same country are closely allied to the puff adder. The first is the DAS ADDER, or RIVER JACK (*Clotho nasicornis*) of the colonists, remarkable for the long curved horn or spine upon the nose, formed by the peculiar development of the scales over the nostril. This curious structure is only found in the male. In color it is much darker than the puff adder, being black, marbled with a paler hue, and decorated with sundry lozenge-shaped spots along the back.

THE BERG ADDER (*Clotho átropos*) is another of these fearful reptiles. As its name denotes, it is found more among the hills and stony ranges than on the plains, but is not unfrequently found upon the flats, and will sometimes intrude into very awkward positions, such as the floor of a hut, or even the bed upon which some wearied man is about to cast himself. It is not quite so poisonous as the puff adder, though its looks are quite as unprepossessing, and it never bites unless purposely irritated or trodden upon.

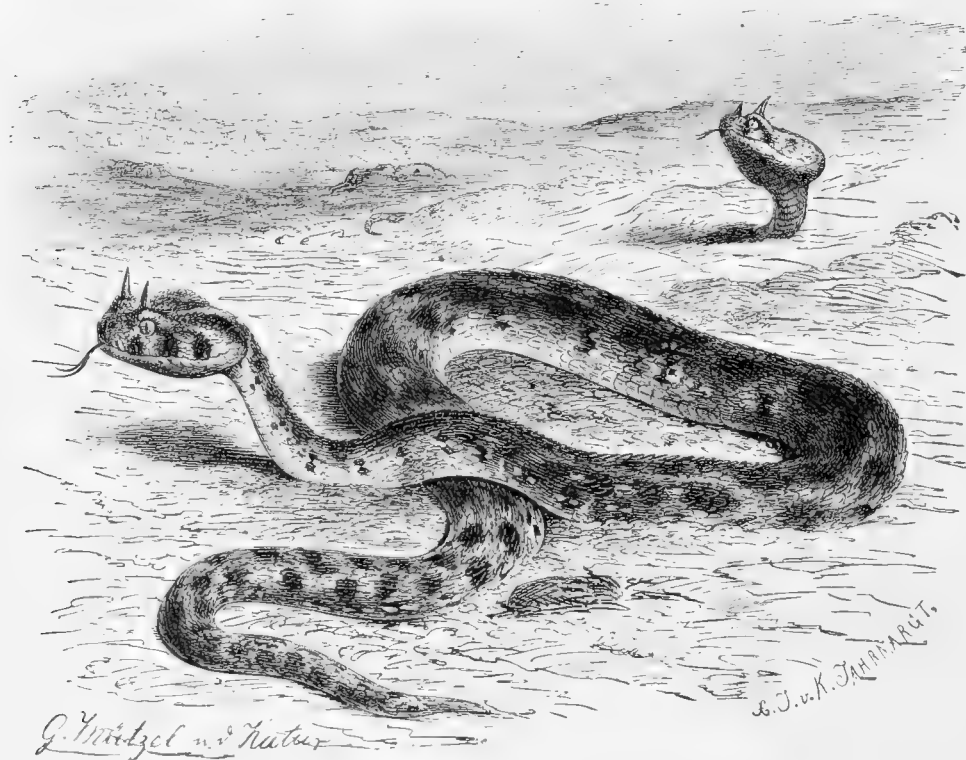
It is an ugly, thick-bodied, slow-crawling creature, with a suddenly tapering tail and a most evil looking head. It is not a large reptile, its average length being about eighteen inches. Its color is olive-gray, marbled on the sides, and decorated along the back with four rows of dark squared spots.

YET one more species of this genus deserves a passing notice. This is the HORNED ADDER (*Clotho cornúta*), sometimes, but erroneously, called the Cerastes, a term that is rightly applied to another Serpent shortly to be described. It sometimes goes by the popular name of HORNSMAN. It derives its name of Horned Adder from the groups of little thread-like horns that are seen on the head, one group appearing above each eye. In some works of Natural History, it is called the PLUMED VIPER, in allusion to these curious groups. It is not very graceful in form, being decidedly short, squat, and puffy in shape, but is very prettily marked, its body being richly marbled with chestnut, covered with a multitude of minute dots, and variegated with four rows of dark spots along the back, two rows running on each side of the vertebral line.

THE true CERASTES, or HORNED VIPER, is a native of Northern Africa, and divides with the cobra of the same country the questionable honor of being the “worm of Nile,” to whose venomous tooth Cleopatra’s death was due.

The bite of this most ungainly looking Serpent is extremely dangerous, though, perhaps, not quite so deadly as that of the cobra, and the creature is therefore not quite so much dreaded as might be imagined. The Cerastes has a most curious appearance, owing to a rather large horn-like scale which projects over each eye, and which, according to the natives, is possessed of wonderful virtues. They fancy that one of the so-called horns contains the supply of poison for the teeth, and that the other, if pounded and the powder rubbed over the eyelids, will enable the fortunate experimenter to see all the wealth of the earth—a privilege which, according to the peculiar cast of the Oriental mind, is of nearly as much value as the actual possession. The reader may remember a tale in the “Arabian Nights,” in which a similar story is narrated.

The Cerastes has, according to Bruce, an awkward habit of crawling until it is alongside of the creature whom it is about to attack, and then making a sidelong leap at its victim. He



CERASTES, OR HORNED VIPER.—*Vipera cerastes*.

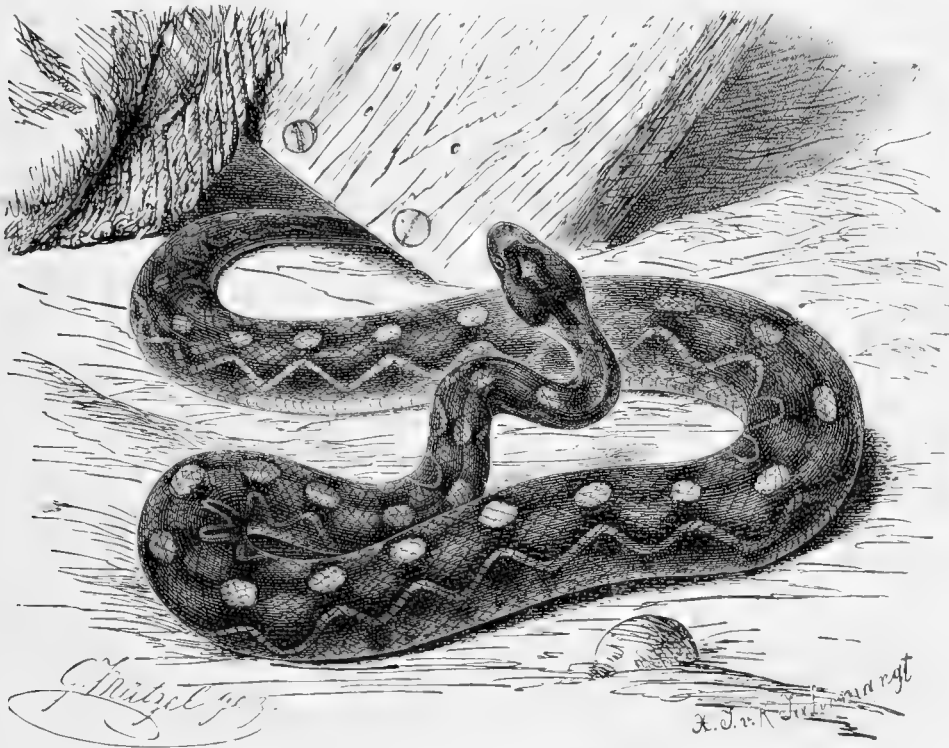
relates an instance where he saw a Cerastes perform a certainly curious feat: “I saw one of them at Cairo crawl up the side of a box in which there were many, and there lie still as if hiding himself, till one of the people who brought them to us came near him, and though in a very disadvantageous position, sticking, as it were, perpendicularly to the side of the box, he leaped near the distance of three feet, and fastened between the man’s forefinger and thumb, so as to bring the blood.”

The man who was thus bitten happened to be one of the men who profess Serpent charming, and avow themselves to be proof against the bite of any poisonous Snake. In this instance no ill effects followed the hurt, although Bruce proved that the poison-fangs had not been extracted, by making the reptile bite a pelican, which died in about thirteen minutes. Some persons have suggested that in this, as well as in other similar instance, the man was a clever juggler, who substituted a really venomous specimen for a Snake whose poison-fangs had been

extracted. But in any case it would be necessary to handle the really poisonous reptile for the purpose of effecting the exchange, and, in my opinion, the necessary rough handling of the creature would be a matter of no small danger. Bruce enters into this subject at some length, and records the result of a long series of experiments in a form which, though very interesting, is now so familiar as to need no quotation.

That in many instances the poison-teeth of venomous Serpents have been extracted, in order to allow the performer to play his tricks with them without harm, is very well known, but the fact of acknowledged and detected imposture does not invalidate the reality which is clumsily imitated by pretenders, any more than a forgery disproves the existence of a genuine document. More will be said on this subject when we come to the different species of cobra.

The *Cerastes* usually lives in the driest and hottest parts of Northern Africa, and lies half-buried in the sand until its prey shall come within reach. Like many Serpents, it can



HORATTA PAM.—*Echis carinata*.

endure a very prolonged frost without appearing to suffer any inconvenience; those kept by Bruce lived for two years in a glass jar without partaking of food, and seemed perfectly brisk and lively, casting their skins as usual, and not even becoming torpid during the winter.

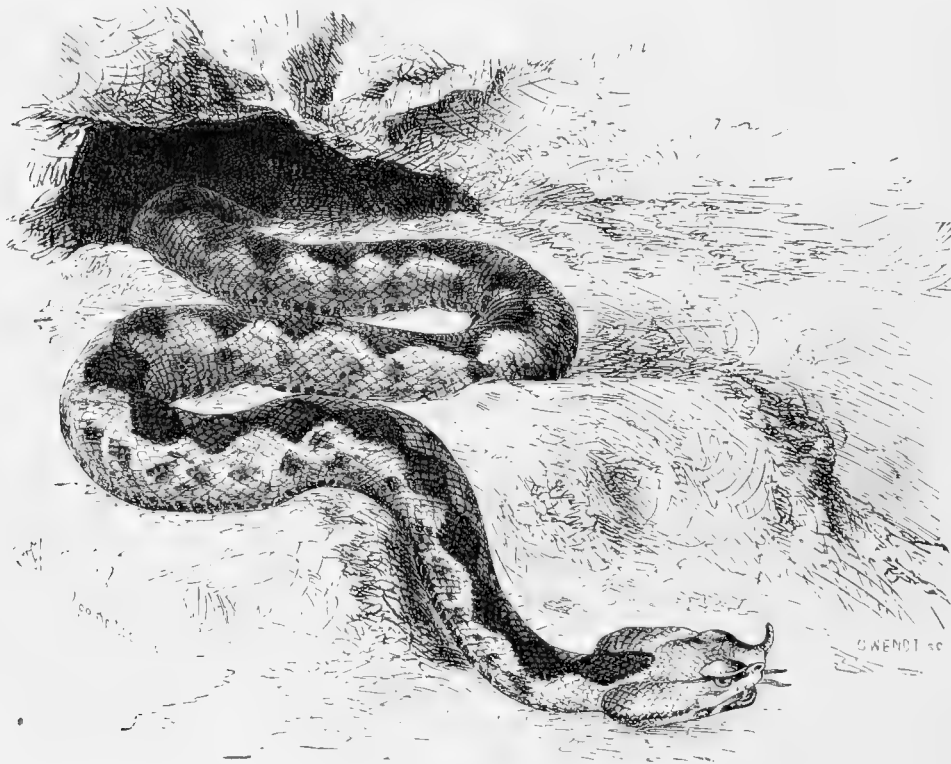
The color of the *Cerastes* is pale brownish white, covered irregularly with brown spots. Its length is about two feet.

PASSING to another genus of venomous Snakes, we come to a rather pretty little Serpent, an inhabitant of India, and called by the natives HORATTA PAM (*Echis carinata*). It is said to be very dangerous in spite of its small dimensions, and to require a double dose of Serpent medicine in order to counteract the effects of its poison. Its color is grayish brown, darkening into rather deep brown on the head, and variegated with angular white streaks on the body, and large oblong spots on the head, edged with a deeper hue. Its length is about fifteen or sixteen inches.

THE COMMON ASP, OR *CHERSÆA* (*Vipera aspis*) is nearly allied to the preceding species. This Snake is common in many parts of Europe, and is plentiful in Sweden and the

neighboring countries, besides being distributed over nearly the whole continent. It is much dreaded, and with reason, for its bite is very severe, and in some cases will cause death. As is the case with other venomous reptiles, the Asp is most dangerous during the hottest months of the year, and it has well been remarked that there is probably some connection between the electrical state of the atmosphere and the venom of Serpents, as the poison is always most deadly and the creatures most fierce when the electrical conditions of the atmosphere are disturbed, and the thunder-clouds are flying quickly through the air. When a person is bitten in one of his limbs, he quickly digs a hole and buries the injured part below the surface of the earth, as the fresh mould is thought to be very efficacious in alleviating the ill effects of the poison. Should the injury be in a toe or a finger, the rougher but more effectual remedy of instant amputation is generally employed.

The color of this reptile is olive above, with four rows of black spots. The two middle rows are often placed so closely together, that they coalesce and form a continuous chain of black spots along the spine, very like the well-known markings of the common viper.



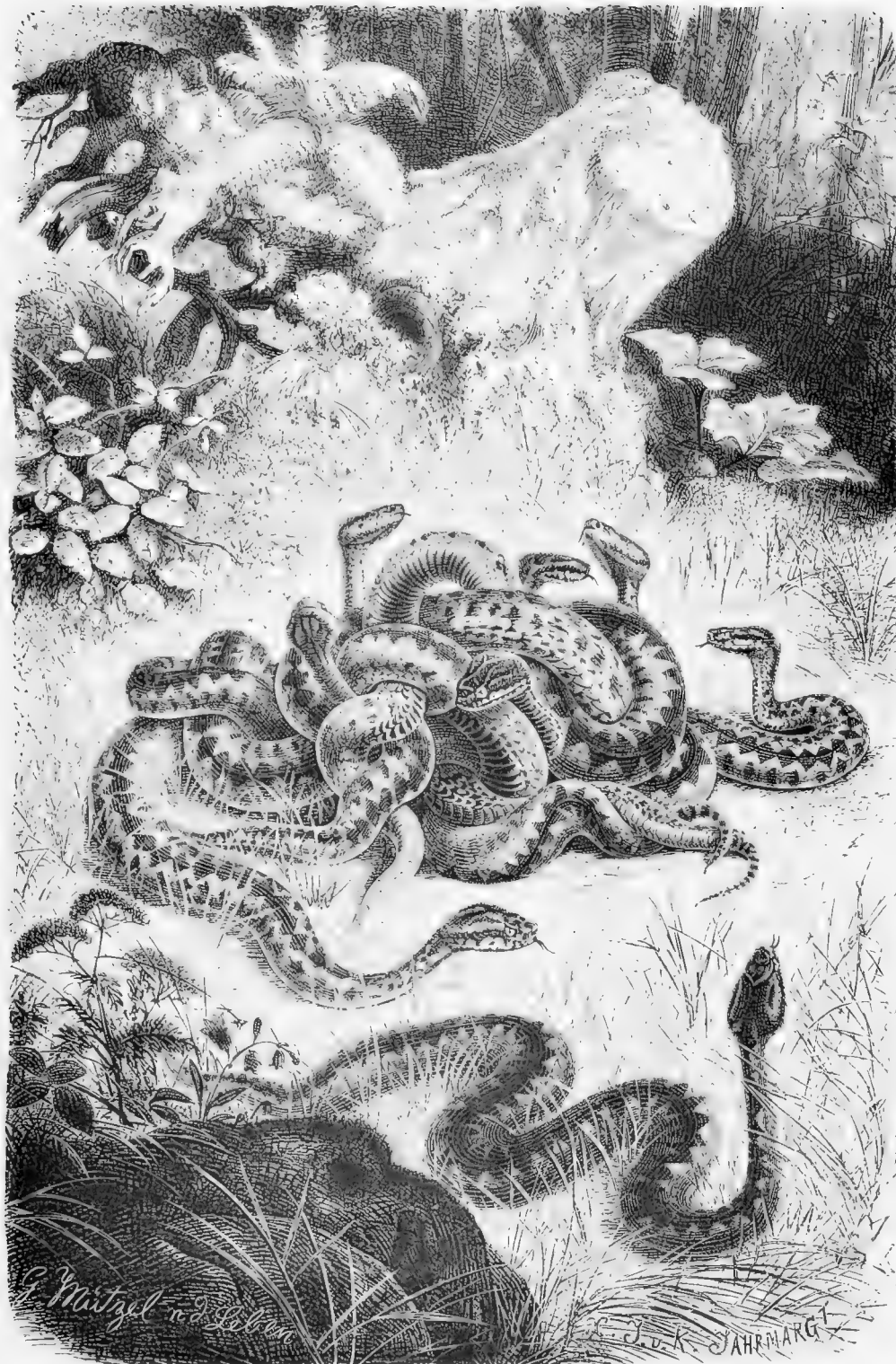
SAND-NATTER. - *Vipera ammodytes*.

ANOTHER venomous Snake, the AMMODYTE, or SAND-NATTER (*Vipera ammodytes*), belongs to the same genus as the asp.

This reptile inhabits southern Europe, and is generally found in rocky localities. The bite of this creature is very dangerous, and the remedies employed are generally of little efficacy. Enlarging the wound with a thorn, and squeezing a garlic upon the part bitten, is the general mode of alleviating the pain, but is of little use to the injured person. Its color is olive above, with a broad oblique dark streak on each temple, two similar streaks on each side of the head, and a wavy dark line along the crown of the spine.

THE common VIPER, or ADDER, is very well known in many parts of Europe, but in some localities is very plentiful, while in others it is never seen from one year's end to another.

Many persons mistake the common grass Snake for the Viper, and dread it accordingly. They may, however, always distinguish the poisonous reptile from the innocuous, by the



VIPER, OR ADDEK.

chain of dark spots that runs along the spine, and forms an unfailing guide to its identification. It is the only poisonous reptile inhabiting some European countries, the variously-colored specimens being nothing more than varieties of the same species.

Like most reptiles, whether poisonous or not, the Viper is a very timid creature, always preferring to glide away from a foe rather than to attack, and only biting when driven to do so under great provocation.

The following interesting account of a Viper's bite and its consequences, has been kindly forwarded to me by Mr. W. C. Coleman:—

“Several years ago, in my school-boy days, I had an experience with a Viper, which may possibly interest such of your readers as have not enjoyed a similar intimacy with the creature, especially as it places the Viper character in a somewhat more amiable light than it is usually represented:

“One cold, damp day in the beginning of May, I was out in the country on a foraging expedition; birds' nests and objects of natural history in general being the objects of search. Entering, in the course of exploration, a likely coppice, I descried a blackbird's nest perched among some tangled stems of underwood three or four feet from the ground. A glance at the interior, however, soon showed that some other marauder had forestalled me, as the sole occupants of the nest were some crushed and empty egg-shells, and scanty remains of the fluid contents spilt about. ‘A weasel,’ thought I, but wrongfully, as it happened, for on turning away in dudgeon, a rustling movement among the herbage on the ground a couple of yards off, attracted my eyes and ears; and there I saw the undoubted spoiler of the nest, a large Viper, moving away briskly with his tail in the direction of the nest.

“A little knowledge is a dangerous thing, and my slight natural history reading, assisted by bad engravings, had helped me to fancy that I knew the Viper from the common Snake well enough; and so, deciding that this was only a common harmless Snake, I made a plunge at the creature and apprehended him with my unprotected hand. Receiving no bite, I was now confirmed in my idea of the beast's perfect innocence (except in the bird's-nest matter), and decided on adopting him as a pet. So presently set off home, a distance of more than two miles, taking my serpentine friend in my hand. Not always in my hand, however, for to beguile the homeward journey I proceeded to try sundry experiments on the supple backbone and easy temper of the animal, occasionally tying him round my neck, and so wearing him for a considerable distance; then twining him round my wrist into a fancy bracelet, and weaving him into various knots and devices according to taste, all this with perfect impunity on my part, and the utmost apparent good humor on his.

“On the road, a kind farmer of my acquaintance, whose natural history lore was more practical than my own, endeavored to convince me that I was ‘harboring a Viper in my bosom,’ but I was not going to hear my good-tempered playmate called bad names; put my finger into the Adder's very mouth to prove he had no idea of biting, and so passed on, in much conceit with myself as an accomplished herpetologist.

“We thus reached home in perfect safety and amity. My brothers and sisters greeted the stranger with some little instinctive horror at first, but got over that feeling when they heard of his innocent nature and amusing capabilities, in proof of which I repeated the necktie experiment, etc. About this stage, however, I must mention that he exhibited a somewhat unpleasant phenomenon common to the Snake tribe in general, who can relieve themselves of the torpor consequent on a heavy meal, by disgorging the same when irritated and requiring restoration of their usual activity. The rejectamenta in this case consisted of portions of unhatched young birds, thus confirming the nest robbery.

“Being thus lightened, and perhaps stimulated by the warmth of a fire in the room, he was now lively enough, unhappily for me, for on essaying to continue my experiments, by tying him into a double knot, his endurance was at an end; one dart at my finger and a sharp puncture told me that the thing was done. Then, too late, I recollected that the ‘Adder is distinguished by a zigzag chain of dark markings down the back,’ and sure enough the vile creature before me had those very marks. In a rage, I battered his life out with a stick, lest

he should do more damage, and then settled down to watch the progress of the poison within my system

“It was not slow to take effect; first the wound looked and felt like a nettle sting, then like a wasp sting, and in the course of a few minutes the whole joint was swollen, with much pain. At this juncture my father, a medical man, arrived from a country journey, and set the approved antidotes to work, ammonia, oil and lunar caustic, to the wound, having previously made incisions about the punctured spot, and with paternal affection attempted to draw out the poison by suction; but nothing availed, and all sorts of horrid symptoms set in, fainting, sickness, delirium, and fever; the hand and whole arm to the shoulder greatly swollen and discolored, with most intense pain. This state of things lasted for several days. I forget the exact time, but I was not fully restored for more than a fortnight after the bite.

“Since that day I have taken care to put my acquaintance with Serpents on such a footing as to be able at a glance to tell the species of any of the common Snakes; a piece of useful knowledge most easily gained, and well worth the acquirement.”

It was a most providential circumstance that the reptile did not bite him immediately after its capture, and that the wound was inflicted on the finger and not on the neck, as in the one case he could hardly have reached his home, and in the other, the great swelling might have caused suffocation, as is known to be the case with persons bitten in the neck by other poisonous Serpents.

A FEW words will not be out of place respecting the alleged capability of the Viper of receiving its progeny into its mouth when in danger.

A long-standing controversy on this subject has elicited a vast amount of correspondence, the whole of which seems to resolve itself into two divisions, namely, communications from a great number of persons who assert that they have seen the young Vipers crawl into their parent's open mouth, and letters from two or three persons who say that they did not do so, because such a proceeding is impossible, and contrary to the laws of nature.

One of the most learned of the objectors remarks, that no amount of testimony can prevail against reason, and that the persons who assert that they have seen the young Vipers crawl into their mother's mouth, have fallen into the dangerous fallacy of believing what they saw. Now this argument, novel though it may be to the scientific world in general, is perfectly familiar to theologians as being the sheet-anchor of a certain school of controversialists, who deny the credibility of the miraculous events narrated in the Scriptures. It has been repeatedly exploded in polemical controversy, and long abandoned by impartial thinkers, inasmuch as it assumes a knowledge of all the laws of nature, and contracts the power of the Divine Creator of the Universe within the narrow limits of the individual idiosyncrasy and mental capacities of the disputant.

It has ever been conceded that, in all ages, the testimony of credible witnesses has been the surest mode of confuting false reasoning and thereby eliciting truth; so that when any unprejudiced reasoner finds that a favorite theory is contradicted by the testimony of even one trustworthy observer, much more when the united accounts of many competent judges all tend to the same point, he feels that it is time for him to reflect whether, however perfect may be the form of his syllogism, there may not be something wrong with his premises. Reasoning is more liable to falsity than the senses to deception. It is easy enough to talk of a flagrant violation of the laws of nature, but before we venture to do so it is as well to be quite certain that we are sure of the full extent of those laws. Who is there, even among the most learned, that can define the full working of even a single known law and its ever-varying action under different circumstances? And who can venture to say that some hitherto unrecognized law may not be in existence, which, if known and acknowledged, would account for the circumstances which at present seem so unaccountable?

In the second place, if we are not to depend upon the testimony of our acknowledged senses, on what are we to depend for the whole of natural philosophy, astronomy, or, indeed, any other established science? It is simply on the testimony of our senses that all existing



Animate Creation.

WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so, as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston, who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet, etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield, and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities. Our endeavor has been to find an author whose work would be noted for its fund of anecdote and vitality rather than for merely anatomical and scientific presentation, and we arrived at the conclusion that we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work—a work most popularly approved by speakers of the English language. It would be superfluous to say one word concerning the standard character of his book, from the pages of which old and young at the other side of the Atlantic have obtained so much instruction and rational amusement. Avoiding the lengthened dissertations and minute classifications of specialists, he presents to his readers in popular terms a complete treatise on the Animal Kingdom of all climes and countries. The one objection that could be urged against it was, that animal life in America might be treated more fully and American forms given more consideration. In order to obviate this drawback and to do full justice to the creatures of our own country, we secured the aid of Dr. J. B. HOLDER, of the American Museum of Natural History in New York, an undoubted American authority, who has adapted Wood's work to American wants and given prominence to American forms of Animal life.

The splendid work on Rodentia, by Allen, Coues, and others, will be fully consulted. The valuable work on North American Birds, by Baird, Brewer, and Ridgway, will be the guide in the treatment of birds. The late arrangement of the classification and nomenclature of North American Birds, by Mr. Ridgway, and the Committee on that subject of the Ornithologists' Union, will be utilized in full. The arrangement of Mammals will be after the latest classification by Professor Flower, of the Zoological Society of London. So that this will be the first popular Natural History worthy of the name that has made its appearance here, which gives due and full recognition to the animate world surrounding us.

Terms of Publication.

The extent of the work will be 68 parts of 28 pages, at the price of 25 cents each. The entire publication will contain 34 Oleographs and 68 Full Page Engravings on Wood, besides many hundreds of exquisite Illustrations interspersed through the text. The parts will be issued every two weeks, and are payable only as delivered. No subscriber's name will be received for less than the entire work, and anyone removing, or not regularly supplied, will please address the Publisher by mail.

N. E.

SELMAR HESS, Publisher, New York.

Testimonials to the "Tafeln" of Brehm's Thierleben.

The late CHARLES DARWIN writes:—"The illustrations are the best I ever saw in any work. I find it superfluous to enter here into particulars, as I already, in the 'Descent of Man,' have willingly and openly confessed how much I have profited by Mr. Brehm's book, and how highly I esteem it."

Sir JOHN LUBBOCK, Bart., D.C.L.:—"You have, I think, done good service in publishing them. They are certainly very admirable."

W. B. CARPENTER, M.D., LL.D., writes:—"I can quite endorse the favorable opinions already given by distinguished zoologists as to the high character of the illustrations generally."

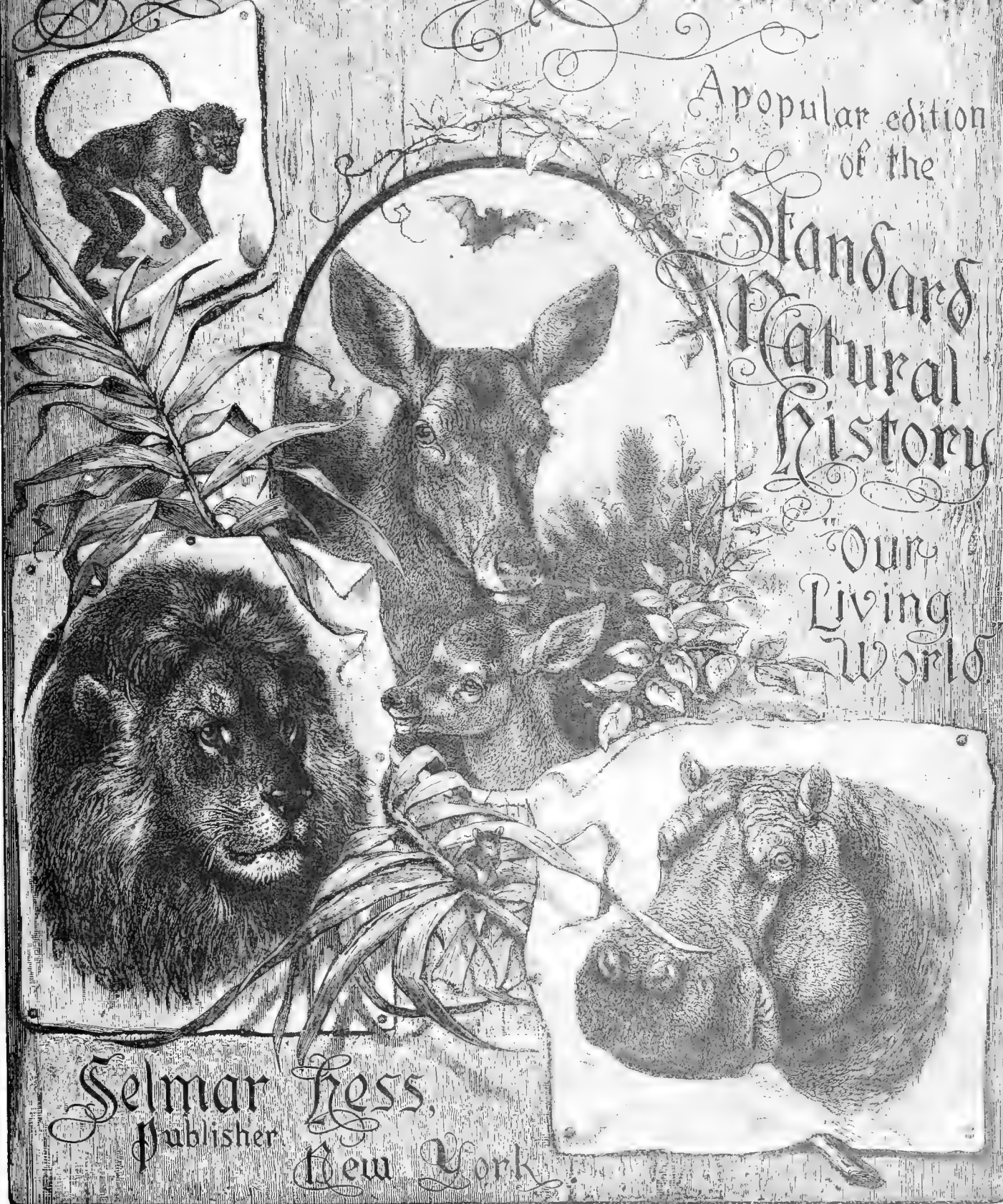
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Animate Creation

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sciences are founded, and even analogous reasoning is not admitted as valid proof of an asserted fact. There is hardly any new discovery which does not destroy some old and respectable theory, and give entirely a new idea of the law of nature on which it depends.

The operation of the senses is in itself one of the known laws of nature, by which we discover facts and through which we are enabled to exercise our reasoning faculties. A human being without the senses of sight, hearing, and touch, would be the dullest animal on the face of the earth, and as long as the privation lasted, would hold a lower place than a sponge or a medusa. If we once acknowledge that the evidence of the senses is not to be believed, we must reject the whole of the physical sciences. Astronomical observations, chemical experiments, geological surveys, anatomical researches, and the whole of natural history, must be at once thrown aside if such a theory is to be consistently carried out; and for the same reason, the courts of law must be abolished, depending as they do on the personal observations of human beings, mostly illiterate, and often ignorant to a degree. Repeated observations are the only method of ascertaining the laws of nature, and if they show that certain events, however strange they may appear, have really occurred, they surely prove, not that the senses of the witnesses were deceived, but that another law of nature has been discovered.

Were the Viper the only creature of whom such an act is related, the phenomenon would be less worthy of belief; but there is hardly a poisonous Snake of any country by whom the same act is not said to be performed, the narrators not being professed naturalists with a theory, but travellers, hunters, and settlers, casually noting the result of their personal experience. I cannot but think that the accumulated testimony of many trustworthy persons, acting independently of each other, accustomed to observation, and mostly unaware of the importance that would be afterwards attached to their words, is entitled to some respect, and affords legitimate grounds to the truth-seeker, not for contemptuous denial, but for further investigation.

Several observant inhabitants assert that both sexes assume this protective habit, the male as well as the female receiving the young into the mouth in cases of sudden danger. In those localities, the head of the Viper is always chopped off as soon as the reptile is killed, and the Viper-catchers say that in such cases the young Vipers frequently are seen crawling out of the severed neck.

I certainly never saw the Viper act in this manner, but I have had very few opportunities of watching this reptile in a wild state and noting its habits; whereas those who spend their lives in the forests, and especially those men who add to their income by catching or killing these reptiles, speak of the reception of the young into the mouth of the parent, as a fact too well known to be disputed.

It has been objected that the young would be consumed by the gastric juice of the parent—one of the most sensible objections that has been made. But this assertion has been invalidated by the researches of able anatomists and experimentalists, such as Mr. F. T. Buckland, etc., who have discovered by careful dissection, two facts; the one, that the young may be concealed within the expansile body of the parent without entering the true stomach at all, the œsophagus or gullet forming a highly expansile antechamber between the throat and the actual stomach; and the other, that if they should happen to do so, the gastric juice would not hurt them. Incredible, therefore, as the possibility of such an act may seem, it can but be acknowledged that the weight of practical testimony is wholly in its favor. Moreover, the various suggestions offered to account for the deception practised by the Viper upon the eyes of observers, just as if it had been a professed conjurer performing before an audience, are really puerile in the extreme, and if they happen to affect the written testimony of one person, they are contradicted by the written testimony of another. It is to be hoped that if the Viper really does act in the manner stated, a specimen may be obtained with the young still within her body, and attested in such a manner that no objector may invalidate the proof by saying that the old one had been captured and the young pushed down her throat by force.

The head of the Viper affords a very good example of the venomous apparatus of the poisonous Serpents, and is well worthy of dissection, which is better accomplished under water than in air. The poison-fangs lie on the sides of the upper jaw, folded back and almost

undistinguishable until lifted with a needle. They are singularly fine and delicate, hardly larger than a lady's needle, and are covered almost to their tips with a muscular envelope through which the points just peer. The poison-secreting glands and the reservoir in which the venom is stored are found at the back and sides of the head, and give to the venomous Serpents that peculiar width of head which is so unfailing a characteristic. The color of the poison is a very pale yellow, and its consistence is very like that of salad oil, which, indeed, it much resembles both in look and taste. There is but little in each individual; and it is possible that the superior power of the larger venomous Snakes of other lands, especially those under the tropics, may be due as much to its quantity as its absolute intensity. In a full-grown rattlesnake, for example, there are six or eight drops of this poison, whereas the Viper has hardly a twentieth part of that amount.

On examining carefully the poison-fangs of a Viper, the structure by which the venom is injected into the wound will be easily understood. On removing the lower jaw, the two fangs are seen in the upper jaw, folded down in a kind of groove between the teeth of the palate and the skin of the head, so as to allow any food to slide over them without being pierced by their points. The ends of the teeth reach about half-way from the nose to the angle of the jaw, just behind the corner of the eye.

Only the tips of the fangs are seen, and they glisten bright, smooth and translucent, as if they were curved needles made from isinglass, and almost as fine as a bee's sting. On raising them with a needle or the point of the forceps, a large mass of muscular tissue comes into view, enveloping the tooth for the greater part of its length, and being, in fact, the means by which the fang is elevated or depressed. When the creature draws back its head and opens its mouth to strike, the depressing muscles are relaxed, the opposite series are contracted, and the two deadly fangs spring up with their points ready for action. It is needful, while dissecting the head, to be exceedingly careful, as the fangs are so sharp that they penetrate the skin with a very slight touch, and their poisonous distilment does not lose its potency, even after the lapse of time.

The next process is to remove one of the teeth, place it under a tolerably good magnifier and examine its structure, when it will be seen to be hollow, and, as it were, perforated by a channel. This channel is, however, seen, on closer examination, to be formed by a groove along the tooth, which is closed, except at the one end whence the poison exudes and the other at which it enters the tooth. If the tooth be carefully removed, and the fleshy substance pushed away from its root, the entrance can be seen quite plainly by the aid of a pocket lens. The external aperture is in the form of a very narrow slit upon the concave side of the fang, so very narrow, indeed, that it seems too small for the passage of any liquid.

There are generally several of the fangs in each jaw, lying one below the other in regular succession. From the specimen which has just been described I removed four teeth on each side, varying in length from half to one-eighth the dimensions of the poison-fangs.

The Viper seems to be well aware of the power of its fangs, and to discriminate between animate and inanimate antagonists. I have tried in vain to make a Viper bite a stick with which I was irritating it; but no sooner did a kitten approach, than the reptile drew back its head and made its lightning-like dart at the little creature with such rapidity, that it would have gained its point, had not its back been so much injured as to deprive it of its natural powers.

The ordinary food of the Viper is much the same as that of the common Snake, and consists of mice, birds, frogs, and similar creatures. It is, however, less partial to frogs than the common Snake, and seems to prefer the smaller mammalia to any other prey. The young of the Viper enter the world in a living state, having been hatched just before they are born. The fat of the Viper was once in high estimation as a drug, and the older apothecaries were accustomed to purchase these reptiles in considerable numbers. Even now this substance is in some repute in many agricultural districts, being employed as a remedy for cuts, sprains, or bruises, and especially as a means of alleviating the painful symptoms of a Viper's bite.

The color of the Viper is rather variable; but the series of very dark marks down the back is an unfailing sign of the species, and is permanent in all the varieties. Generally, the

ground color is grayish-olive, brown, or brownish-yellow; along the back runs a chain of zig-zag blackish markings, and a series of little triangular spots is found upon each side. The largest specimen I have yet seen in a wild state was one of the yellow varieties. Sometimes the ground is brick-red, and now and then a nearly black specimen is found. Mr. Bell mentions an example where the ground color was grayish-white, and the markings jetty-black.

THE reptile that is called by the significant title of DEATH ADDER, or DEATH VIPER, is a native of Australia, where its poisonous fangs render it an object of much fear. A very excellent, though short description of this Snake is given by Mr. Bennett in his "Wanderings in New South Wales."

"The most deadly Snake in appearance, and I believe also in effect, is one of hideous aspect, called by the colonists the Death Adder, and by the Yas natives 'Tammin,' from having a small, curved process at the extremity of the tail; or, more correctly, the tail terminating suddenly in a small, curved extremity, bearing some resemblance to a sting. It is considered, by popular rumor, to inflict a deadly sting with it.

"This hideous reptile is thick in proportion to its length; the eye is vivid yellow, with a black longitudinal pupil. The color of the body is difficult to be described, being a complication of dull colors, with narrow, blackish bands shaded off into the colors which compose the back; abdomen slightly tinged with red; head broad, thick and flattened. The specimen I examined measured two feet two inches in length, and five inches in circumference. A dog that was bitten by one died in less than an hour. The specimen I examined was found coiled up near the banks of the Murrumbidgee river; and being of a torpid disposition, did not move when approached, but quietly reposed in the pathway, with its head turned beneath its belly."

The generic title of Acanthophis, or Thorny-Snake, is given to this species on account of the structure of the tail, which is furnished at its extremity with a recurved horny spine.

RIVER OR SEA SERPENTS.

WE now arrive at a very remarkable family of Snakes, which pass their lives in water, either fresh or salt, and are river or sea Serpents as the case may be. In order to enable them to pass through the waters without injury to the organs of respiration, the nostrils are furnished with a valve so as to prevent the ingress of water while the creature is below the surface.

A good example of these marine Serpents is the BLACK-BACKED PELAMIS (*Pelamis bicolor*) the Nalla Whallagee Pam of the Indian fishermen. This Snake is found only at sea, and is said seldom if ever to approach the shore, except for the purpose of depositing its eggs, which are laid on the beach sufficiently near high-water mark for the young Snakes to seek their congenial element as soon as they are hatched. The Black-backed Pelamis is frequently found sleeping on the surface of the sea, and is then caught without much difficulty, as it is forced to throw itself on its back before it can dive. It has been suggested that this movement is intended to expel the air in the ample lungs. Sometimes it is unwillingly captured by the fishermen in their nets, and is an object of considerable dread to them on account of the formidable character of its teeth. In these Serpents the fangs are but little larger than the other teeth of the jaw, but can be distinguished by their slightly superior size and the groove that runs along their front edge. The average length is about one yard.

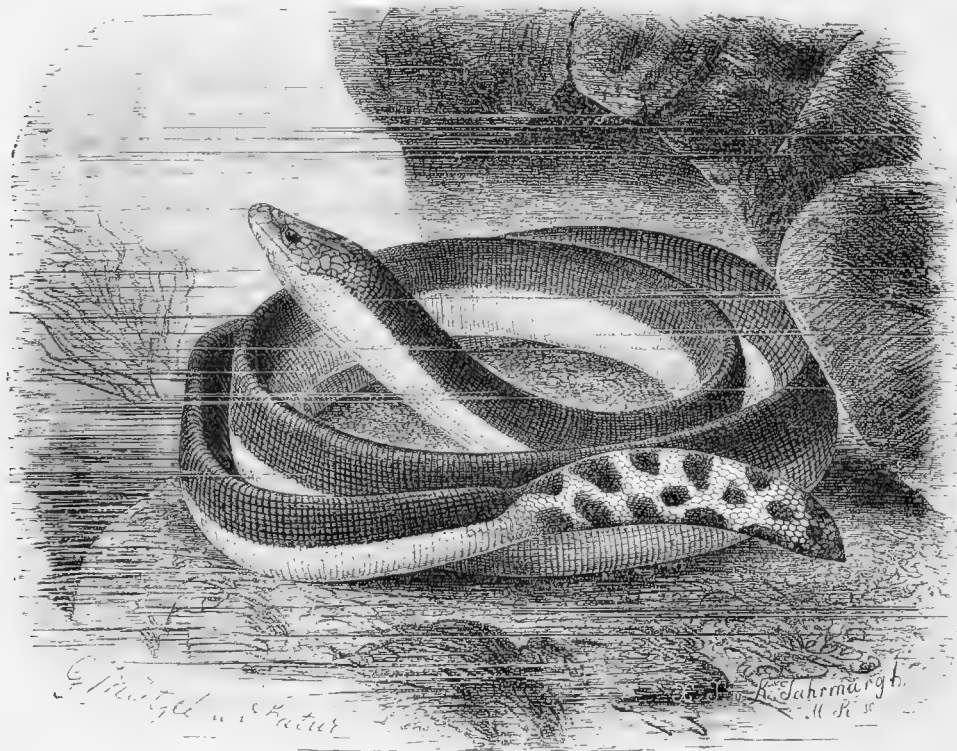
THE SHOOTER SUN (*Hydrophis obscura*) is another of the sea Serpents. This reptile is also one of the Indian species, and inhabits the sea or the saline waters of the river-mouths, not being able to exist in fresh water. It is an admirable swimmer, but is very awkward on dry land, and cannot survive for any length of time unless it has access to salt water. The outline of this Serpent is most remarkable. The head and neck are almost absurdly minute

in proportion to the wide thick body, bearing about the same proportion as the tip of the little finger does to the wrist. The tail is also very wide, extremely blunt, and compressed.

The markings of this reptile are rather curious. The ground color is black. There is a large yellow spot on each side of the head, a series of pale, gray-brown spots runs on each side of the neck, and a row of large rounded white marks is arranged along the back so as to form a richly variegated pattern of boldly contrasted colors.

THE CHITTUL (*Hydrophis sublaevis*) is another of these marine Snakes, and is found in India and Ceylon. It is rather a large species, sometimes exceeding five feet in length, and is handsomely colored. It is extremely venomous, a fowl that had been bitten by a Chittul dying within five minutes after receiving the injury. The ground color of this Snake is yellow, and the body is covered with an irregular row of black rings. Some black bands also cross the neck.

In the ACROCHORDE, sometimes called the Oular Carron, the tail, instead of being flattened, is rounded, conical, and very short, diminishing in diameter in a very sudden manner. It is a native of Java, and is said to be wholly vegetarian in its diet, the stomach



BLACK-BACKED PELAMIS.—*Pelamis bicolor*.

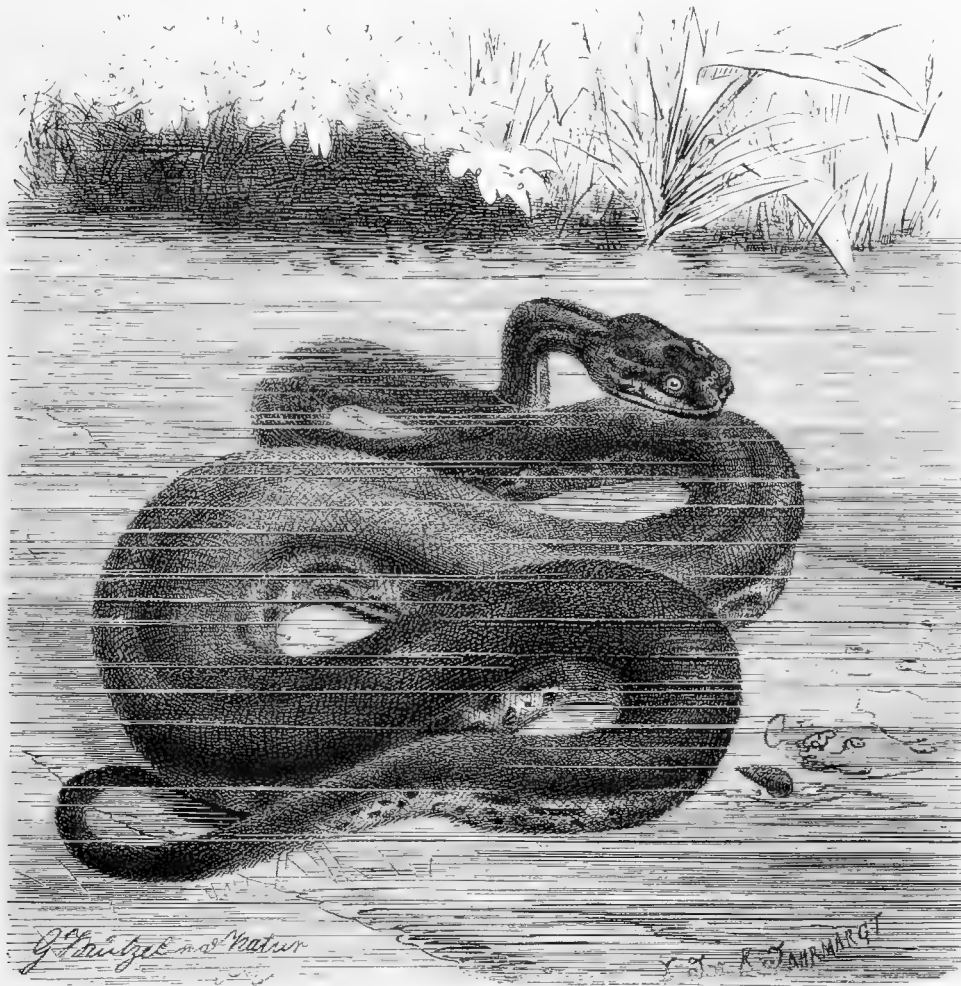
having been found to contain nothing but half-digested fruit. The flesh of the Acrochorde is said to be excellent.

Upon the head are a number of little scales, each of which is divided into three ridges. The creature is in the habit of distending its body with air to a very great extent, and when it so acts the scales separate from each other and make the head and body look as if they were covered with tubercles. The general color is brown in the adult, and brown banded and streaked with a darker hue in the young.

THE CHERSYDRUS (*Chersydrus granulatus*) is a rather curious aquatic Serpent, found in Asia and most common in Java. It is sometimes called the Banded Acrochorde, but wrongly so, as its tail, instead of being round and conical, is flat, compressed, and sword-like in shape.

It inhabits the bottoms of marine creeks and the mouths of rivers. The Javanese call it Oular Limpe. The body of this reptile is covered with small scales, each boldly keeled in the centre, and its color is black and white arranged in alternate rings.

THE ERPETON, or HERPETON, as the name is sometimes written, is a truly curious reptile, of no great size, but bearing a pair of appendages on the head that seem to serve no recognized purpose save to bewilder zoologists. The muzzle of this creature is covered with scales, and on each side of it rises a curious appendage. This remarkable organ is soft, but completely covered with scales and defended by them. Of the habits of the Erpeton nothing appears to be known, and even its country is dubious. Its color is pale brown streaked with white.

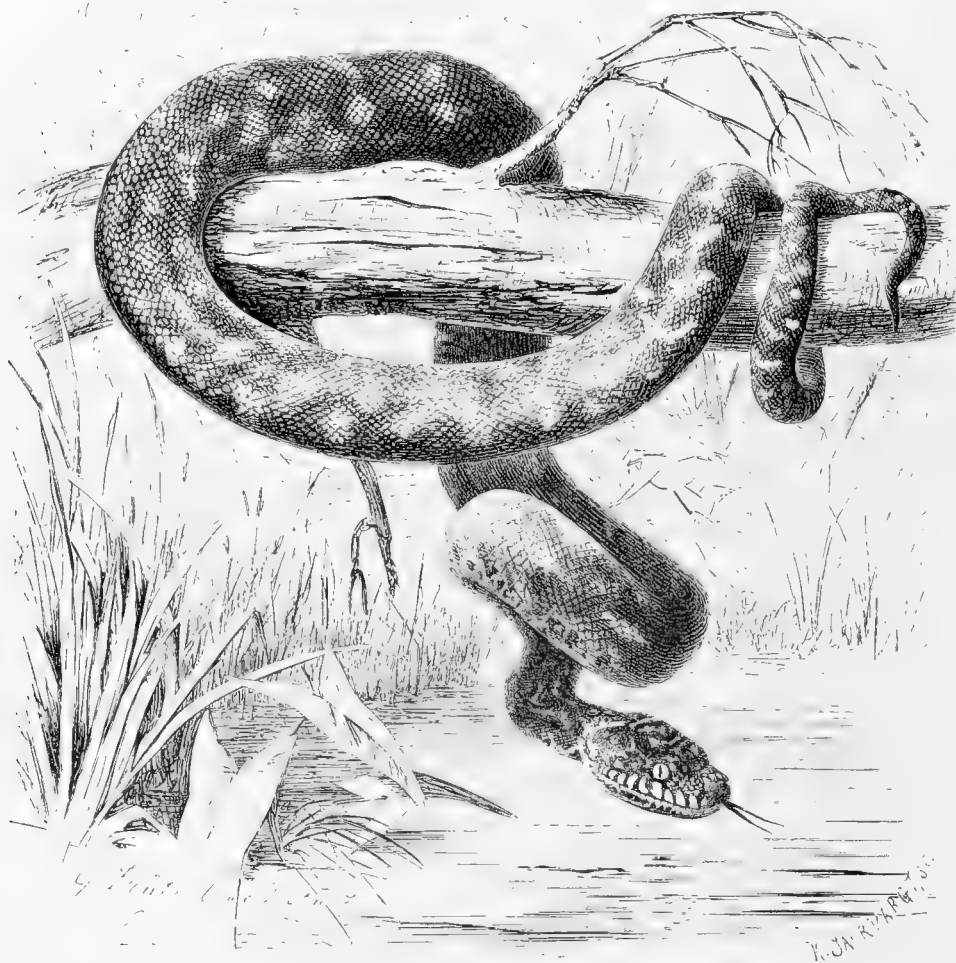


ACROCHORDE.—*Acrochordus javanicus*.

THE sombre and rather unsightly CERBERUS, better known by its native name of KAROO BOKADAM, is an Asiatic reptile, being found in India, the Philippines, Ceylon, Borneo, and similar countries. It is an ugly looking Serpent, but is not much dreaded, and is thought to be practically non-venomous. It is a stout, thick-bodied Snake, with a very large head in proportion to the size of its neck, though small in comparison with the body. The mouth is not large, and the teeth are small, regular, and set rather closely together. The nostrils of this Serpent are very small, and placed close to each other almost on the very tip of the muzzle. The eyes are small, round, and projecting as if squeezed out of the head, and are surrounded by a curious circle of nearly triangular scales, much as a circular window in a brick wall is edged with wedge-shaped bricks.

The general color of this Serpent is grayish-brown above, covered with narrow bands of black set rather closely together. The abdomen is black mottled with yellow, the sides are white with spots of pale brown, and the lips and throat are of the same tint, but spotted with black. The tail is nearly black. The usual length of this Serpent is about three feet six inches.

WE now arrive at a very important family of serpents, including the largest species found in the order. These Snakes are known by the popular title of Boas, and scientifically as Boidæ, and are all remarkable, not only for their great size and curious mode of taking their prey, but for the partial development of the hinder limbs, which are externally visible as a pair of horny spurs, set one on each side at the base of the tail, and moderately well developed under the skin, consisting of several bones jointed together. In most of the species the tail is



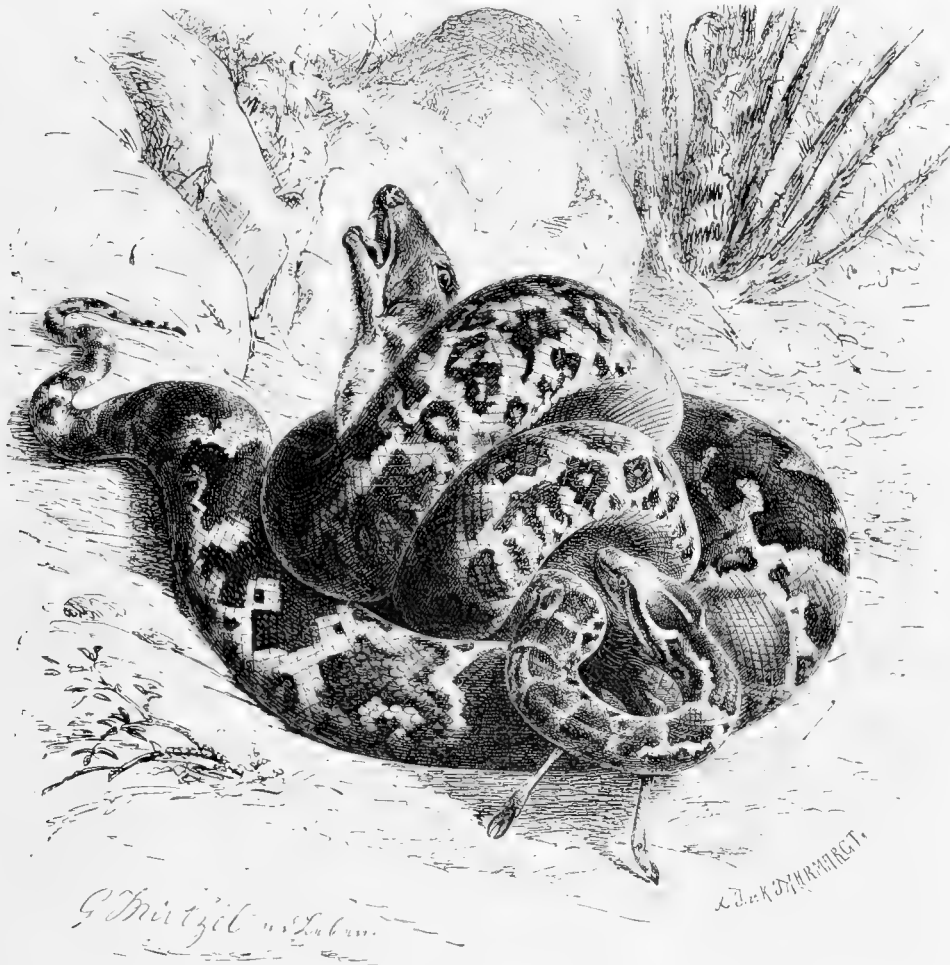
CARPET SNAKE.—*Morelia variegata*.

rather short and strongly prehensile. The peculiar habits of these enormous Snakes will be mentioned in connection with the various species. The first of these creatures is the DIAMOND SNAKE of Australia (*Morelia spilotes*), a very handsome species and tolerably common. It is called the Diamond Snake on account of the pattern of the colors, which are generally blue, black, and yellow, arranged so as to produce a series of diamonds along the back. The CARPET SNAKE (*Morelia variegata*), of the same country, is closely allied to it. Both these reptiles are variable in their coloring.

THE members of the restricted genus PYTHON are remarkable for their habit of depositing the eggs together and coiling their bodies round them, so as to form a large conical heap. The common grass Snake is said to perform the same feat. The true Pythons are inhabitants of

Asia, and are generally found in India. The common ROCK SNAKE of India (*Python molurus*) is a good example of this genus. The natives believe that the little spurs are useful in fighting, and therefore cut them off whenever they capture the reptile. It is the Pedda-Poda of the Hindoos. It is not one of the largest of its kind, usually attaining a length of ten or eleven feet, and not being held in much dread. A fowl that was inclosed in a cage with one of these Serpents, soon obtained the mastery over her terrible companion, and was seen quietly pecking at its head.

One of these reptiles that was kept at the gardens of the Zoological Society, once made a curious mistake while being fed, and had well-nigh sacrificed the life of its keeper. The man had approached the reptile with a fowl in his hand and presented it as usual to the Snake. The

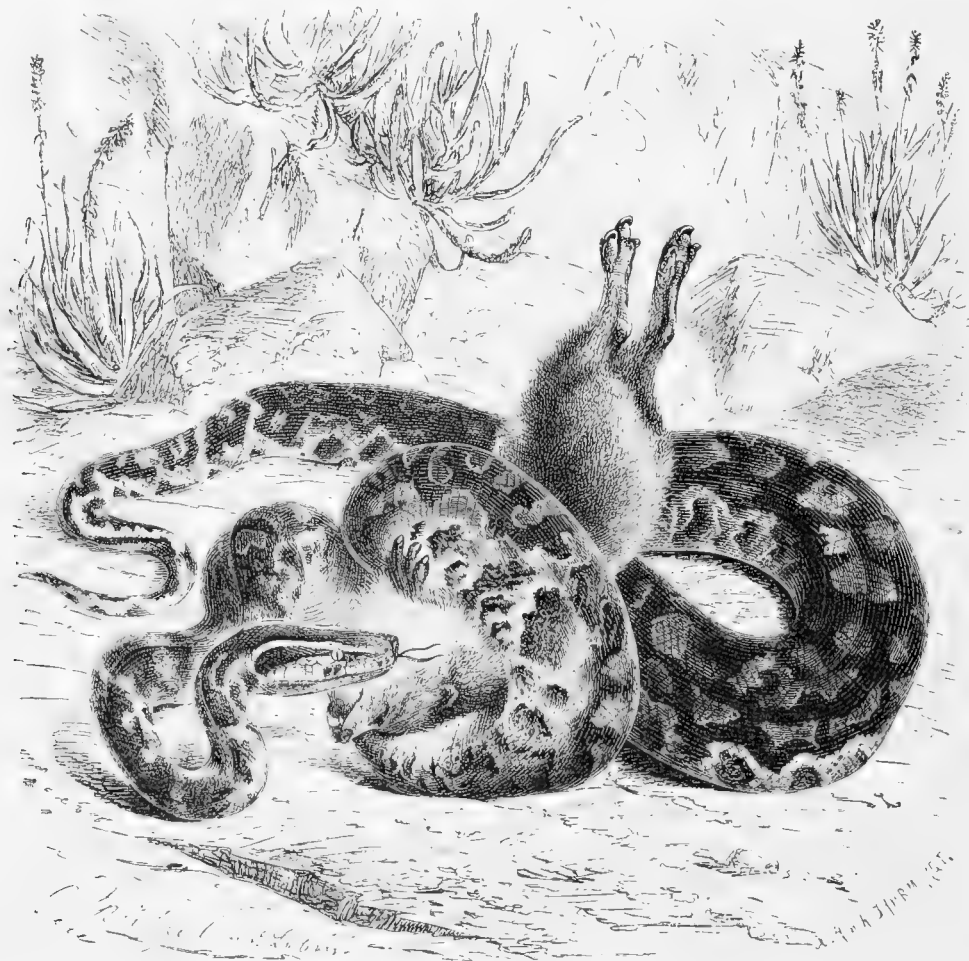


ROCK SNAKE OF INDIA.—*Python molurus*.

Serpent darted at the bird, but as it was just then shedding its skin and nearly blind, it missed its aim, and instead of seizing the bird, grasped the keeper's left thumb, and instinctively flung its coils around his arms and neck, as is customary when the animal seized is of considerable size.

The keeper tried to force the Snake's head from its hold, but could not reach it, as he was bound in the folds of the Snake. He then cast himself on the ground in order to battle to the greatest advantage, but would probably have succumbed to the fearful pressure, had not two keepers providentially entered the room, and by breaking away the Serpent's teeth released the man from his terrible assailant. Except the fright and a few wounds from the Serpent's teeth, no evil results ensued. The representation in our picture is one-tenth of the actual size of the specimen from which it was drawn.

ANOTHER species of Indian Rock Snake, called by the natives ULAR SAWA (*Hypsirhina aër*), is tolerably common, and in its habits resembles the preceding species. It often attains to a very considerable size, and is said when full-grown to be about thirty feet in length. This terrible Snake has been known to kill mankind, crushing the body in its numerous folds until nearly every bone was broken. In one such instance, the man had been caught by the right wrist, as was seen by the marks of the Serpent's teeth.



NATAL ROCK SNAKE.—*Hortalia natalensis*. (One-eighth natural size.)

THE handsome NATAL ROCK SNAKE, OR PORT NATAL PYTHON, as it is sometimes called, now comes under our notice. It is a fine, handsome species, sometimes attaining a great length, and being most beautifully colored. During life and when in full health and in the enjoyment of liberty, this, in common with many other Snakes, has a beautiful rich bloom upon its scales, not unlike the purple bloom of a plum or grape. Should, however, the Snake be in ill health, this bloom fades away, and in consequence, we seldom if ever see it on the scales of the Serpents which are kept in glass cases.

The dimensions of this reptile are often very great. Dr. A. Smith has seen a specimen measuring twenty-five feet in length, exclusive of a portion of the tail which was missing. Flat skins of this creature are, however, very deceptive, and cannot be relied upon, as they stretch almost as readily as India rubber, and during the process of drying are often extended several feet beyond the length which they occupied while surrounding the body of their quondam owner.

The teeth of this Serpent are tolerably large, but not venomous, and although of no insignificant size, are really of small dimensions when compared with the size and weight

of their owner. Few persons have any idea of the exceeding heaviness of a large Snake, and unless the reptile has been fairly lifted and carried about, its easy gliding movements have the effect of making it appear as if it were as light as it is graceful.

Both jaws are thickly studded with these teeth, and their use is to seize the prey and hold it while the huge folds of the body are flung round the victim, and its life crushed out of its frame by the contracting coils. In order to secure its prey, the Rock Snake acts after the manner of all this family. It waits in some spot where it knows that its victim will pass, coils its tail round some object, such as a tree or a stone, so as to give it a firm hold, and then, rapidly darting at the prey, it draws back its head, carrying the poor victim into the fatal grasp of its folds. It usually seizes by the throat, and retains its hold until the crushed animal is quite dead.

The following interesting account of the Rock Snake of Natal has been kindly forwarded to me by Captain Drayson :—

“The Rock Snake is somewhat rare, even in the least populous districts, and, in consequence of its retired habits and silent method of moving, it is not frequently seen. Although on an average I traversed the forests and plains near my various stations at least five times a week, I saw but seven Rock Snakes during a period of nearly three years. This Snake retreats into rocky crevices, or amongst the most tangled brushwood, after it has devoured its prey, which consists of toads, frogs, lizards, such as guanas, etc., birds of any size, and even small bucks. Its bite is quite harmless compared to that of the poisonous Snakes, and it destroys its victims by pressure.

“So cautious is this Snake to remain quite quiet if it thinks itself unseen, that on one occasion I nearly rode over a rather large Boa, which lay on a small path along which I was riding. On each side of this path there was a dense jungle, and there was merely room for one animal to travel along it. I happened to ‘pull up’ my pony to examine the surrounding bush, when I noticed that his erected ears indicated that he had seen game, he being a most accomplished shooting pony. Upon looking on the path before me I observed a very large Snake, lying perfectly still, and looking at me in a very suspicious manner. The reptile being partly concealed by the long grass, I could not see whether or not it was a poisonous Snake, so I quietly ‘reined back’ about a yard, and shot the creature through the body. The coils and contortions were something terrific to see, as the monster fought hard for his life; but even the bone and muscle of a Boa has but a poor chance against gunpowder and lead. A charge of buck shot in the head settled the business, and cleared the path of a very disagreeable *vis-à-vis*. This Snake measured about sixteen feet in length, and was in very fair condition, having a fine bloom on his skin. He had resided about a hundred yards from a long *vlei* (lagoon), in which frogs and lizards abounded.

“A much larger Rock Snake was shot by me some time after this, and measured upwards of seven yards. I once had an opportunity which rarely occurs to many men, viz., that of trying my speed with a young Boa-constrictor. Upon returning from shooting one afternoon I crossed the Umbilo River near Natal, and shortly after observed a *coran* flying up and down in a very singular manner. This bird being very good eating, I dismounted, and commenced stalking him, and approached within a few yards of him without being discovered. I then noticed a Snake creeping towards the *coran*, which merely flew on a few feet and then settled again. The Snake again approached the bird, which, however, seeing me, became disenchanted, and was making its escape when I shot it, and then turned my attention to the Snake, which remained quite still. I soon saw that the animal was a young Rock Snake about twelve feet long, and, being desirous to obtain a live specimen of this reptile, I ran to my pony, where on the saddle I had a long leather strap, with which I hoped to noose the young Boa.

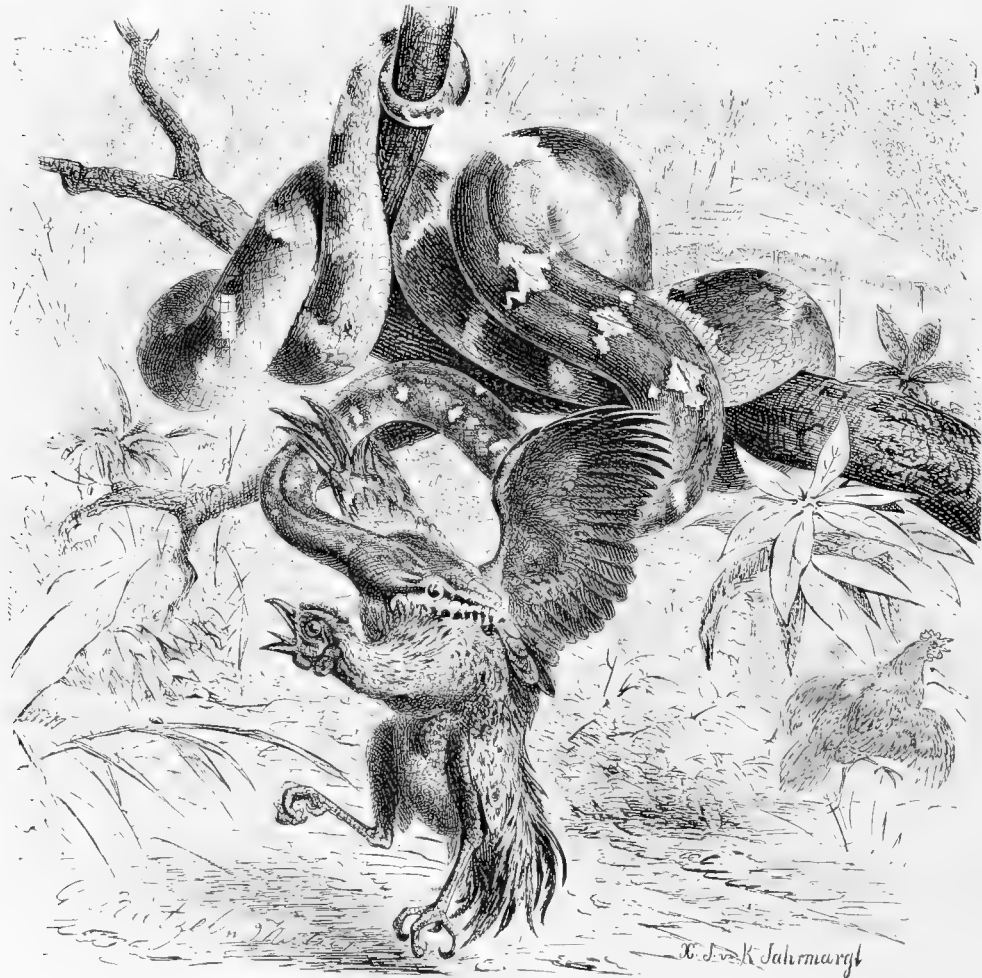
“Upon returning to the scene of the *coran*’s death, I found the Snake making off as fast as he could towards a clump of thick bush. Immediately starting after him, I headed him after a race of about sixty yards, when he turned and tried another direction. I failed in noosing him, and, finding that he would probably escape into the bush, I was compelled

to knock him on the head with a dead branch which happened to be near me. I believed him to have been killed outright; but on conducting a naturalist to the scene on the following morning the Snake had vanished, a fact which, combined with subsequent experience of the Snake nature, induces me to believe that he was merely stunned by the blow, and became refreshed during the cool of the evening, after which he retreated to his stronghold."

The color of the Natal Rock Snake is olive, variegated with yellow cross-bands and spots, edged with deep black. The head is marked with an arrow-headed spot, and a dark streak runs from the back of the eye. The under parts and the sides of the face are yellow.

There are several other species inhabiting Africa, resembling the preceding creature in general habits and appearance.

THE splendid RINGED BOA of America, sometimes called the ABOMA, has been celebrated for its destructive powers, and in ancient times was worshipped by the Mexicans and propitiated with human sacrifices. Naturally, the people of the country would feel disposed to awe in the presence of the mighty Snake whose prowess was so well known by many fatal experiences; and this disposition was fostered by the priests of the Serpent deity, who had



DOG-HEADED BOA.—*Xiphosoma caninum*.

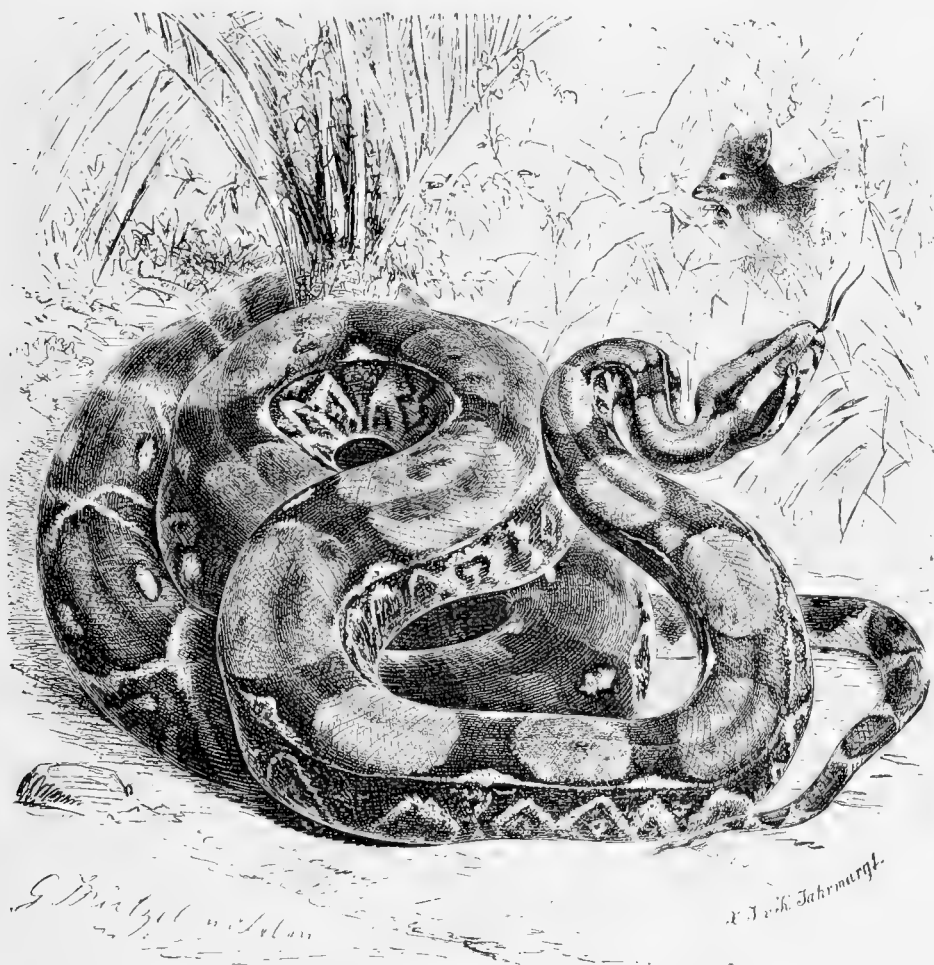
succeeded in taming several of these giant Snakes, and teaching them to glide over and around them, as if extending their protection to men endowed with such supernatural powers.

This Serpent destroys its prey, after the fashion of its family, merely by squeezing it to death between its folds. While thus engaged, the reptile does not coil itself spirally round the victim, but wraps fold over fold, to increase its power, just as we aid the grasping strength

of one hand by placing the other over it. It is said that the Snake can be removed from its prey by seizing it by the tail, and thus unwinding it. Moreover, a heavy blow on the tail, or cutting off a few feet of the extremity, is the best way of disabling the monster for the time.

This creature is rather variable in its coloring, the locality having probably some influence in this respect. Generally, it is rich chocolate-brown, with five dark streaks on the top and sides of the head, a series of large and rather narrow dark rings along the back, and two rows of dark spots on the sides. Sometimes a number of large spots are seen on the back, and white streaks on the sides. In all the members of this genus, the hinder limbs or "spurs" of the male are larger and stronger than in the female.

ANOTHER American species, the DOG-HEADED BOA, or BOJOBI (*Xiphosoma caninum*), is notable for the formidable armament of teeth which line the mouth, and the beautiful green color of its skin. As is the case with all the Boidæ, this species is only found in the hottest parts of the country, and is most plentiful in Brazil. It may be known from the other species, partly by its green color, partly by the deep pits on the plates that edge the lips, and partly by the regular ring of scales that surrounds the eye. This Snake is sometimes called the ARARAMBOYA.



BOIGUACU.—*Boa constrictor*.

WE now come to the BOIGUACU, or true BOA CONSTRICTOR, a title which is indifferently applied to all the family, and with some degree of appropriateness, inasmuch as they all kill their prey by pressure or constriction.

This magnificent reptile is a native of Southern and Tropical America, and is one of those Serpents that were formerly held sacred and worshipped with divine honors. It attains a

very large size, often exceeding twenty feet in length, and being said to reach thirty feet in some cases. It is worthy of mention, that, before swallowing their prey, the Boas do not cover it with saliva, as has been asserted. Indeed, the very narrow and slender-forked tongue of the Serpent is about the worst possible implement for such a purpose. A very large amount of this substance is certainly secreted by the reptile while in the act of swallowing, and is of great use in lubricating the prey, so as to aid it in its passage down the throat and into the body; but it is only poured upon the victim during the act of swallowing, and is not prepared and applied beforehand.

The dilating powers of the Boa are wonderful. The skin stretches to a degree which seems absolutely impossible; and the comparison between the diameter of the prey and that of the mouth through which it has to pass, and the throat down which it has to glide, is almost ludicrous in its apparent impracticability, and, unless proved by frequent experience, would seem more like the prelude to a juggler's trick than an event of every-day occurrence. To such an extent is the body dilatable, that the shape of the animal swallowed can often be traced through the skin, and the very fur is visible through the translucent eyes, as the dead victim passes through the jaws and down the throat.

There is a popular idea among the inhabitants of the country in which the Boa lives, that, if it attacks a man in a forest, he may possibly escape by slipping round a tree in such a manner that the Serpent may squeeze the trunk of the tree, mistaking it for the body of the man, and so burst itself asunder by the violence of its efforts. Whether any one has escaped by this rather transparent device is not mentioned.

The color of the Boa Constrictor is rich brown, and along its back runs a broad chain of large blackish spots of a somewhat hexagonal shape, and of pale white spots scooped at each end. These dark and pale spots are arranged alternately, and form a really pretty pattern; and, should the colors be faded, as is always the case when the skin has been renewed, the species may be recognized by the arrangement of the scales round the eyes, which are set in a circle, are thirty in number, and are separated from the scales of the lips by two rows of smaller scales.

AN equally celebrated Snake, the ANACONDA, is figured in the accompanying full-page illustration.

This gigantic serpent is a native of tropical America, where it is known under several names, La Culebra de Agua, or Water Serpent, and El Traga Venado, or Deer-Swallower, being the most familiar. The flesh of this Serpent, although firm and white, is seldom if ever eaten by the natives, although the flesh of Serpents is considered a delicacy by many nations. Within the body is a large amount of fat from which can be obtained a very considerable quantity of oil. This oil is thought to be a specific for many complaints, especially for rheumatism, strains, and bruises. Seven or eight gallons of fine oil can be extracted from one of these reptiles; but the process of draining off the oil is generally performed in so careless a manner, that half of the amount is usually wasted.

Sir R. Ker Porter has some curious remarks on the Anaconda: "This Serpent is not venomous nor known to injure men (at least not in this part of the New World); however, the natives stand in great fear of it, never bathing in waters where it is known to exist. Its common haunt, or rather domicile, is invariably near lakes, swamps and rivers; likewise close to wet ravines produced by inundations of the periodical rains; hence, from its aquatic habits, its first appellation (*i. e.* Water Serpent). Fish, and those animals which repair there to drink, are the objects of its prey. The creature lurks watchfully under cover of the water, and while the unsuspecting animal is drinking, suddenly makes a dart at the nose, and with a grip of its back-reclining double range of teeth, never fails to secure the terrified beast beyond the power of escape."

Compression is the only method employed by the Anaconda for killing its prey, and the pestilent breath which has been attributed to this reptile is wholly fabulous. Indeed, it is doubtful whether any Snake whatever possesses a fetid breath, and Mr. Waterton, who has handled Snakes, both poisonous and inoffensive, as much as most living persons, utterly



ANACONDA.

denies the existence of any perceptible odor in the Snake's breath. It is very possible that the pestilent and most horrible odor which can be emitted by many Snakes when they are irritated, may have been mistaken for the scent of the breath. This evil odor, however, is produced from a substance secreted in certain glands near the tail, and has no connection with the breath.

The color of the Anaconda is rich brown; two rows of large round black spots run along the back, and each side is decorated with a series of light golden yellow rings edged with deep black.

ONE or two members of this family are worthy of a passing notice. The well-known YELLOW SNAKE of Jamaica (*Chilabothrus inornatus*) is allied rather closely to the boa and the anaconda. It is a rather handsome reptile, being of an olive-green upon the head and front part of the body, covered with a multitude of little black lines, drawn obliquely across the body. The hinder part of the body is black, spotted with yellowish olive.

ANOTHER member of this family, the CORAL SNAKE (*Tortrix scytale*) is a well-known inhabitant of Tropical America, and is feared or petted by the natives, according to the locality in which it happens to reside. In some parts of the country, the native women, knowing it to be perfectly harmless, and being pleased with the bold contrast of black and pale gold which decorate its surface, are in the habit of taming it and of placing it round their necks in lieu of a necklace. In other parts of the country, however, the natives believe it to be terribly poisonous, and flee from its presence with terror.

It lives chiefly on insects, worms, and caterpillars, and is very timid. This creature does not taper so gradually from the middle of the body to the tail as is usual in most Serpents, but is nearly of the same cylindrical form throughout its length. The ground color of this Serpent is pale yellow, decorated with jetty-black rings, about sixty in number, that are drawn irregularly over its surface. The Coral Snake never grows to any great size, and seldom reaches two feet and a half in length.

COLUBRINÆ.

WE now come to another section of the Serpents, termed COLUBRINÆ, the members of which are known by the broad, band-like plates of the abdomen, the shielded head, the conical tail, and the teeth of both jaws. Some of them are harmless and unfurnished with fangs, whereas some are extremely venomous and are furnished with poison-fangs in the upper jaw. These, however, do not fold down like those of the viper and rattlesnake, but remain perfectly erect. The formation of the fangs again differs in the various species. In some the fang is grooved for the introduction of poison into the wound, whereas in others it is perforated nearly throughout its length.

As an example of the first family of these Serpents, we may take the common BROWN SNAKE of America (*Conocéphalus striatus*).

This reptile is quite harmless, and is plentiful in many portions of America, having rather a wide range of locality. Although common, it is not conspicuous, for its small dimensions, its sombre hue, and its retiring habits serve to conceal it from the general gaze. It is usually found hiding under the bark of trees, in stone heaps, or among the crevices of rocky ground, choosing those localities because it feeds principally on insect prey, and can find abundance of food in such places. Its color is grayish brown above and white below. It is a small species, rarely reaching eleven inches in length.

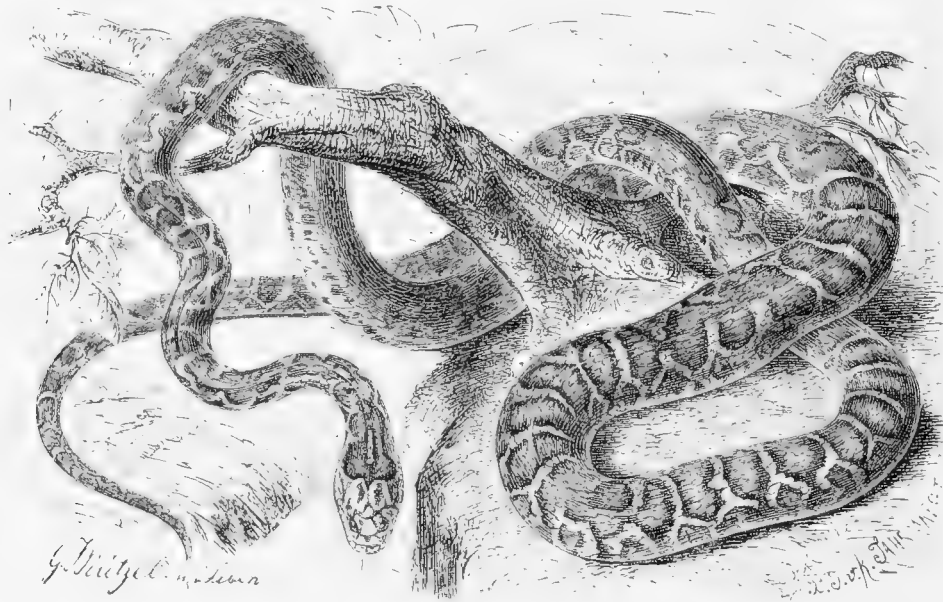
THE large family of the Coronellidæ contains many curious Serpents, among which may be mentioned the well-known SCHAAP-STICKER of Southern Africa.

This Snake has a rather wide range of country, being spread over nearly the whole of Southern Africa, and very common at the Cape of Good Hope. It is a handsome little

reptile, prettily marked, and brisk and lively in its movements, as is required for the purpose of catching the agile prey on which it feeds. The Schaap-sticker lives mostly on insects and small lizards, and darts upon them with great swiftness of movement. It is generally found crawling among heaps of dead leaves, or trailing its variegated form over grassy banks, where it finds the prey on which it subsists.

The color of this Serpent is extremely variable, and decidedly different in the old and young. In the young specimen, the spots that ornament the back are darker than in the adult, and there is generally a little wash of green over the surface. The general color of this Snake is brown, with a grayish or golden tint according to the individual. Along the back run several rows, usually three or four in number, of dusky spots, generally of a somewhat oval or rhombic form, and edged with deep black. In one specimen the spots have coalesced so as to form three continuous bands running along the body. The length of the Schaap-sticker is about two feet.

ANOTHER species belonging to this family is the *Coronella Austríaca*. It is rather remarkable, that where the Snake is tolerably common, the sand lizard (*Lacerta stirpium*) is



SCHAAP-STICKER.—*Psammophylax rhombceatus*. (One-half natural size.)

also generally found. In general appearance, this Snake is not unlike the viper, and is about the same size, attaining a length of two feet when adult. It may, however, easily be known from the viper, by the absence of the chain of dark lozenge-shaped marks upon the back, for which is substituted a double series of small dark spots, one row at each side of the spine. There is a dark patch upon the shoulder and head, and under the eyes runs a blackish streak. The body is generally brown, but the depth and tone of the ground color and the markings are extremely variable, but are almost always darker towards the head. Below, the color is light brown, often marbled with black. The neck is large, being scarcely smaller than the body.

THE BLACK SNAKE, OR ZWARTE SLANG (*Coronella cana*), of Southern Africa, belongs to the same genus.

This reptile is common throughout Southern Africa, but is not very often seen, on account of its timid habit of hiding itself in some crevice, except when in search of food, or when coiled up in repose enjoying the hot beams of the sun. When young, it frequents little hillocks covered with stones, but when it reaches adult age, it takes to the plains, preferring those that are of a sandy nature, interspersed with little shrubs. It is a shy reptile, and mostly runs away when alarmed. Sometimes, however, it will turn upon the pursuer, and if

grasped, will coil itself round the arm and squeeze so tightly, that the hand becomes numbed and unable to retain its hold.

Many Snakes are variable in their coloring, but the Black Snake is, perhaps, the most remarkable among them for this peculiarity. Usually, as its name imports, it is black, but sometimes it is bright chestnut. Many specimens are gray, mottled with black, while others are chestnut, marbled with deep rich brown. When full grown, it attains a length of seven feet.

THE common GRASS SNAKE, or RINGED SNAKE, is a good example of the *Natricidæ*.

It is extremely plentiful throughout Europe, being found in almost every wood, copse, or hedgerow, where it may be seen during the warm months of the year, sunning itself on the banks, or gently gliding along in search of prey, always, however, betraying itself to the initiated ear by a peculiar rustling among the herbage. Sometimes it may be witnessed while in the act of creeping up a perpendicular trunk or stem, a feat which it accomplishes, not by a spiral movement, as is generally represented by artists, but by pressing itself firmly against the object, so as to render its body flatter and wider, and crawling up by the movement of the large banded scales of the belly, the body being straight and rigid as a stick, and ascending in a manner that seems almost inexplicable.

The Ringed Snake is perfectly harmless, having no venomous fangs, and all its teeth being of so small a size that even if the creature were to snap at the hand, the skin would not be injured. Harmless though the Serpent be, it will occasionally assume so defiant an air, and put on so threatening an aspect, that it would terrify those who were not well acquainted with its habits. I have kept numbers of these Snakes, and have often known them, when irritated, draw back their heads and strike at the hand in true viperine fashion. Indeed, the venomous look of the attitude is so strong, that I never could resist the instinctive movement of withdrawing the hand when the Snake made its stroke, although I knew full well that no injury could ensue.

The food of the Ringed Snake consists mostly of insects and reptiles, frogs being the favorite prey. I have known Snakes to eat the common newt, and in such cases the victim was invariably swallowed head first, whereas the frog is eaten in just the opposite direction. Usually, the frog, when pursued by the Serpent, seems to lose all its energy, and instead of jumping away, as it would do if chased by a human being, crawls slowly like a toad, dragging itself painfully along as if paralyzed. The Snake, on coming up with its prey, stretches out its neck and quietly grasps one hind foot of the frog, which thenceforward delivers itself up to its destroyer an unresisting victim.

The whole process of swallowing a frog is very curious, as the creature is greatly wider than the mouth of the Snake, and in many cases, when the frog is very large and the Snake rather small, the neck of the Serpent is hardly as wide as a single hind leg of the frog, while the body is so utterly disproportioned, that its reception seems wholly impossible. Moreover, the Snake generally swallows one leg first, the other leg kicking freely in the air. However, the Serpent contrives to catch either the knee or the foot in its mouth during these convulsive struggles, and by slow degrees swallows both legs. The limbs seem to act as a kind of a wedge, making the body follow easily, and in half an hour or so the frog has disappeared from sight, but its exact position in the body of the Snake is accurately defined by the swollen abdomen. Should the frog be small, it is snapped up by the side and swallowed without more ado.

In captivity, this Snake will eat bread and milk, and insects of various kinds, such as the cockroach, meal-worm, or any beetle that may be found running about under stones and leaves. It always, however, prefers frogs to any other food, and seems to thrive best on such a diet.

The skin or slough of the Ringed Snake is often found in the hedgerows or on waste grounds, entangled among the grass stems and furze through which the creature had crawled with the intention of rubbing off the slough against such objects. In some countries the rejected slough is thought to be a specific against the headache, and is tied tightly round the forehead when employed for alleviating pain.

The Ringed Snake is fond of water, and is a good swimmer, sometimes diving with great ease and remaining below the surface for a considerable length of time, and sometimes swimming boldly for a distance that seems very great for a terrestrial creature to undertake. This reptile will even take to the sea.

I have often seen tame Snakes taken to an old deserted stone-quarry for a bath in the clear water which had collected there. Generally the Snake would swim quietly from one side to another, and might then be recaptured, but on sundry occasions it preferred diving to the very bottom, and there lay among the stones, heedless of all the pelting to which it was subjected, and impassive as if perfectly acquainted with the harmless nature of stones projected into water. Nothing would induce the Snake to move but a push with a stick, and as the water was rather deep and the quarry wide, a stick of sufficient length was not readily found. The motions of the Snake while in the water are peculiarly graceful, and the rapid progress is achieved by a beautifully serpentine movement of the body and tail.

This Snake is susceptible of kindness, and if properly treated, soon learns to know its owner, and to suffer him to handle it without displaying any mark of irritation. Though harmless and incapable of doing any hurt by its bite, the Snake is not without other



RINGED SNAKE, OR GRASS SNAKE.—*Tropidonotus natrix*.

means of defence, its surest weapon being a most abominable and penetrating odor, which it is capable of discharging when irritated, and which, like that of the skunk, adheres so closely to the skin or the clothes, that it can hardly be removed even by repeated washings. Moreover, it is of so penetrating a nature that it cannot be hidden under artificial essences, being obtrusively perceptible through the most powerful perfumes, and rather increasing than diminishing in offensiveness by the mixture. The reptile will, however, soon learn to distinguish those who behave kindly to it, and will suffer itself to be handled without ejecting this horrible odor.

The young of the Ringed Snake are hatched from eggs, which are laid in strings in some warm spot and left to be hatched by the heat of the weather or other natural means. Dung-hills are favorite localities for these eggs, as the heat evolved from the decaying vegetable matter is most useful in aiding their development, and it often happens that a female Snake obtains access into a hothouse and there deposits her eggs. Some persons say that the mother is sometimes known to remain near the eggs, and to coil herself round them as has already been related of the boa. The eggs are soft, as if made of parchment, and whitish.

They are found in chains containing fifteen or twenty, and are cemented together by a kind of glutinous substance.

During the winter the Snake retires to some sheltered spot, where it remains until the warm days of spring call it again to action. The localities which it chooses for its winter quarters are always in some well sheltered spot, generally under the gnarled roots of ancient trees, under heaps of dry brushwood, or deep crevices. In these places the Snakes will congregate in great numbers, more than a hundred having been taken from one hollow. A few years ago I saw a hole from which a great number of Ringed Snakes had been taken; it was situated in a bank, at some depth. The color of the Ringed Snake is grayish-green above and blue-black below, often mottled with deep black. Behind the head is a collar of golden yellow, often broken in the middle so as to look like two patches of yellow. Behind the yellow collar is another of black, sometimes broken in the middle also. Along the back run two rows of small dark spots, and a row of large, oblong spots is arranged down each side. Both the color and the shape of the spots are very variable.

The length of this reptile is generally about a yard, but it sometimes attains a length of four feet. The female is always larger than the male. The generic title *Tropidonotus* is formed from two Greek words signifying keel-backed, and is given to these Serpents because the scales of the back are keeled.

THE HOG-NOSE SNAKE is so called from the odd formation of the muzzle, which is rather blunt, and slightly turned up at the tip, something like the snout of a hog. It generally frequents moist and marshy localities, as the edges of rivers and ponds, where it finds a plentiful subsistence among the toads, frogs, lizards, and insects which swarm in such spots. It is an inhabitant of Northern America.

Although as harmless as our ringed Snake, and of similar dimensions, so that it need not be feared on account of its bodily strength, the Hog-nose Snake is rather feared by those who are not acquainted with its structure and habits. If it be irritated in any way, it assumes a most threatening attitude, coils itself like a rattlesnake, flattening its head after the fashion of venomous Serpents, utters a furious hiss, and strikes at the foe with the rapidity of lightning. Yet all this flourish of defiance is without the least foundation, and although it might serve to intimidate the ignorant, only raises the mirth of the better instructed. For the Serpent does not even open its mouth when it strikes, but darts its closed jaws at the foe, without even inflicting the trifling wounds which might be caused by its small but needle-like teeth. Even if pushed about with a stick, and handled in the roughest manner, it never bites, but contents itself with its impotent personation of the venomous Snakes.

Sometimes it tries other arts, and instead of stimulating envenomed rage, pretends to be dead and lies motionless, hoping to escape as soon as the enemy has gone away. So perfectly does it assume the semblance of death, suffering itself to be tossed about without displaying the least sign of life, the muscles relaxed and the body hanging loosely and heavily in the hand, that experienced naturalists have been repeatedly deceived, and only discovered the deception by seeing the reptile make its escape after they had left it lying apparently dead upon the ground.

The color of the Hog-nose Snake is rather variable, but is generally of a darker or lighter brown above, with a row of large blotches of a different shade of brown running along the sides. Sometimes these blotches are so large, that they unite across the back and form broad bands. There is a dark band between the eyes. The average length of this reptile is about three feet.

THE species called BLOWING VIPER (*Heterodon platyrhynchus*), and Buckwheat-nose, is a most vicious appearing reptile, yet wholly harmless. Its habit of inflating its head and throat renders it unusually forbidding. It is common in the Middle and New England States west of the Connecticut River. *H. simus* is common in the Western States. Five other species are known in North America.

THE sombre BLACK VIPER belongs to the same genus as the preceding species, and is very similar to that reptile in many of its habits. It is also an inhabitant of Northern America. Like the hog-nose Snake, it is much dreaded from its fierce aspect, but without the least reason. It is a very ugly and ungraceful-looking Snake, with a neck of great width, and a head very narrow in front and very wide behind, and is by no means a pleasing object to the eye. It does not frequent the marshy localities so constantly as the hog-nose, but prefers the more elevated and drier situations, having a great fondness for the pine-barren districts where the soil is dry and the fallen leaves afford it a shelter and a hunting-ground. It feeds mostly on little mammalia, certain reptiles and insects. Like the hog-nose Snake, it hisses and strikes with fangless jaws when irritated, and on account of its thick body, flat, wide head, and little glittering eyes, has so venomous an aspect, that it terrifies almost any antagonist for the moment, and then glides away before he has recovered from the instinctive shock to the nerves.

The color of the Black Viper is wholly black above, without any spots, though on the living Snake there are indications here and there of a deeper tint. The under parts are blackish-slate, and the throat takes a whiter hue. It is but a little Serpent, in spite of all its airs, being seldom more than twenty inches in length.

THE PINE SNAKE (*Pityophis melanoleucus*), called also Bull Snake, is found in the pine-barrens of New Jersey, and southwards in such localities to Georgia. Six other species of this genus are recorded as North American.

ALLEGHANY BLACK SNAKE (*Coluber obsoletus*). This was first discovered on a summit of the Blue Ridge Mountains, in Virginia. Specimens have since been found in the Highlands of the Hudson River. It resembles the common Black Snake, but has carinated scales, which readily distinguish it. It is credited with an exceedingly mild disposition, quite in contrast with the latter reptile.

Holbrook's specimen measured five feet three inches.

DeKay calls it the Racer, and Pilot Black Snake. Yet it surely cannot be the Racer that is so often referred to by observers, who report a long and large Black Snake, which runs along the tops of bushes, and well justifies the popular designation.

THE FOX SNAKE (*C. vulpinus*) inhabits from Massachusetts westward to Kansas and northward.

THE family of the Colubrinæ is represented in most parts of the world, North America possessing a large number of examples.

THE CORN-SNAKE of America may be reckoned among the most handsome of its tribe. This pretty reptile is extremely common in many parts of America, although it is not very frequently seen, owing to its dislike of daylight. As long as the sun is above the horizon, the Corn-Snake conceals itself in some hiding-place, and issues from its home as soon as the shades of evening begin to approach. It is fearless after its fashion, and has an instinctive liking for the habitations of mankind, haunting farms and houses, where it does considerable service by devouring rats and mice. Occasionally it takes toll in the form of a chicken, but its services most certainly outbalance its little perquisites. It will even enter houses, and can be tamed and made quite familiar. Sometimes it takes a fancy to frequent the roadside, and may be seen quietly coiled and at rest, or trailing its beautiful scales out of the reach of wheels or hoofs.

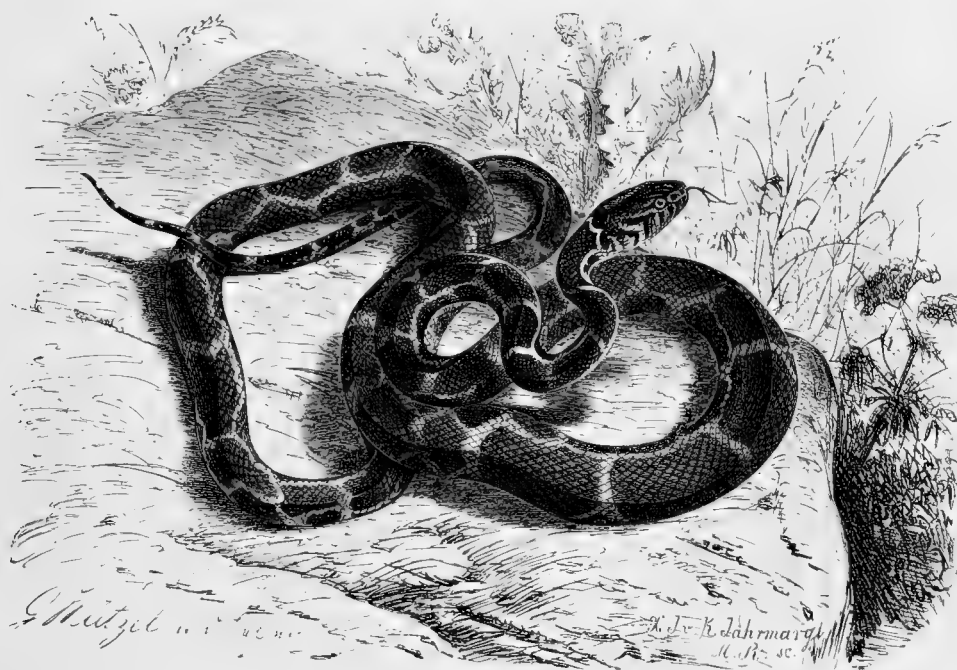
The colors of this Serpent are brilliant, and arranged in a bold and striking manner. The general color is rich chestnut-red, and along each side runs a series of large patches of a brighter, but deeper red, each patch being edged with jetty-black. There is also a row on each side of much smaller spots of an oval shape, just outside the larger row, and arranged alternately with them. These spots are golden-yellow, and are also edged with black. There are some similar spots on the head, and a streak is generally found over each temple. The under

parts are silvery white, boldly checkered with black. The length of the Corn-Snake varies from five to six feet.

The SPOTTED RACER is another name for the Corn-Snake of the South, its northern limit being the Carolinas.

ANOTHER example of this genus is the THUNDER SNAKE, so called from the threatening black and white of its body, which seems to have a lowering aspect, and to menace poison as the thunder-cloud augurs lightning. Sometimes it is known by the name of KING SNAKE, or CHAIN SNAKE, the latter title being given because the black and white markings of the body are arranged alternately in a chain-like fashion.

The Thunder Snake is mostly found in moist and shady places, where it feeds upon small quadrupeds, reptiles, and birds if it can catch them. The portentous aspect of this Snake is fully carried out by its character, which is fierce, quarrelsome, and aggressive to a degree



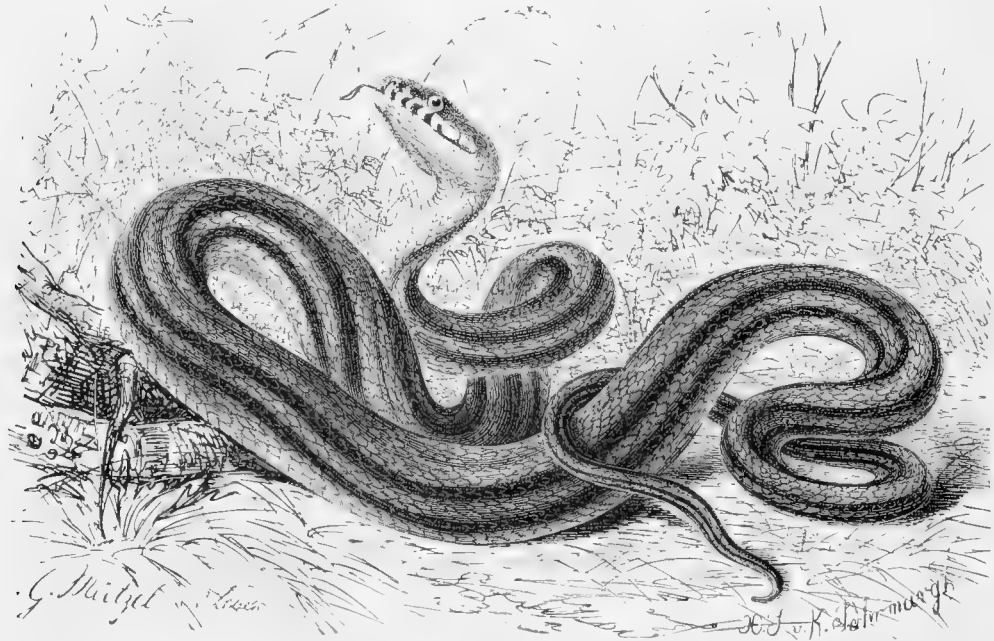
THUNDER SNAKE - *Ophibolus getulus*.

seldom found even in poisonous Serpents, and in a fangless Snake not at all to be expected. If put in a box with other Serpents, it always quarrels and fights with them; and in one instance, when a Thunder Snake had been introduced into a cage where a miliary rattlesnake was residing, it attacked the venomous reptile in spite of its poisonous weapons, overpowered, killed, and ate it. Some persons think that a deadly feud always rages between the Thunder Snake and rattlesnake, but the truth of this supposition is somewhat dubious. In the instance just mentioned, the creature would probably have treated a Serpent of any species in precisely the same manner.

The Thunder Snake is colored after a very peculiar fashion. All along the body run alternate bands of jetty-black and pure white, the black being very broad and the white very narrow, and not reaching completely across the body. The head is also mottled and scribbled with black upon white after a curious and most complicated fashion. The full length of this Serpent is about four feet.

THE SCARLET KING SNAKE (*Ophibolus doliatus*) inhabits Florida, and extends northward only as far as North Carolina. Its length is three feet six inches. Five other varieties of this genus are recorded as North American, found in the Southwestern States.

The CHICKEN SNAKE (*Coluber quadrivittatus*) derives its name from its habit of entering farms and houses and stealing chickens from the roost. As, however, it feeds largely on rats and mice, its services in this respect may in all probability counter-balance the loss caused by its thefts. Like the corn-Snake, it is soon tamed, and will become very familiar. In color it is a very delicate looking reptile, being of a soft bright golden-brown, and having four narrow stripes upon a rich dark brown running the whole length of the body. In length it is usually about four feet six inches, though a few specimens attain the length of six and even seven feet. This is also a Northern American reptile.



CHICKEN SNAKE.—*Coluber quadrivittatus*.

SAY'S SNAKE is a most attractive creature, having a bluish-black body, with round milk-white spots, thickly bespattered over the entire upper surface. It measures from three to four feet in length.

Its *habitat* is throughout the Gulf States.

THE MILK SNAKE, or HOUSE SNAKE (*Ophibolus triangulus*), is common in many parts of North America, and has derived its popular names from its habit of entering houses and its fondness for milk, which some persons fancy it obtains from the cows. Its general food consists of mice and insects, and, like the preceding species, it is probably of some use to the farm where it takes up its residence, and worthy of the encouragement which it sometimes receives.

In the general arrangement of the markings, it is not unlike the corn-Snake, with which it has often been confounded, especially after the fresh beauty of its colors has been dimmed by death, or extracted and changed by spirits. There are similar rows of patches along the sides, but in this species the spots are much broader, often coalescing over the back and forming bands, and the general hue of the body is a beautiful blue tinge. The under parts are silver-white, boldly tessellated with oblong and sharply defined marks of black.

The length of the Milk Snake is generally about four feet. It inhabits as far north as Maine. In Massachusetts it is called Checkered Adder; in New York it is Sachem Snake and Sand King, and Spotted Adder. In Arkansas and Georgia two species are found, respectively.

KENNICOTT'S CHAIN SNAKE (*Ophibolus calligaster*) is a species found from Illinois to Kansas.

THE INDIGO SNAKE (*Spilotes couperi*), called also Gopher Snake, is a dark indigo-blue in color, much resembling the Black Snake in the bluish-black color. It is stouter in body, and from that fact and a fancied courageousness, the negroes regard it as an enemy and victor of the rattlesnake. Its habit of frequenting the holes of the Gopher suggests the local name.

Species belonging to the genus *Coluber* are found in Australia, India, Japan, China, and Europe, the latter (*Coluber asculapii*) being the Serpent which is represented by the ancients as twined round the staff of Æsculapius and the caduceus of Mercury.

THE BLACK SNAKE of America (*Bascanium constrictor*) is perhaps the best known of the numerous Serpents, which, happening to be black or dark brown, have been called by the same title.

This Snake is common in Northern America, where it is sometimes known under the name of RACER, on account of its great speed. It is a perfectly harmless, but highly irascible reptile, especially during the breeding-season, when it seems to become endowed with an unreasoning ferocity, which, happily for the world, is seldom found in reptiles better provided with offensive weapons. It has a curious habit of rustling its tail among the herbage in such a manner as to resemble the whirr of the dreaded rattlesnake, and then darts at the object of its rage and inflicts a tolerably severe bite, thereby inducing great terror on the part of the sufferer, who, in the hurry of the moment, naturally believes that he has been bitten by the rattlesnake itself.

It is fond of climbing trees in search of young birds, eggs, and similar dainties, and even in that position, is of so tetchy a disposition, that when irritated, it will descend in order to attack its foe. Even if confined with other Snakes, it becomes quarrelsome, fights with them, and if possible will kill them.

The haunts of the Black Snake are usually to be found along the edges of streams and ponds or lakes, and the reptile is mostly to be seen in shady spots, well sheltered by brushwood. Sometimes, however, it goes farther a-field, and wanders over the free country, traverses rocky soil, or glides along the roadside.

The Black Snake is a most useful reptile, being very fond of rats, and able from its great agility to climb over walls or buildings in search of its prey, and to insinuate its black length into their holes.



COLUBER.—*Coluber asculapii*.

It also feeds much on birds, especially when they are young, and is consequently an object of detestation to the feathered tribes. It often happens that the locality of the Black Snake is indicated by the proceedings of the little birds, which collect above their hated enemy, scold with harsh cries, flutter their wings noisily, and by dint of continual annoyance will often drive the reptile away from the locality. It has been thought that this Serpent was in the habit of killing its prey by pressure, after the fashion of the boas, but this statement has not been satisfactorily confirmed.

The color of this Snake is blue-black above, and ashen slate below, becoming rather whiter upon the throat. In some specimens a number of spots are observed upon the back of a deeper and duller hue than the general tint. In length the Black Snake generally reaches from five to six feet.

This familiar Serpent of our country-side is the *beau ideal* of its race; expressing the most slender and graceful form, with an extreme length of body. The tail is prolonged gradually to a mere point, and becomes highly prehensile. The head is graceful, and the steel-bluish, uniform color, with the beautifully tessellated arrangement of scales, all tend to render the creature attractive in spite of its being a Snake, usually the embodiment of the unsightly. Add to this, the Black Snake is the most active of its order; and even the most powerful.

This is widely distributed over the United States. A species found in California is dedicated to General Fremont. It has a stouter body and a larger head than the preceding. Nine other species will be found enumerated in the catalogue at the end of this volume.

BEAD SNAKE (*Elaps fulvius*). Inhabits Virginia and southward to Alabama. It is also called Harlequin, from its curiously marked body. Though possessing poison-fangs, it is very gentle and mild in disposition. It is jet-black, with seventeen broad crimson rings, each bordered with yellow. Two other species are recorded, *E. tenere*, and *E. tristis*, of Texas.

RIBBON SNAKE (*Eutania saurita*). Called also Swift Garter Snake. The markings are slender and ribbon-like. Inhabits east of the Alleghanies and southward to Georgia.

FAIRIES GARTER SNAKE (*E. faireyi*). Inhabits the Mississippi valley, and northward to Michigan. SAY'S GARTER SNAKE has the same *habitat*. HAY'S GARTER SNAKE inhabits from Lake Michigan, westward to Oregon.

COMMON GARTER SNAKE (*E. sirtalis*), is the familiar striped Snake of eastern New England, and is our most common species. Several varieties are known. Ten other species are also enumerated as inhabiting the United States.

WATER ADDER (*Tropidonotus sipedon*). This is an exceedingly common aquatic Snake, indigenous to the Eastern United States.

A variety, called the RED-BELLIED WATER SNAKE, is common in Michigan. Twelve distinct species are known as North American.

THE small, but interesting family of the Dryadidæ contains a number of Serpents remarkable for the slender elegance of their form, the delicate beauty of their coloring, and the singular swiftness of their movements.

The well-known COACH-WHIP SNAKE, of North America, is a useful example of this family.

This remarkable reptile has not earned its popular name without good reason, for the resemblance between one of these Serpents and a leather whip-thong is almost incredibly close.

The creature is very long in proportion to its width, the neck and head are very small,

the body gradually swells towards the middle and then as gradually diminishes to the tail, which ends in a small point. The large smooth scales are arranged in such a manner that they just resemble the plaited leather of the whip, and the polished brown-black of the surface is exactly like that of a well-worn thong.

The movements of this Snake are wonderfully quick, and when chasing its prey, it seems to fly over the ground. The mode of attack is very remarkable. Seizing the doomed creature in its mouth, it leaps forward, flings itself over the victim, envelops it with coil upon coil of its lithe body, so as to entangle the limbs and bind them to the body, and, in fact, makes itself into a living lasso. One of these Snakes was seen engaged in battle with a hawk, and would apparently have conquered in the seemingly unequal combat had not the foes been separated. It had grasped the hawk by one wing, had dragged it to the ground, and had succeeded in disabling the terrible claws from striking, when the sudden approach of the narrator alarmed the Snake, which released its hold, darted into the bushes, and permitted the rescued hawk to fly away in peace.

The color of this Serpent is rather variable. Generally it is shining black above and lighter beneath, with splashes of purple-brown. Sometimes, however, it is cream or clay-colored, and occasionally has been seen almost white. But, whatever color may be the body, the portion near the head is always raven-black. The length of this Snake is about five or six feet.

The Coach-Whip Snake (*Bascanium flagelliforme*) is a rare species, inhabiting the Gulf States. As its name suggests, the body is long, slender, and graceful; and it is a rapid runner.

Other species are from Texas, from the great Salt Lake, and from California. A genus, *Salvadora*, has a species found in Mexico.

ANOTHER very slender Snake, also a native of America, is closely allied to the preceding species. This is the GREEN SNAKE, well known for its grass-green color and its singular activity.

The Green Snake is fond of climbing trees, traversing the boughs in search of food with marvellous celerity, and darting at its insect prey through considerable distances. So slender is this Serpent, that a specimen which measures three feet in length, will barely reach one-third of an inch in thickness at its widest part. Partly owing to this extreme delicacy of form, and partly on account of the leaf-green color of its body, the Green Snake is not easily seen among the foliage, and in many cases would be undiscovered but for its rapid and energetic movements. The food of this Snake consists mostly of insects. It is very readily



COACH-WHIP SNAKE.—*Bascanium flagelliforme*.

tamed, and many persons are fond of carrying the beautiful creature about them, tying it round their throats as a necklace, or as a bracelet on the wrist. The eye corresponds in beauty to the rest of the person, being very large and of a beautiful topaz-yellow.

The color of the Green Snake is delicate grass-green above, and silvery-white below. Its average length is about three feet. Its shape is much like the Black Snake, but it is smaller.

Its *habitat* is in the Southern States.

Another species is found in Texas and Arkansas.

THE COMMON GREEN SNAKE, called also Grass Snake, in the Northern States, inhabits from Massachusetts to Pennsylvania.

Contia, a genus of Baird and Giraud, has three species, *C. mitis*, of California.

THE RING-NECKED SNAKE (*Diadophis punctatus*), called also the Little Black and Red Snake, inhabits from Maine to Florida. Another species, *D. amabilis*, inhabits California; *D. docilis*, Texas; *D. pulchellus*, California; *D. regalis*, Mexico.

Lodia is a genus of Baird and Giraud. *L. tenuis* is the species found in Puget Sound region.

Sonora is a genus of same authorities; species *semi-annalata*, found in Mexico.

THE SCARLET SNAKE (*Cemophora coccinea*) inhabits the Gulf States. It is an exceedingly handsome reptile; richly colored.

Rhinochilus lecontei is a form discovered by Lecont in San Diego, California.

THE BROWN SNAKE (*Haldea striatula*) inhabits from Virginia to the Gulf States.

THE HORN SNAKE (*Furancia abacura*), called also Red-bellied Snake, inhabits the Gulf States. Two other allied genera, *Abaster* and *Virginia*, with one species each, are known in the Southern States.

THE WORM SNAKE, called also GROUND SNAKE (*Carphophiops amœnus*), inhabits from Pennsylvania to Gulf States.

The genus *Tantilla* embraces two species, each of the Southern States.

THE small BROWN SNAKE (*Storeria dekayi*) found rather common from New York State to the Gulf States. It is a small gray form, with minute spots of black along its upper parts.

Another species is STORER'S SNAKE (*S. occipito maculata*).

A FAMILY of North American Reptiles named *Boidæ*, is characterized by the individuals having rudimentary hinder limbs, or spur-like appendages, situated near the anus. The LEAD-COLORED WENONA (*Charina plumbea*) inhabits Puget Sound. *C. bottæ* is another species, found in the same region.

BRAZIL possesses a most lovely example of these Serpents, the EMERALD WHIP SNAKE (*Philodryas viridissimus*).

Dr. Wucherer, of Bahia, writes as follows concerning this pretty species in a letter quoted by Sir J. E. Tennent, in his "Natural History of Ceylon": "I am always delighted when I find that another tree-Snake has settled in my garden. You look for a bird's nest: the young ones have gone, but you find their bed occupied by one of these beautiful creatures, which will coil up its body of two foot in length within a space not larger than the hollow of your hand.

"They appear to be always watchful, for at the instant you discover one, the quick playing of the long, black, forked tongue, will show you that you, too, are observed. On

perceiving the slightest sign of your intention to disturb it, the Snake will dart upwards through the branches and over the leaves, which scarcely seem to bend beneath the weight. A moment more, and you have lost sight of it. Whenever I return to Europe, you may be sure that in my hothouse these harmless lovely creatures shall not be missing."

The green color of this species is paler than above.

THE GRAY SNAKE of Jamaica (*Drómicus ater*) is another instance of this family. It is often called the BLACK SNAKE, but as that title has already been employed, it is better to use the popular name which is first mentioned.

This reptile is extremely plentiful in Jamaica, where it is mostly found haunting heaps of dead leaves, rocks and buildings. It is especially fond of the crevices found in old walls, and will lie for hours with its head and neck hanging out of some cranny partially awaiting the approach of any miserable lizard which may come within reach while searching after flies. It is rather a savage ophidian, darting fiercely at its adversary if irritated, and inflicting a wound which, though not dangerous, is very unpleasant, and causes the limb to swell and ache for some time. It is said, that if it is attacked by a dog, it strikes at the eyes, and can blind the poor creature. While preparing to strike, it dilates its neck, and flattens its head, so as to look as like a venomous Serpent as its limited means will permit.

The color of the Gray Snake is exceedingly variable. Mostly, it is uniformly black, with a tinge of brown; but it often happens, that the former tint is subservient to the latter, and in many cases the color is gray, sometimes of a uniform tint, and sometimes variegated with large dark spots. The length of this Snake is rather more than three feet.

THE little family of the Dasypeltidæ possesses but one genus, but is remarkable for the formation of the teeth and their use. The teeth of the jaws are very minute and scanty, being at the most only six or seven in number; but some sharp and strong processes issue from the hinder vertebræ of the neck, through holes in the membranes, and form a series of tooth-like projections in the gullet.

The most familiar example of this family is the ROUGH ANODON, of Southern Africa. The name Anodon is of Greek origin, and signifies toothless. This reptile lives almost wholly upon eggs, which it eats after a curious fashion. When it finds a nest, it takes the eggs into its mouth, where they lie unharmed, on account of the absence of teeth, so that the shell is not broken, and the liquid contents are preserved. When, however, the reptile swallows the egg, it passes into the throat, and meets the saw-like row of vertebral teeth which have just been mentioned. In its passage, the shell is cut open by these teeth, and the muscular contraction of the gullet then crushes the eggs, and enables the contents to flow down the Snake's throat. These bony processes are tipped with enamel like real teeth.

The color of this remarkable Serpent is brown, with a row of black marks along the back, sometimes coalescing into a continuous chain, a series of smaller spots upon each side, and some arrow-head marks upon the head of a jetty-black.

THE next family is composed of the Tree-Serpents, or Dendrophidæ, so called from the habit of residing among the branches of trees.

Our first example of this family is the well-known BOOMSLANGE, of Southern Africa. In pronouncing this word, which is of Dutch or German origin, and signifies Tree-Snake, the reader must remember that it is a word of three syllables. The Boomslange is a native of Southern Africa, and is among the most variable of Serpents in coloring, being green, olive, or brown; of such different colors, that it has often been separated into several distinct species.

Dr. A. Smith has given the following valuable description of the Boomslange and its habits:—

"The natives of South Africa regard the Boomslange as poisonous; but in their opinion we cannot concur, as we have not been able to discover the existence of any gland manifestly

organized for the secretion of poison. The fangs are inclosed in a soft, pulpy sheath, the inner surface of which is commonly coated with a thin, glairy secretion. This secretion possibly may have something acrid and irritating in its quality, which may, when it enters a wound, occasion pain and swelling, but nothing of greater importance.

“The Boomslange is generally found on trees, to which it resorts for the purpose of catching birds, upon which it delights to feed. The presence of a specimen in a tree is generally soon discovered by the birds of the neighborhood, who collect around it, and fly to and fro, uttering the most piercing cries, until some one, more terror-struck than the rest, actually scans its lips, and, almost without resistance, becomes a meal for its enemy. During such a



BOOMSLANGE.—*Buccephalus capensis*.

proceeding, the Snake is generally observed with its head raised about ten or twelve inches above the branch, round which its body and tail are entwined, with its mouth open and its neck inflated as if anxiously endeavoring to increase the terror which, it would almost appear it was aware, would sooner or later bring within its grasp some one of the feathered group.

“Whatever may be said in ridicule of fascination, it is nevertheless true, that birds, and even quadrupeds also, are, under certain circumstances, unable to retire from the presence of certain of their enemies; and what is even more extraordinary, unable to resist the propensity to advance from a situation of actual safety into one of the most imminent danger. This I have often seen exemplified in the case of birds and Snakes; and I have heard of instances equally curious, in which antelopes and other quadrupeds have been so bewildered by the sudden appearance of crocodiles, and by the grimaces and contortions they practised, as to be unable to fly or even move from the spot towards which they were approaching to seize them.”

THE beautiful BOIGA, sometimes called the AHLETULLA, also belongs to the family of Tree-Serpents. This pretty and graceful creature inhabits Borneo, and, on account of the extreme gentleness of its disposition and the ease with which it is tamed the children are in the habit of considering it as a kind of living toy, and allow it to twine around their bodies, or carry it about in their little hands, without the least alarm. It is a most active Serpent,

living in trees, and darting its lithe form from branch to branch with arrow-like celerity, leaping, as it were, from the coiled folds in which it prepares itself for the spring, and passing through the boughs as if shot from a bow, its glittering scales flashing an emerald or sapphirine radiance, as it glances through the sunbeams.

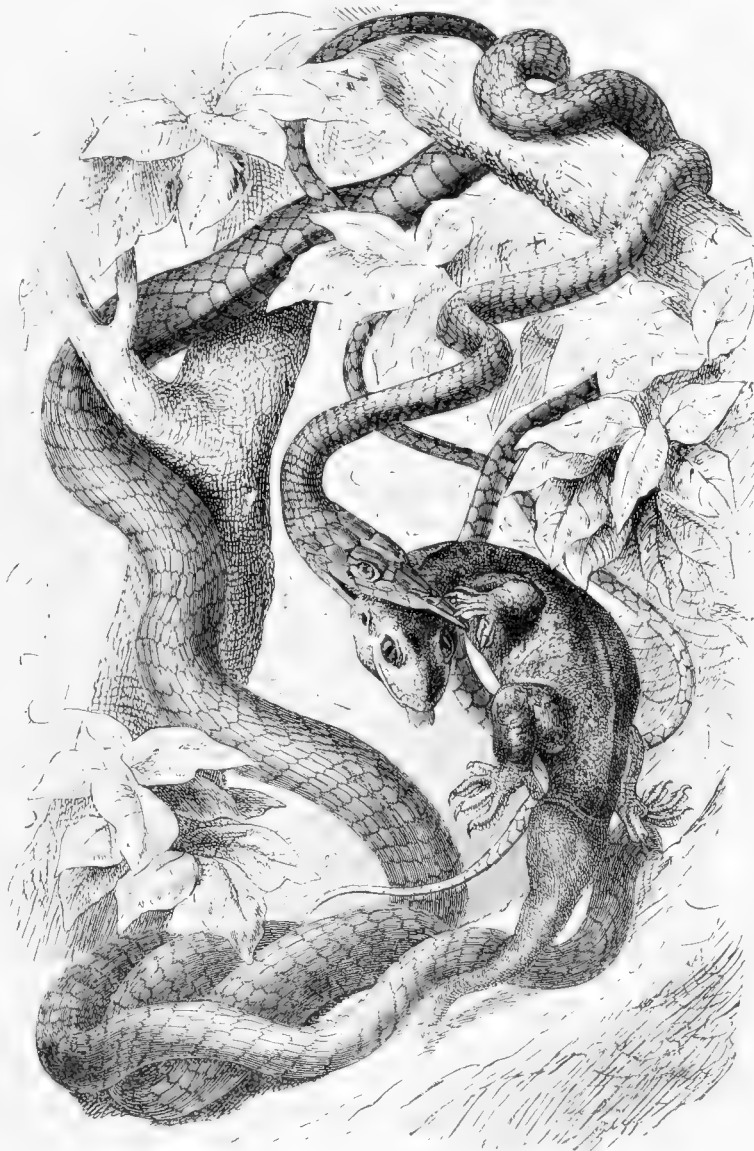
The head of the Boiga is long and slender, as beseems the delicate body; the eye is very full and round, and the gape very wide. The upper part of its body is rich, shining blue, shot with sparkling green; and three bright, golden stripes run along the body, one traversing the spinal line, and another passing along each side. Behind each eye is a bold jetty-black streak, and immediately below the black line runs a stripe of pure white.

The specific name ought properly to be spelled *leiocercus*. It is of Greek origin, and signifies smooth-tail, in allusion to the smooth-surfaced scales of the back and tail.

THE family of the Wood-Snakes, or Dryiophidæ, as they are learnedly called, contains some interesting and rather curious reptiles.

The GOLDEN TREE-SNAKE, which is a native of Mexico, is a most lovely species, and of a most singular length, looking more like the thong of a "gig whip" than a living reptile. It lives in trees, and in many respects resembles the preceding species. It is not so gorgeously decorated as the boiga, but its colors are beautifully soft and delicate. The general tint of this Serpent is gray, tinged with yellow, and having a golden reflection in certain lights, and being decidedly iridescent in others. The body is profusely covered with minute dottings of black.

THE accompanying illustration represents the LANGAHA, one of the Serpents of Madagascar, remarkable for the singular appendage to the head. The muzzle is extremely elongated, and is furnished with a fleshy projection, about one-third as long as the head, and covered with small scales. There is another species, the COCK'S-COMB LANGAHA (*Langaha crista-galli*), also a native of Madagascar, which is known from the ordinary species by the form of the appendage, which is toothed something like the comb upon a cock's head. The color of the Langaha is reddish-brown.



LANGAHA.--*Langaha nasuta*. (Two-thirds natural size.)

A VERY beautiful example of the Wood-Snakes is found in Ceylon. This is the BROWN WOOD-SNAKE (*Passerita mycterizans*). Like the langaha, the snout of this Serpent is

furnished with an appendage, which is pointed, and covered with scales, and is about one-fourth as long as the head. This appendage is conspicuous, but its use is not very plain. It lives almost wholly in trees, and is nocturnal in its habits, traversing the boughs at night for the purpose of catching the small birds as they sleep, taking their young out of the nest, and preying upon the lizards and geckos which also prowl about the trees by night in search of their insect food. There are two varieties of this beautiful Serpent, one being bright green above, with a yellow stripe down each side, and paler below; while the other is brown, glossed with purple, and without the yellow stripe. This variety is rare. The length of these Snakes rarely exceeds three feet.

THE DIPSAS and its congeners may be known from the preceding Snakes, which they much resemble in general form, by the large size of the head compared with the extremely delicate and slender neck. The body, too, is much wider in the centre, causing the neck and tail to appear disproportionately small. This Snake is a native of many parts of Asia, and is found in the Philippines. The name Dipsas is derived from a Greek word, signifying thirst, and is given to this Snake because the ancients believed that it was eternally drinking water and eternally thirsty; and that, to allay in some degree the raging drought, it lay coiled in the scanty springs that rendered the deserts passable. As they considered almost all Serpents to be venomous, and, according to the custom of human nature, feared most the creatures of which they knew least, they fancied that the waters were poisoned by the presence of this dreaded Snake. Lucan, in the Pharsalia, alludes to this idea:—

“ And now with fiercer heat the desert glows,
And mid-day gleamings aggravate their woes;
When lo! a spring amid the sandy plain
Shows its clear mouth to cheer the fainting train.
But round the guarded brink, in thick array
Dire aspics rolled their congregated way,
And thirsting in the midst the horrid Dipsas lay.
Blank horror seized their veins, and at the view,
Back from the fount the troops recoiling flew.”

The ancient writers also averred that the bite of the Dipsas inoculated the sufferer with its own insatiate thirst, so that the victim either died miserably from drought, or killed himself by continually drinking water.

The colors of the Dipsas are not brilliant, but are soft and pleasing. The general tint is gray, banded with brown of different shades, sometimes deepening into black. The top of the head is variegated with brown, and a dark streak runs from the eye to the corner of the mouth.

THE BANDED BUNGARUS is a native of India, where, from its habits, it is sometimes called the Rock Serpent. The name Bungarus is a most barbarous Latinization of the native word Bungarum-Pamma, which, though not euphonious, has at all events the advantage of being indigenous, and might have been spared the further distortion of being wrested into a sham classical form. In this reptile the head is rather flat and short, and the muzzle is rounded. The upper jaws are furnished with grooved fangs.

The color of the Banded Bungarus is very variable, but always consists of some light hue, relieved by bands or rings of jetty-black along its length.

AN allied species, the SERPENT-EATING HAMADRYAS (*Hamadryas elaps*), is noted for the peculiarity from which it derives its name. It feeds almost wholly on reptiles, devouring the lizards that inhabit the same country, and also living largely on Snakes. Dr. Cantor says of this Serpent that it cannot bear starvation nearly so well as most reptiles, requiring to be fed at least once a month. “Two specimens in my possession were regularly fed by giving them a Serpent, no matter whether venomous or not, every fortnight. As soon as this food is brought near, the Serpent begins to hiss loudly, and expanding its hood, rises two or three

Animate Creation.

"Tafeln" of Brehm's Thierleben.

in any work. I find it superfluous to enter here into particulars, as I already, in the 'Descent of Man, Brehm's book, and how highly I esteem it,' publishing them. They are certainly very admirable. Reliable opinions already given by distinguished zoologists as to the high character of the illustrations

WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston, who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet, etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield, and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities.

Our endeavor has been to find an author whose work would be noted for its fund of anecdote and rather than for merely anatomical and scientific presentation, and we arrived at the conclusion we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work most popularly approved by speakers of the English language. It would be superfluous to

concerning the standard character of his book, from the pages of which old and young of the Atlantic have obtained so much instruction and rational amusement. Avoiding dissertations and minute classifications of specialists, he presents to his readers in complete treatise on the Animal Kingdom of all climes and countries. The one

be urged against it was, that animal life in America might be treated more fully given more consideration. In order to obviate this drawback and to do full of our own country, we secured the aid of Dr. J. B. HOLDER, of the American History in New York, an undoubted American authority, who has adapted

unwants and given prominence to American forms of Animal life. on Rodentia, by Allen, Coues, and others, will be fully consulted. The American Birds, by Baird, Brewer, and Ridgway, will be the guide in the

ute arrangement of the classification and nomenclature of North American and the Committee on that subject of the Ornithologists' Union, will be arrangement of Mammals will be after the latest classification by Professor Society of London. So that this will be the first popular Natural History

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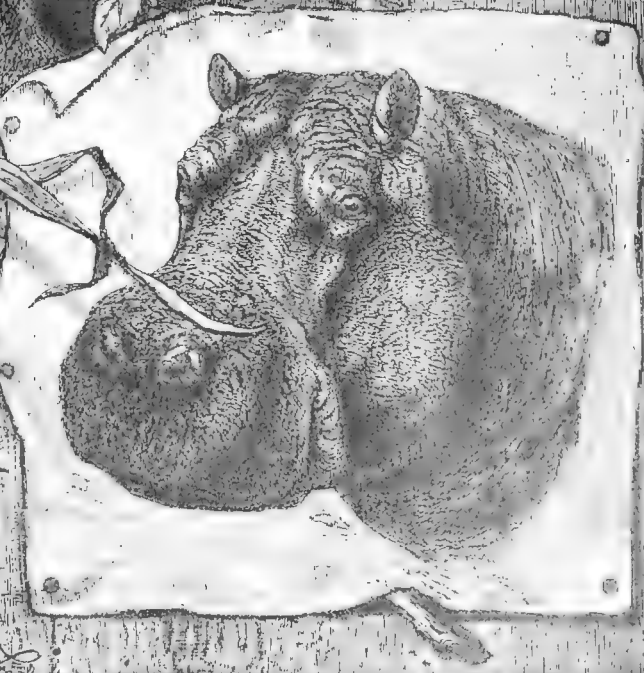
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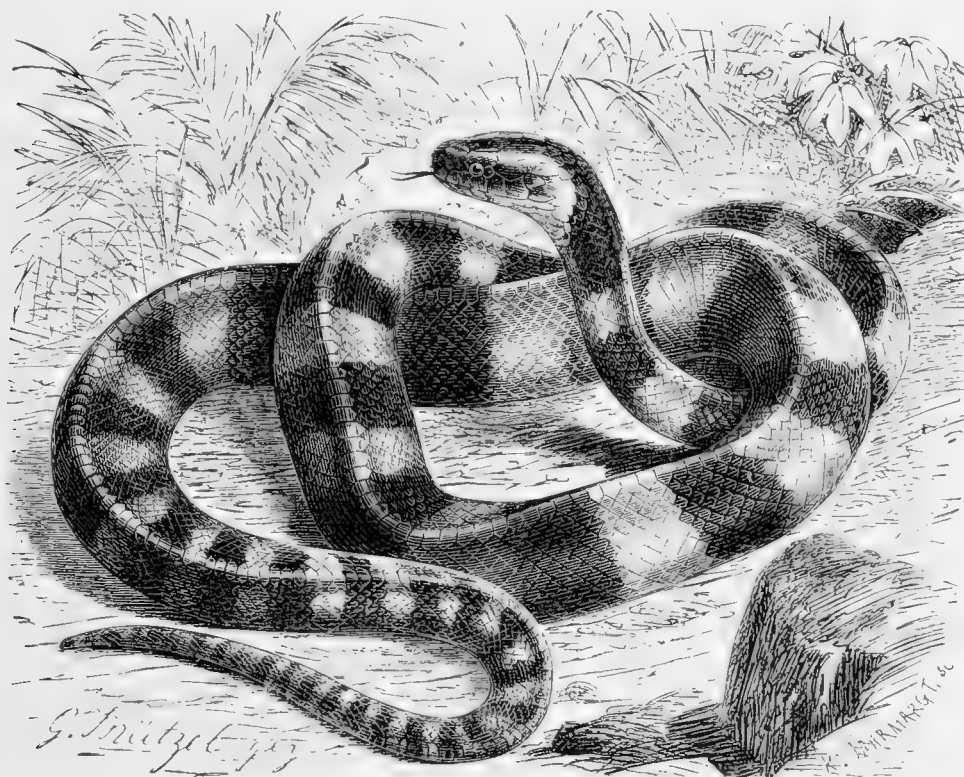
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feet, and retaining this attitude, as if to take a sure aim, watching the movements of the prey, darts upon it in the same manner as the *naja tripudians* (*i. e.* the cobra) does. When the victim is killed by poison, and by degrees swallowed, the act is followed by a lethargic state, lasting for about twelve hours.

The Hamadryas is fond of water, will drink, and likes to pass the tongue rapidly through water as if to moisten that member. It is a fierce and dangerous reptile, not only resisting when attacked, but even pursuing the foe should he retreat, a proceeding contrary to the general rule among Serpents. The poison of this creature is virulent and active, a fowl dying in fourteen minutes, and a dog in less than three hours, after receiving the fatal bite, although the experiments were made in the cold season, when the poison of venomous Snakes is always rather inactive. The poisonous secretion reddens litmus paper very slightly, and, as is the case with most Serpent poisons, loses its efficacy by being exposed to the air. The native name of the Hamadryas is Sunkr Choar.



BANDED BUNGARUS.—*Bungarus fasciatus*.

The color of this Snake is generally of an olive hue, auburn and pale below, but there is a variety marked with cross-bands of white. It is a large species, varying from four to six feet in length, while some specimens are said to reach ten feet.

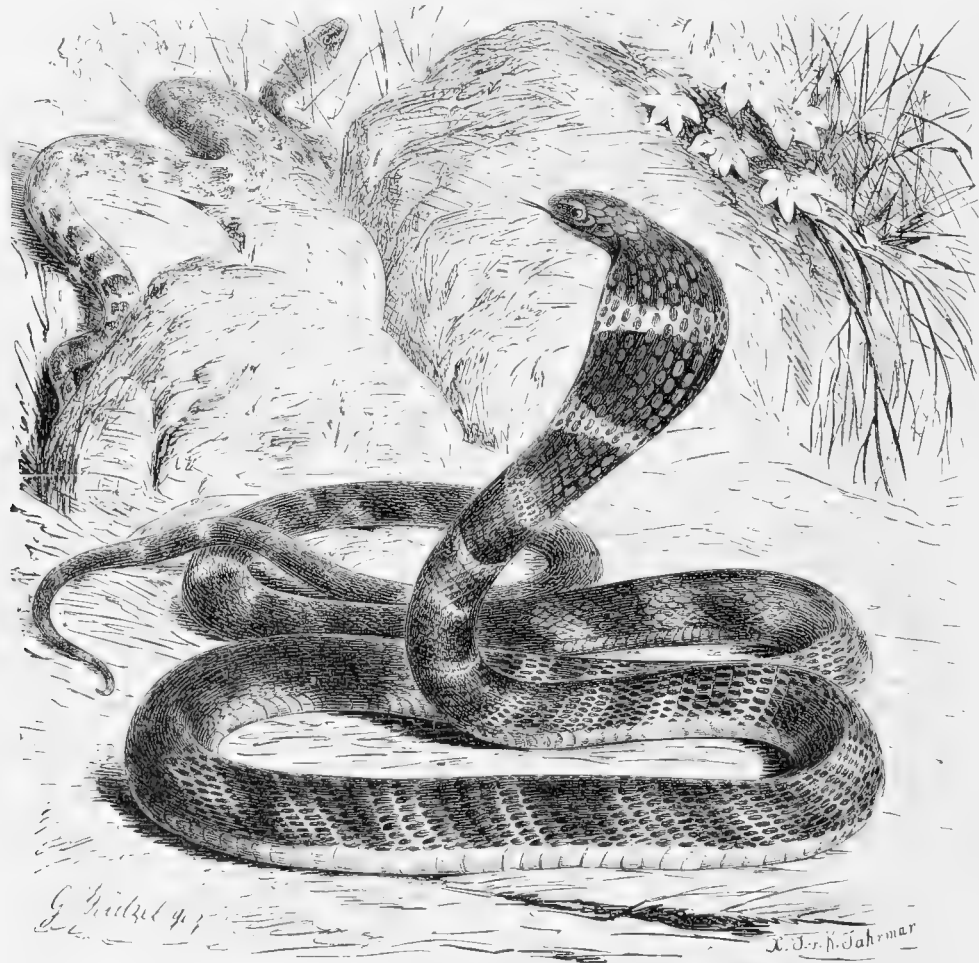
WE now come to some of the most deadly of the Serpent tribe, the first of which is the well-known COBRA DI CAPELLO, or HOODED COBRA of India.

This celebrated Serpent has long been famous, not only for the deadly power of its venom, but for the singular performances in which it takes part. The Cobra inhabits many parts of Asia, and in almost every place where it is found, certain daring men take upon themselves the profession of Serpent-charmers, and handle these fearful reptiles with impunity, cause them to move in time to certain musical sounds, and assert that they bear a life charmed against the bite of these reptilian playmates. One of these men will take a Cobra in his bare hands, toss it about with perfect nonchalance, allow it to twine about his naked breast, tie it round his neck, and treat it with as little ceremony as if it were an earth-worm. He will then

take the same Serpent—or apparently the same—make it bite a fowl, which soon dies from the poison, and will then renew his performances.

Some persons say that the whole affair is but an exhibition of that jugglery in which the Indians are such wondrous adepts; that the Serpents with which the man plays are harmless, having been deprived of their fangs, and that a really venomous specimen is adroitly substituted for the purpose of killing the fowl. It is moreover said, and truly, that a Snake, thought to have been rendered innocuous by the deprivation of its fangs, has bitten one of its masters and killed him, thus proving the imposture.

Still, neither of these explanations will entirely disprove the mastery of man over a venomous Serpent. In the first instance, it is surely as perilous an action to substitute a venomous Serpent as to play with it. Where was it hidden, why did it not bite the man

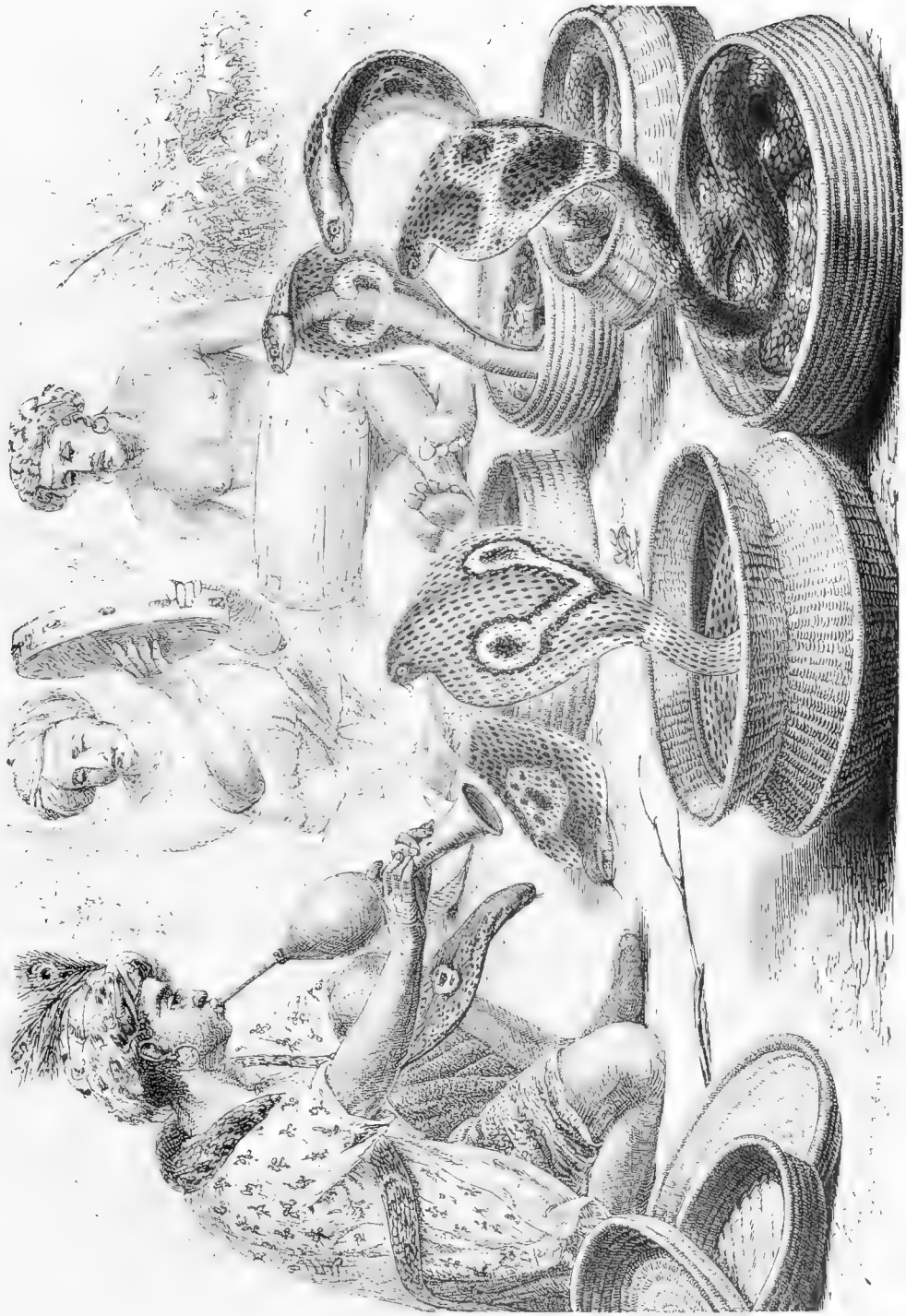


SERPENT-EATING HAMADRYAS.—*Hamadryas elaps*. (See page 140.)

instead of the fowl, and how did the juggler prevent it from using its teeth, while he was conveying it away? And, in the second instance, the detection of an impostor is by no means a proof that all who pretend to the same powers are likewise impostors.

The following narrative of Mr. H. E. Reyne, quoted by Sir J. E. Tennent in his "Natural History of Ceylon," seems to be a sufficient proof that the man did possess sufficient power to induce a truly poisonous Serpent to leave its hole and to perform certain antics at his command: "A Snake-charmer came to my bungalow, requesting me to allow him to show me his Snake dancing. As I had frequently seen them, I told him I would give him a rupee if he would accompany me to the jungle and catch a Cobra that I knew frequented the place.

"He was willing, and as I was anxious to test the truth of the charm, I counted his tame Snakes, and put a watch over them until I returned with him. Before going I examined the



COBRA DI CAPELLO.

man, and satisfied myself he had no Snake about his person. When we arrived at the spot, he played upon a small pipe, and after persevering for some time, out came a large Cobra from an ant-hill which I knew it occupied. On seeing the man, it tried to escape, but he caught it by the tail and kept swinging it round until we reached the bungalow. He then made it dance, but before long it bit him above the knee. He immediately bandaged the leg above the bite, and applied a Snake-stone to the wound to extract the poison. He was in great pain for a few minutes, but after that it gradually went away, the stone falling off just before he was relieved.

“When he recovered, he held up a cloth, at which the snake flew, and caught its fangs in it. While in that position, the man passed his hand up its back, and, having seized it by the throat, he extracted the fangs in my presence and gave them to me. He then squeezed out the poison on to a leaf. It was a clear oily substance, and when rubbed on the hand, produced a fine lather. I carefully watched the whole operation, which was also witnessed by my clerk and two or three other persons.”

With regard to the so-called charming of Serpents, there is no need of imagining these men to be possessed of any superhuman powers; for these, and most of the venomous Serpents, are peculiarly indolent, and averse to using the terrible weapons which they wield; in proof of which assertion, the reader may recollect that Mr. Waterton, though not pretending to be a Snake-charmer, carried a number of rattlesnakes in his bare hand without being bitten for his meddling. Not that I would positively assert that the Snake-charmers do not possess some means of rendering themselves comparatively proof against the Serpent's bite; for it is reasonable to conclude that, just as a secretion of a cow will, when it has been suffered to pervade the system, render it proof against the poison of the small-pox, there may be some substance which, by a kind of inoculation, can guard the recipient against the poison of the Cobra. In the last century, the one was quite as irremediable as the other.

Another fact is yet to be mentioned. In almost every instance where a poison, vegetable or animal, is likely to gain access to human beings, Nature supplies a remedy at no great distance, just as, to take a familiar instance, the dock is always to be found near the nettle. There certainly are many poisons for which no sure remedy has been discovered, and, until lately, the venom of the Cobra ranked among that number. Recently, however, some important discoveries have been made, which seem to prove that the bite of the Cobra may be cured in two methods, viz., the external application of certain substances to the wound; and the internal administration of others. As the general character of the Cobra is almost precisely the same as that of many other venomous Serpents, and has long been familiar to the public, I shall devote the greater portion of the space, not to the creature itself, but to the remedies for its bite.

The first of these remedies is a plant belonging to the group of birth-worts, and known to botanists by the name of *Aristolochia indica*.

This plant has long been considered as a valuable remedy for the bite of the Cobra, but the accounts of its use and mode of operation have mostly been vague and scarcely trustworthy. I have, however, been fortunate enough to obtain much valuable information on this subject from R. Lowther, formerly Commissioner in India, who was accustomed to employ this plant very largely in cases of Cobra-bites, and has kindly forwarded the following communication on the subject:—

“According to your request I have the pleasure of inclosing a statement of one out of at least twenty cases of Snake-bites, in which the exhibition of the *Aristolochia indica* was attended with complete success, on patients who were brought to my house on a litter, in a perfect state of coma from the bites of venomous Snakes.

“The *Aristolochia indica* is noticed by medical writers as a powerful stimulant, much extolled as a remedy for Snake-bites, in support of which I need only refer you to my detailed statement, as also to the circumstances under which the plant was transferred to my garden at Allahabad. The gentleman from whom I received it (Mr. Breton, Deputy Collector of Customs) gave me the following account of it:

“A Cobra, to the great alarm of his servants, had taken up its abode in a mound of earth, formed by white ants, in the vicinity of his house. A party of Snake-catchers having one day made their appearance in the village, Mr. Breton was afforded the opportunity of getting rid of the reptile by having it dug out of its lodgment. After having reached a considerable depth, the man at work used his finger for the purpose of ascertaining the direction of the hole. This seemed to have been its termination, or nearly so, as the Snake caught hold of his finger. His companion immediately ran off to the bank of a stream near at hand, and brought back some leaves, which, having bruised with a stone, he administered to his friend's relief. Mr. Breton requested the man to take him to the plant, which he forthwith removed to his own garden. The Snake-catcher informed him the plant was a specific, and that they usually carried the dried root about with them in case of need.

“Mr. Breton, having been subsequently appointed to Allahabad, brought the plant away, and was successful in the treatment of numerous cases. On being removed to a distant station, he transferred the plant to me. The plant is a creeper, and sheds its leaves at that season when Snakes, for the most part, are lying inert in their holes. I should have mentioned, that the Cobra above referred to was killed in the hole.

“There are several species of *Aristolochia*, all of them I believe stimulant; but the *Indica* is that which I refer to—it is intensely bitter and strongly aromatic.

“In one bad case which came under my treatment, in which large doses had been exhibited, I gave an additional leaf to the patient to take home, but to be used only in case of relapse. Her husband informed me that, although quite recovered, she took the extra dose at one o'clock in the morning, and became so giddy that in attempting to move she reeled about like a drunken creature.

“A young Hindoo woman was brought to my door in a ‘charpoy,’ or litter, in a state so apparently lifeless from a Snake-bite, that I had no hesitation in refusing to prescribe. An officer, who was on a visit at my house at the time, considered the woman beyond the power of human relief, and advised me to send her away, as my failure would bring discredit on a remedy which was attracting public notice. In this instance the patient was as cold as marble; there was no pulsation; countenance death-like.

“The woman's husband manifested great distress at my refusal, at the same time urging that as the remedy had been prepared, I might, at any rate, give his wife the chance of recovery. I explained to him my motives, and my firm belief that his wife was dead long before he had reached my door. However, rather than add to his distress by persisting in my refusal, I forced her jaws open, and poured down her throat three medium-sized leaves of the *Aristolochia Indica*, reduced to a pulp, with ten black peppercorns, diluted with a graduated ounce of water. The remedy having flowed into her stomach, I directed her body to be raised and supported in a sitting posture, and with some anxiety, though without the slightest prospect of success.

“I attentively watched her features, and in the course of eight or ten minutes I observed a slight pulsation on her under lip. I instantly directed her husband, with the aid of my own servants, to drag her about for the purpose, if possible, of increasing the circulation. Supported by two men, holding her up by the waist and arms, she was moved about, her feet helplessly dragging after her. After the lapse of a few minutes, I perceived an attempt on the part of the patient to use her feet. I accordingly directed them to raise her body sufficiently high to admit of the soles of her feet being placed on a level with the ground. In a few minutes she gave a deep inspiration, accompanied with a kind of shriek, manifesting the return of consciousness. This was followed by an exclamation, ‘A fire is consuming my vitals!’ At this time her chest and arms were *deadly cold*. I immediately gave her the pulp of one leaf in an ounce of water, which greatly alleviated the burning sensation in the stomach.

“She was then enabled to explain the position of the wound in her instep, which had the appearance of a small speck of ink, surrounded by a light-colored circle. I had the part well rubbed with the *Aristolochia*, after which she was able to walk without assistance. I kept her walking up and down for at least a couple of hours. Having expressed herself

entirely recovered, I allowed her to depart. She called on the following morning to show herself.

“The Snake unfortunately escaped, but the woman described it as a ‘Kala Samp,’ which is the term ordinarily used for the Kobra Kapelle.

“I have written the above entirely from memory, the case having occurred eight or nine years ago.

“A middle-aged woman was brought to my door in the early part of the rainy season, who had been bitten by a Snake at daybreak, while stooping down for the purpose of sweeping the floor. She called out to the people of the house that a rat had bitten her, and nothing more was thought of it, as her attention was directed to her infant, who became fractious for the breast. She accordingly went to bed to give the child sustenance, and not long afterwards complained of giddiness. It was suggested to her that a Snake might have bitten her, but she referred to a hole in the mud-wall from which the rat must have darted out.

“Nothing further transpired until the household were alarmed on finding her in a state of insensibility, foaming at the mouth, and the infant at her breast. They were then convinced that a Snake must have done the mischief, and immediately carried her off to the charmer! After detaining the woman for a full hour, the fellow coolly told her friends to take her off to the Commissioner, who would prescribe for her. The poor woman had been dead for some time before the incantations were finished. On arriving at my house, I found the deceased in a state of incipient decomposition, and, having heard the statement of her friends, directed them to take the body away for the performance of funeral rites, and to lose no time in bringing her infant, who was said to be suffering from the effects of the poison.

“The poor thing reached my house in a state of insensibility, though not dead. Its head was hanging on its shoulder, and when raised beyond the perpendicular would fall on the opposite shoulder. The body was not cold, and that was the only indication that death had not supervened. I selected one of the smallest of the leaves of the *Aristolochia*, and pounded one-third of it, and, with a small table-spoonful of water, poured the solution into the stomach. After the lapse of four or five minutes the child heaved a deep sigh, opened its eyes wildly, gave a loud scream, and afterwards became quite composed. The child was brought to me on the following morning quite well.”

As this plant is so valuable, and seems likely to become an acknowledged remedy, a few lines may be spared for a short description of the species, and the mode of its action.

The *Aristolochia Indica* is one species of a rather large genus, inhabiting many parts of the world, but being most plentiful in the hotter regions. It is a creeping plant, and the specimens grown by Mr. Lowther were trained upon a trellis-work, which they clothed with their narrow, abruptly pointed leaves. Another species of this group of plants, the *Aristolochia serpentina*, is not uncommon in parts of North America, where it is known under the title of the Virginian Snake-root. An infusion of this plant is used as a specific against ague and liver affections.

The fresh leaf of the *Aristolochia Indica* is, when tasted, very bitter and aromatic, bearing some resemblance to quinine in the clear searching quality of the bitter. It is remarkable that when persons are suffering from the poison of the Cobra, they describe it as being sweet. There is certainly a kind of sweetness in the leaf, for on chewing a dried leaf of this plant, kindly sent me by Sir W. Hooker, from the collection in the botanical gardens at Kew, I find it to be rather, but not very bitter, with a pungent aroma, something like that of the common ivy, and a faint, though decided sweetness as an after-flavor.

It is not a universal specific, for when experiments were tried by getting some dogs bitten by the Cobra, and treating them with this leaf, they died to all appearance sooner than if they had been entirely neglected. Mr. Lowther has made rather a curious series of experiments on the Cobra's poison and the mode of its action, and has found that while human beings become cold as marble under the influence of the venom, dogs are affected

in precisely an opposite manner, being thrown into a high fever, from which they die. The body of a dog killed by a Cobra's bite, will remain quite hot for some ten hours. The *Aristolochia*, therefore, which is a powerful stimulant, rather aids than counteracts the operation of the poison.

In the case of a human being, however, the effect of this remedy seems to be infallible, and Mr. Lowther informs me that he always kept a mortar and pestle by the plant, so that no time should be lost in bruising the leaf, and mixing it thoroughly with water, before pouring it down the throat of the sufferer. The admixture of water was necessary, because, in most instances, the patient was insensible, and the jaws stiffened, so that the mouth needed to be opened forcibly, and the preparation poured down the throat.

THE second mode of cure employed by the natives of India, Ceylon, and even of some parts of Africa, is the now celebrated Snake-stone, so carefully described by Sir J. E. Tennent in his "Natural History of Ceylon." On being bitten by a Cobra, the sufferer applies one of these remarkable objects to each puncture, where they adhere strongly for a variable space of time, five or six minutes appearing to be the usual average. They seem to absorb the blood as it flows from the wound, and at last fall off without being touched, when the danger is considered to be over. This mode of application is general throughout all parts of the world where the Snake-stone is known.

Through the kindness of Sir J. E. Tennent, I have been enabled to make a careful inspection of these objects, and to peruse the original letters relating to their use. They are flattish, shaped something like the half of an almond with squared ends, rather light, bearing a very high polish, and of an intense black—in fact, looking much as if they were rudely cut from common jet. The value of these singular objects is placed beyond doubt by the carefully accredited narratives lately published.

In one case, a native was seen to dart into the wood, and return, bearing a Cobra, about six feet in length, grasping it by the neck with the right hand and by the tail with the left. The Serpent was powerful, and struggled so hard, that its captor was forced to call for assistance. As, however, he held the reptile awkwardly, it contrived to get its head round, and to the horror of the spectators, fastened on his hand, retaining its hold for several seconds. The white bystanders at once gave up the man for lost, but his companion speedily produced from his waistband two Snake-stones, one of which he applied to each puncture. They clung firmly, seemed to absorb the flowing blood, and in a minute or two relieved the extreme pain which the man was already suffering. Presently both Snake-stones dropped simultaneously, and the man declared that the danger had then passed away.

Another native then took from his stores a little piece of white wood, passed it over the head of the Cobra, grasped it by the neck and put it into his basket, averring that when armed with this weapon, a man could handle any kind of Snake without being bitten.

A similar instance is related by Mr. Lavalliere, formerly District Judge of Kandy, and forwarded to Sir J. E. Tennent by the writer, together with the materials employed. The woody substances will presently be described; at present our business is with the Snake-stone, or Pamboo-Kaloo as the natives call it.

The formation of these objects has long been a mystery, and they have been made into a very profitable article of commerce by those who possess the secret. The monks of Manilla are said to be the chief makers of Snake-stones, and to supply the merchants, by whom they are distributed throughout so many countries.

One of these stones was sent for analysis to Mr. Faraday, who pronounced it to be made of charred bone, and in all probability to have been filled with blood, and again charred. "Evidence of this is afforded, as well by the apertures of cells or tubes on its surface, as by the fact that it yields and breaks under pressure, and exhibits an organic structure within. When heated slightly, water rises from it and also a little ammonia, and if heated still more highly in the air, carbon burns away, and a bulky white ash is left, retaining the shape and size of the stone." This ash is composed of phosphate of lime, and Sir J. E. Tennent remarks,

with much judgment, that the blood discovered by Mr. Faraday was probably that of the native to whom the Snake-stone was applied.

Another light has been thrown on the subject by Mr. R. W. H. Hardy, who states that the Snake-stone is in use in Mexico, and that it is formed by cutting a piece of stag's-horn into the proper shape, wrapping it tightly in grass or hay, folding it in sheet copper so as to exclude the air, and calcining it in a charcoal fire.

Being desirous of testing the truth of this recipe, I procured a piece of stag's-horn, cut it into proper shape, and exposed it to the heat of a fierce charcoal fire for an hour and a half. On removing it from the copper, the hay had been fused into a black mass, easily broken, and forming a complete cast of the inclosed horn, which fell out like an almond from its shell.

On comparing the charred horn with the veritable Snake-stones, I find them to be identical except in the polish. The fracture of both is the same, and when exposed to a white heat in the air, my own specimen burned away, leaving a white ash precisely as related of the real specimen, and the ashes of both are exactly alike, saving that my own is of a purer white than that specimen calcined by Mr. Faraday, which has a slight tinge of pink, possibly from the absorbed blood. On throwing it into water it gave out a vast amount of air from its pores, making the water look for a few seconds as if it were newly opened champagne, a peculiarity which agrees with Thunberg's description of the Snake-stone used at the Cape, and imported at a high price from Malabar. The rather high polish of the Cingalese Snake-stone I could not rightly impart to my own specimen, probably for want of patience. I found, however, that by rendering the surface very smooth with a file, and afterwards with emery paper, *before* exposing it to the fire, it could be burnished afterwards by rubbing it with polished steel. Even in the original objects, the polish is not universal, the plane side being much rougher than the convex.

We will now pass to the little pieces of woody substance, by which the natives assert that they hold dominion over the Serpent tribe. It has already been mentioned that the native who produced the Snake-stones, employed a small piece of wood as a charm to render the Snake harmless while he handled it. Mr. Lavalliere, in the course of his narration, remarks that the man who was bitten proceeded to bandage his leg above the wound, and to stroke it downwards with a piece of some root. I have also inspected the identical substances used in the two cases just narrated, and have come to the conclusion that no virtue resides in the particular plant from which the charm is taken, but the whole of its value lies in the confidence with which the possessor is inspired.

There are three specimens of charmed woods, all belonging to different plants. One is apparently a part of an aristolochia, another is so small and shrivelled that it cannot be identified, while the third, on being cut and tasted, proves to be nothing more or less than a piece of common ginger. This fact serves to establish the theory of Mr. Waterton, that there is no particular secret in Snake-charming, except the possession of confidence and unhesitating resolution.

ONE notable peculiarity in the Cobra is the expansion of the neck, popularly called the hood. This phenomenon is attributable, not only to the skin and muscles, but to the skeleton. About twenty pairs of the ribs of the neck and fore part of the back are flat instead of curved, and increase gradually from the head to the eleventh or twelfth pair, from which they decrease until they are merged into the ordinary curved ribs of the body. When the Snake is excited, it brings these ribs forward so as to spread the skin, and then displays the oval hood to best advantage. In this species, the back of the hood is ornamented with two large eye-like spots, united by a curved black stripe, so formed that the whole mark bears a singular resemblance to a pair of spectacles.

The native Indians have a curious legend respecting the origin of this mark, and their reverence for the reptile. One day when Buddha was lying asleep in the sun, a Cobra came and raised its body between him and the burning beams, spreading its hood so as to shade his face. The grateful deity promised to repay the favor, but forgot to do so. In those days the Brahminny kite used to prey largely on the Cobras, and worked such devastation among

them, that the individual who had done Buddha the forgotten service ventured to remind him of his promise, and to beg relief from the attacks of the kite. Buddha immediately granted the request by placing the spectacles on the Snake's hood, thereby frightening the kite so much that it has never since ventured to attack a Cobra.

It is rather curious that many persons fancy that the Cobra loses a joint of its tail every time that it sheds its poison, this belief being exactly opposite to the popular notion that the rattlesnake gains a new joint to its rattle for every being which it has killed.

The color of this Serpent is singularly uncertain, and in the museums may be seen several specimens of each variety. In some cases the body is brownish-olive, and the spectacles are white, edged with black. Another variety is also brownish-olive, but covered with irregular cross-bands of black. The spectacles are remarkably bold, white, edged with black. Other specimens are olive, marbled richly with brown below. The spectacles are like those of the last variety. Sometimes a few specimens are found of a uniform brownish-olive without any spectacles; others are black with white spectacles, and others, again, black without spectacles. Even the number of rows in which the scales are disposed is as variable as the color. The specimens without spectacles seem to come from Borneo, Java, the Philippines, and other islands. The length of the Cobra di Capello is usually between three and four feet.

THE AFRICAN COBRA, or HAJE, is equally poisonous with its Asiatic relative. It is sometimes called SPUUGH-SLANGE, or Spitting-Snake, on account of its power of projecting the poisonous secretion to a distance. It effects this object by a sudden and violent expiration of the breath, and, if aided by the wind, will strike an object at the distance of several feet. Gordon Cumming mentions an instance of his suffering from the poison of this Serpent: "A horrid Snake, which Kleinberg had tried to kill with his loading-rod, flew up at my eye and spat poison in it. I endured great pain all night; the next day the eye came all right again." This short narrative was much ridiculed when the work first appeared, familiar as the existence of the Spitting-Snake has been to naturalists for many years.

The Haje is one of the fiercest among poison-bearing Snakes, seldom running from an adversary, but generally turning to fight, and not unfrequently beginning the attack. Generally, it moves slowly, but when angry, it darts at its foe, and strikes and spits with such rapid energy, that the antagonist stands in need of a quick hand and eye to conquer the furious reptile. It is a good climber, and is in the habit of ascending trees in search of prey. It is fond of water, and will enter that element voluntarily. While immersed, it swims well, but slowly, scarcely elevating its head above the surface.

In coloring it is one of the most variable of Snakes. Sometimes it is light yellow-brown, either of a uniform tint, or covered with irregular blotches. This is the variety shown in the colored illustration. Other specimens are black when adult, having, when young, a series of broad yellow bands on the fore part of the body. Another variety is black, with a grayish-white spectacle-like mark on the neck, and the fore part of the abdomen yellow, with some broad cross-bands. It is rather curious that the hood of the black specimens is not so wide as in the yellow and brown varieties. The length of the Haje is about five or six feet.

ONE of the brightest and loveliest of Serpents is the BEAD SNAKE of North America.

This beautiful little reptile inhabits the cultivated grounds, especially frequenting the sweet-potato plantations, and burrowing in the earth, close to the roots of the plants, so that it is often dug up by the negroes while getting in the harvest. It possesses poison-fangs, but is apparently never known to use them, permitting itself to be handled in the roughest manner, without attempting to bite the hand that holds it.

The colors of this Snake are bright, pure, and arranged in a manner so as to contrast boldly with each other. The muzzle and part of the head are black, the remainder of the head is golden-yellow, and the front of the neck jetty-black. A narrow band of golden-yellow with undulating edges comes next the black, and is followed by a broad band of the lightest carmine. From this point the whole of the body and tail are covered with narrow rings of golden-yellow, alternating with broad bands of carmine and jetty-black. Towards the tail the



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AFRICAN COBRA, OR HAJE, AND GAZELLES.

carmine bands become paler and more of a vermilion hue, and for the last four inches there are no red bands, the black and yellow alternating equally. The extreme tip of the tail is yellow. The Bead Snake never attains any great size, seldom exceeding two feet in length.

It is very remarkable that the terrible LABARRI Snake of South America (*Elaps lemniscatus*) should be closely allied to and belong to the same genus as the bead Snake of the Northern States. Mr. Waterton states that this Serpent is fond of lying coiled on a stump of a tree or some bare spot of ground, where it can hardly be distinguished from the object on which it is reposing. The same writer remarks in a letter to me, that "the Labarri Snake has fangs, and is mortally poisonous when adult. It exhibits the colors of the rainbow when alive, but these colors fade in death. I have killed Labarri Snakes eight feet long."

WE now arrive at a most curious family, known by the possession of very long poison-fangs, perforated, and permanently erect. They only include one genus, of which the best known species is the NARROW-HEADED DENDRASPIIS (*Dendraspis angusticeps*).

This Serpent is very long, slender, and unusually active and a good climber, exceeding the haje in this accomplishment. It is found in Southern Africa, and is tolerably common at Natal. Its color is olive-brown washed with green above, and a paler green below. It is rather a large though very slender Snake, sometimes reaching the length of six feet.

THE last example of the Serpent tribe is the ATRACTASPIS of Southern Africa (*Atractaspis irregularis*). The fangs of this Snake are longer in proportion than those of any other known Serpent, reaching nearly to the angle of the mouth. They are so long, indeed, that Dr. Smith is of opinion that the creature cannot open its mouth sufficiently wide to erect the fangs fully, so that the poison-teeth are always directed backwards. They still, however, serve an important purpose; for when the Atractaspis seizes its prey, the poison-fangs necessarily pierce the skin, so as to inject the venom into the body of the victim, and from their shape act as grapnels, by which all attempts at escape are foiled. Very little is known of the habits of this Snake, but it is thought to burrow in loose ground.

The color of the Atractaspis is blackish-green above, shaded with orange-brown, and orange-buff below. It is a small Serpent, rarely measuring more than two feet in length.

THE BATRACHIANS.

FROGS AND TOADS.

THE BATRACHIANS are separated from the true reptiles on account of their peculiar development, which gives them a strong likeness to the fishes, and affords a good ground for considering these animals to form a distinct order. On their extrusion from the egg, they bear no resemblance to their parents, but are in a kind of intermediate existence, closely analogous to the caterpillar or larval state of insects, and called by the same name. Like the fish, they exist wholly in the water, and breathe through gills instead of lungs, obtaining the needful oxygen from the water which washes the delicate gill-membranes. At this early period they have no external limbs, moving by the rapid vibration of the flat and fan-like tail with which they are supplied. While in this state, they are popularly called tadpoles, those of the frog sometimes bearing the provincial name of pollywogs. The skin of the Batrachians is not scaly, and in most instances is smooth and soft. Further peculiarities will be mentioned in connection with the different species.

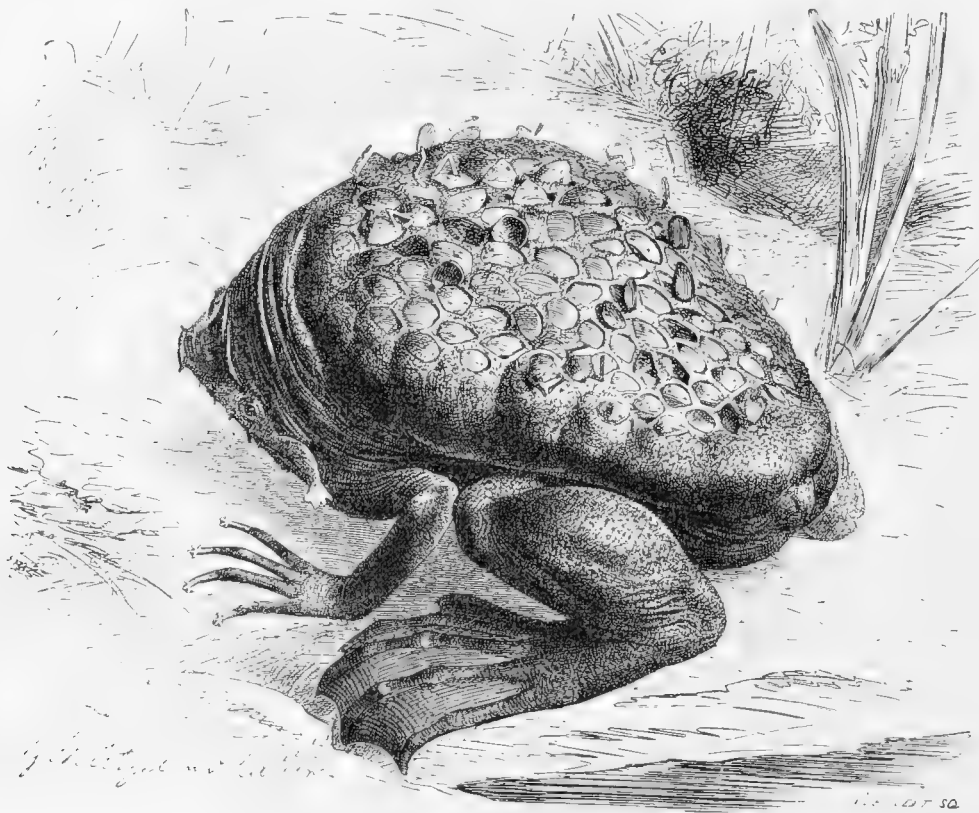
These creatures fall naturally into two sub-orders—the leaping or tail-less Batrachians, and the crawling Batrachians. The leaping Batrachians, comprising the frogs and toads, are familiar in almost all lands.

The tongue plays an important part in separating the frogs and toads into groups; and in the first group the tongue is altogether absent, these creatures being, in consequence, called Aglossa, or tongueless Batrachians.

THE first of these creatures, the XÉNOPUS of Western and Southern Africa (*Dactylethra laevis*), is remarkable for possessing nails on its feet, the first three toes being tipped with a sharply-pointed claw or nail. The family is very small, comprising only one genus, and, as far as is known, two species. The color of the Xenopus is ashy-brown, veined with blackish-brown. It is rather a large species.

THE celebrated SURINAM TOAD has long attracted attention, not for its beauty, as it is one of the most unprepossessing of beings, but for the extraordinary way in which the development of the young is conducted.

When the eggs are laid, the male takes them in his broad paws, and contrives to place them on the back of his mate, where they adhere by means of a certain glutinous secretion,



SURINAM TOAD.—*Pipa americana*.

and by degrees become embedded in a series of curious cells formed for them in the skin. When the process is completed, the cells are closed by a kind of membrane, and the back of the female Toad bears a strong resemblance to a piece of dark honey-comb, when the cells are filled and closed. Here the eggs are hatched; and in these strange receptacles the young pass through their first stages of life, not emerging until they have attained their limbs, and can move about on the ground.

The skin of this, as well as of other Batrachians, is separated from the muscles of the back, and allows room for the formation of the cells, being nearly half an inch thick. The full-sized cells are much deeper than long, and each would about hold a common horse-bean, thrust into it endways. The mouths of the cells assume an irregularly hexagonal form, probably because their original shape would be cylindrical, were they not squeezed against each other.

When the young have attained their perfect state, they break their way through the cover of the cells, and present a most singular aspect as they struggle from the skin, their heads and paws projecting in all directions. After the whole brood have left their mother's back, the cells begin to fill up again, closing from below as well as from above, and becoming irregularly puckered on the floors. The cells in the middle of the back are the first developed; the whole process occupies rather more than eighty days.

As its name implies, this singular creature inhabits Surinam, but is also found in various parts of Central America. In spite of its repulsive aspect, the negroes are said to eat its flesh.

The color of the Surinam Toad is brownish-olive above, and whitish below. The skin is covered with a large number of tiny and very hard granules, among which are interspersed some horny tubercular projections. The snout is of a very curious shape, the nostrils being lengthened into a kind of leathery tube. The throat of the male is furnished with a very large bony apparatus, of a triangular, box-like shape; and within are two movable pieces by which the voice is modulated.

In the illustration the animal appears one-half of its natural size.

WE now come to the Batrachians with tongues. In the greater number of these creatures, the tongue is fastened to the front of the mouth, and free behind, the tip pointing down the throat. The prey is taken by the rapid throwing forward of this tongue, and its equally rapid withdrawal into the mouth, carrying the doomed creature on its tip, with such celerity, that the eye can hardly follow the movement.

The skeleton of the adult Frog is worthy of a short notice before we proceed to the further investigation of these remarkable creatures. The first remarkable point is the shape of the head, and the enormous size of the orbits of the eyes, which are so large, that, when the skull is placed flat upon an open book, several words can be read through the orifices. Very little room is left for the brain, and, in consequence, the intellectual powers of the Frog are but slender.

The vertebræ are furnished with projections at each side, but the ribs are totally wanting. On account of this deficiency, the process of respiration cannot be maintained as is usual among the better developed beings, but is similar to that which is employed by the tortoises. The needful movements are made not by the sides but by the throat, so that if a quiescent Frog be watched, it appears to be continually gulping something down its throat, as is indeed the case, the material being air, which is thus forced into the beautifully formed lungs.

The hind-legs are extremely long, and the toes so much lengthened, that in the common Frog the middle toe occupies about three-fifths of the length of the entire body, and in some species is even more produced. Owing to the peculiar shape of the limbs, the Frog when reposing sits almost upright, and is at once ready for the extraordinarily long leaps which it can take when alarmed. The usual mode of progression is by a series of jumps, though of short range, but the creature will often crawl after the fashion of the toad—the presence of a snake seeming almost always to have the effect of causing the change of action.

The skin of the Frog is very porous, and is capable of absorbing and exuding water with wonderful rapidity. If a Frog, for example, be kept for some time in a perfectly dry spot, it loses its fine, sleek condition, becomes thin and apparently emaciated, and assumes a very pitiable appearance. But if it be then placed merely on wet blotting-paper, its thirsty skin drinks the needful moisture, and it soon becomes quite plump and fresh. A familiar proof of the extreme porosity of the skin is afforded by the dead Frogs which are often found on the highroad or dry paths in the middle of summer, and which are dried into a shrivelled, horny mass, which would be shapeless but for the bones of the skeleton around which the skin and muscles contract.

The whole of these creatures are most tenacious of life, suffering the severest wounds without appearing to be much injured at the time, and bearing the extremes of cold and hunger with singular endurance. Heat, however, is always distasteful to the Frog, and when carried to any extreme becomes fatal. In the hot countries, where Frogs of various species exist, they all unite in the one habit of avoiding the hot beams of the sun by hiding in

burrows or crevices during the day, and only emerging from their refuge in the night-time, or during rainy weather. Many species even dive below the muddy soil of pools as soon as the water has nearly disappeared, and there remain moist, torpid, and content until the next rains refill their home with the needful waters.

Most of the Frogs have a power of changing the color of the skin, which is often found to lose its brightest tints and become dark brown or nearly black in a very short space of time. Any sudden alarm will often produce this change, the presence of a snake being an almost unailing means of effecting this object; and it is known that the color of the Frogs is greatly affected by the locality in which they are at the time placed. The Tree-Frogs are more subject to this change of color than the ordinary species; but even the common Frog is well known to alter from yellow to brownish-black in a very short space of time. This change is produced by some mental emotion acting upon certain masses of pigment or coloring matter in the skin; and for a further elucidation of the subject, I must refer the reader to my "Common Objects for the Microscope," where the pigment masses are drawn as seen through the microscope, and their peculiar action explained.

ONE of the most singular members of this group of animals is the PARADOXICAL FROG (*Pseudis paradoxa*).

This curious creature is a native of Surinam and South America, and is remarkable for the enormous size of the larva, or tadpole. As a general rule, and indeed, as might be expected, the generality of the batrachians are smaller in their larval than in their adult state; the tadpole of the common Frog being a good example. But the Paradoxical Frog exhibits a phenomenon which is perhaps found in none of the higher animals, though common enough among the non-vertebrated beings, and is less in its adult state than in its preliminary form of tadpole.

The tail of this tadpole is exceedingly voluminous, and the body has other envelopes or appendages, which, when thrown off as it proceeds to its perfect state, reduce the bulk so greatly that the earlier observers thought that the creature reversed the usual order of nature, and from a Frog became a tadpole. Some persons went even further, and said that it was changed from a Frog into a fish. The appropriate title of Paradoxical was given to it in allusion to this opinion.

Strange, however, as this phenomenon may appear, and remarkable as it undoubtedly is, it finds abundant parallels in the insects, where the larva is often of greater bulk than the perfect insect, or imago, as it is technically called. We may take for example the common silkworm, where the caterpillar is extremely large when compared with the moth into which it afterwards changes; or that great, fat, bulky, subterranean grub which eats continually for three years, becomes so obese that it is forced to lie on its side, and afterwards turns into the neat, compact, and active little cockchaffer.

The color of the Paradoxical Frog is greenish, spotted with brown, and streaked irregularly with brown along its legs and thighs. The snout is tapering and rather pointed in front.

OUR next example of the Ranidæ is the AFRICAN BULL-FROG.

This fine species is spread over the whole of Southern Africa, but is found most plentifully towards the eastern coast, where it always frequents springs, pools, or the vicinity of fresh water. It is most impatient of drought, and when a more than usually dry season has parched the ground and rendered the hot soil uncomfortable for the delicate skin of the creature's feet and abdomen, these Frogs are said to congregate in the pools in great numbers, and just before the water has quite dried up, to burrow deeply into the soft mud and there lie until the next rains bring the welcome moisture.

Fifty of these large Frogs have been seen gathered together in one little pool, far from any other water. It is, moreover, evident that they must have some place of concealment, for they are sure to appear in great numbers after a few heavy rains, and it is quite consistent with probability that they should possess a simple and obvious method of preserving their lives during the frequent droughts of the climate in which they reside.

Dr. Livingstone mentions this fine species in his well-known work on Southern Africa, as follows:—

“Another article of which our children partook with eagerness was a very large Frog, called ‘Matlamétlo.’

“These enormous Frogs, which, when cooked, look like chickens, are supposed by the natives to fall down from the thunder-clouds, because after a heavy shower the pools which are filled, and retain water a few days, become instantly alive with this loud croaking pugnacious game. This phenomenon takes place in the driest parts of the desert, and in places where to an ordinary observer there is not a sign of life.

“Having been once benighted in a district of the Kalahari, where there was no prospect of getting water for our cattle for a day or two, I was surprised to hear in the fine, still evening the croaking of Frogs. Walking out until I was certain that the musicians were between me and our fire, I found that they could be merry on nothing else but a prospect of rain.

“From the bushmen I afterwards learned that the Matlamétlo makes a hole at the root of certain bushes, and there ensconces himself during the months of drought. As he seldom emerges, a large variety of spider takes advantage of the hole, and makes its web across the orifice. He is thus furnished with a window and screen gratis, and no one but a bushman would think of searching beneath a spider’s web for a Frog. They completely eluded any search on the occasion referred to; and as they rush forth into the hollows filled by the thunder-showers when the rain is actually falling, and the Bechuanas are cowering under their skin garments, the sudden chorus struck up simultaneously from all sides seems to indicate a descent from the clouds.

“The presence of these Matlamétlo in the desert in a time of drought was rather a disappointment, for I had been accustomed to suppose that the note was always emitted by them when they were chin-deep in water. Their music was always regarded in other spots as the most pleasant sound that met the ear after crossing portions of the sandy desert; and I could fully appreciate the sympathy for these animals shown by Æsop, himself an African.”

It is a large and handsome species, but becomes duller in color as it increases in age. The young, however, are very lightly tinted. The general color is greenish-brown above, with a decided rusty wash, variegated with mottlings of reddish-brown, and streaked and spotted with yellow. The green takes a brighter and purer hue along the sides of the head and legs. The abdomen is yellow, mottled with orange, and the chin is striped and splashed with brown. The eyes are very curious and beautiful, being of a rich chestnut hue, covered with a profusion of little golden-white dots, which shine with a metallic lustre.

When young, the yellow lines on the body are edged with jetty-black, and the legs are covered with bold black bars. The head is stout and rather flat, and the skin of the body is puckered into longitudinal folds. The lower jaw is remarkable for two large, bony, tooth-like projections in front. The ordinary length of a full-grown specimen is about six inches.

WE now come to the very large genus of which the common Frog is so familiar an example, and which finds representatives in all except cold latitudes. The very handsome SHAD-FROG derives its popular name from its habit of making its appearance on land at the same time that the shads visit the shore. The specific title *halecína* also alludes to this circumstance, as the Indian word for a shad is halec.

This Frog requires much moisture, and is seldom seen at any distance from the banks of rivers or pools of fresh water. Sometimes, however, when the dew lies very heavily on the grass, the Shad-Frog makes its way over the fields to spots far from the water-side, but takes care to return before the hot sunbeams have dried up the grateful moisture of the herbage. The food of this reptile consists chiefly of insects. It is a very active creature, and ever lively, making leaps of eight or ten feet in length.

It is thought by many persons to rank among the handsomest of the froggish tribe. The general color is light golden-green, variegated with four rows of olive spots, edged with rich gold. One regular row of these spots runs along each side of the spine, and the others are scattered rather vaguely along the sides. The throat is white with a silvery lustre, and the abdomen whitish-yellow. The aural vesicles are brown, with a circular centre of azure-blue, and look like two little targets on the side of the head. The eyes are very large, of a beautiful golden lustre, and with a bold black streak drawn horizontally through their centre. The legs are exceedingly long in proportion to the size of the body, being five inches in length, whereas the body measures scarcely three inches. This length of limb and lightness of body adds greatly to the leaping powers, for which this creature is so celebrated.

The Shad-Frog is called also the Leopard Frog, as well as Shad-Frog in Pennsylvania. It inhabits North America generally.

THE GREEN FROG (*Rana clamitans*), called also Spring Frog, inhabits the United States east of the Rocky Mountains. It is a handsome species—bright green, spotted with black.

THE WOOD FROG (*Rana temporaria*) is a European species, common in all eastern portions of the United States. Two varieties are recognized.

THE SOLITARY SPADE-FOOT (*Scaphiopus*) is a curious form, inhabiting sparsely the eastern United States.

THE COMMON TREE TOAD (*Hyla versicolor*) is very abundant and familiar in the eastern Middle States. Its length is about two inches. *H. pickeringii*, Pickering's Frog, is less common. *H. andersonii*, Anderson's Frog, is quite rare. Pickering's is about one inch in length.

THE TREE FROG (*Chorophilus triseriatus*) inhabits the eastern portion of the United States.

THE CRICKET FROG (*Acris gryllus*) has the same *habitat*. A variety, *crepetans*, is enumerated as a North American form—called the Western Cricket.

ANOTHER very common and very pretty Frog is abundant in the eastern United States. This is the PICKEREL FROG, so called because it enjoys a sad pre-eminence among anglers as a bait for pike, too fortunate if it can be snapped up at once by the voracious fish, instead of dangling for a season in mid-water, with a hook delicately inserted under its skin so as to keep it lively as long as possible, and prevent it from losing by death its attractive appearance.

It is mostly found in or near the salt marshes, and is remarkable for possessing a powerful and extremely disagreeable odor. In spite, however, of this seeming drawback, its flesh is said to be very delicate, and to be quite as good as that of the edible Frog of Europe.

The coloring of this species is very striking, on account of its irregularly squared aspect. The ground tint is pale brown above, covered with moderately large square spots of dark brown arranged like the stones of a tessellated pavement, and producing a somewhat regular pattern. A bright yellow line, not raised above the general surface, runs from behind each eye, and the under parts are yellowish-white. It is quite a little Frog, being under three inches in length.

UPON the accompanying oleograph is presented the figure of the celebrated BULL-FROG of America (*Rana catesbiana*), one of the largest and most conspicuous of its kind.

This enormous batrachian is perhaps the best swimmer among the Frog race, having been known to live for several years in water without any support for its feet. It leads a solitary



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BULL-FROG.

life for the greater part of its existence, living in a hole near the water, and seldom leaving its domicile by day unless when suddenly alarmed. If frightened by an unknown sound or sight, the Bull-Frog leaps at once into the water, and instead of diving to the bottom immediately, skims along the surface for a few yards before it disappears.

During the breeding season, these huge Frogs assemble together in great multitudes, congregating to the amount of four or five hundred in some pool or marsh, sitting with their bodies half submerged, and making night hideous with their horrid bellowing cries. Few persons, except those who have had personal experience, and who have lost night after night of needful sleep by the ceaseless noise, can imagine the loudness of voice and variety of tone possessed by the different species of Frogs. And travellers who lie awake at night, unwilling hearers of the nocturnal concerts, are disposed to envy the happy ignorance of those whose calmer lot is cast in countries where the drummings, bellowings, chatterings, and pipings of the Frog race are practically unknown. Among these nightly musicians the Bull-Frog is the loudest and most pertinacious; mostly remaining quiet by day, but sometimes exulting in a black cloud or a heavy shower, and raising its horrid din even in the hours of daylight.

It is a most voracious creature, feeding mostly on snails and similar prey, which it catches on its nocturnal excursions from its domicile, but often devouring animals of a larger size, such as crayfish, two of which crustaceans have been found in the stomach of a single Bull-Frog, and even gobbling down an occasional chicken or duckling. Taking advantage of its voracity, the inhabitants of the country are in the habit of catching it by means of a rod and line. The hook is generally baited with an insect, and gently drawn along the ground near the Frog, which leaps upon it, seizes it, and is hooked without difficulty. It is rather curious that the Frog will not touch the insect as long as it is allowed to rest quietly on the ground, but as soon as the line is pulled, so as to make the insect move, it is at once pounced upon. The common Frogs and toads have the same custom.

The flesh of the Bull-Frog is very delicately flavored, and in some places the creature is kept in captivity and fed for table.

This species is exceedingly active, making leaps of eight or ten feet in length and five feet in height. There is a well-known story of a race between a Bull-Frog and an Indian, the former to have three jumps in advance, and the distance about forty yards, to a pond from which the Frog had been taken. When the parties were ready to start, the glowing tip of a burning stick was applied to the Bull-Frog, which set off at such a rate, and made such astonishing leaps to get into the welcome water, that its human opponent was vanquished in the race.

In some places this creature is never disturbed, as it is supposed, perhaps with some justice, to aid in keeping the water pure. The popular name of Bull-Frog is derived from its cry, which is said to resemble the bellowing of the animal whose name it bears. Several species of Frog have been classed under the same popular name.

The color of the Bull-Frog is brown, mottled with black above, and taking a greener hue upon the head. The abdomen is grayish-white, and the throat is white dotted with green. The length of the head and body of the large species is rather more than six inches, and a fine specimen will sometimes measure nineteen or twenty inches from the nose to the extremity of its feet. The skin of the back is smooth, and without any longitudinal fold.

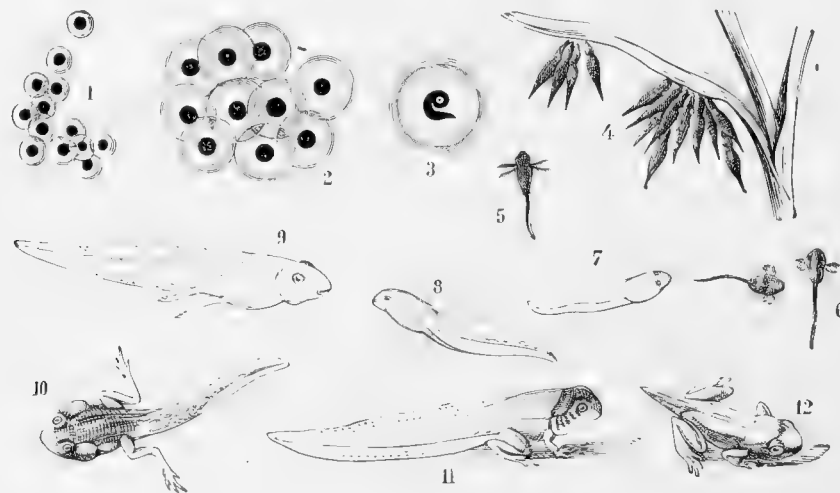
THERE is another tolerably common species inhabiting the same country, which is also popularly called the Bull-Frog. It may be readily distinguished from the bull-Frog, which it otherwise greatly resembles, by the presence of a glandular fold on each side of the back. It is a very noisy creature, with a sharper and more yelping cry than the preceding species. When disturbed, it shoots at once into the water, and there sets up its peculiar cry. It is more active than the common bull-Frog, and if once released, is almost certain to escape, from the great length and rapidity of its leaps, the creature never seeming to pause between two jumps, but springing off the earth with an instantaneous rebound not unlike the flying leaps of the jerboa or kangaroo. It is a moisture-loving species, and is never found far from water.

WE now come to the best known of all the batrachians, the COMMON FROG.

The general form and appearance of this creature are too well known to need much description. It is found plentifully in all parts of Europe and America, wandering to considerable distances from water, and sometimes getting into pits, cellars, and similar localities, where it lives for years without ever seeing water. The food of the adult Frog is wholly of an animal character, and consists of slugs, possibly worms, and insects of nearly every kind, the wire-worm being a favorite article of diet. A little colony of Frogs is most useful in a garden, as they will do more to keep down the various insect vermin that injure the garden, than can be achieved by the constant labor of a human being.

The chief interest of the Frog lies in the curious changes which it undergoes before it attains its perfect condition. Every one is familiar with the huge masses of transparent jelly-like substance, profusely and regularly dotted with black spots, which lie in the shallows of a river or the ordinary ditches that intersect the fields. Each of these little black spots is the egg of a Frog, and is surrounded with a globular gelatinous envelope about a quarter of an inch in diameter. According to gipsy lore, rheumatism may be cured by plunging into a bath filled with Frog spawn.

On comparing these huge masses with the dimensions of the parent Frog, the observer is disposed to think that so bulky a substance must be the aggregated work of a host of Frogs. Such, however, is not the case, although the mass of spawn is forty or fifty times



DEVELOPMENT OF THE EGG AND OF THE TADPOLE OF THE GREEN FROG.—1. Eggs just laid.
2. The same, a short while later. 3. Tadpole in the Egg. 4 and 5. Tadpoles just out of Egg.
6 to 12. Further development of the Tadpole, up to its last transformation.

larger than the creature which laid it. The process is as follows: The eggs are always laid under water, and when first deposited, are covered with a very slight but firm membranous envelope, so as to take up very little space. No sooner, however, are they left to develop, than the envelope begins to absorb water with astonishing rapidity, and in a short time the eggs are inclosed in the centre of their jelly-like globes, and thus kept well apart from each other.

In process of time, certain various changes take place in the egg, and at the proper period the form of the young Frog begins to become apparent. In this state it is a black grub-like creature, with a large head and a flattened tail. By degrees it gains strength, and at last fairly breaks its way through the egg and is launched upon a world of dangers, under the various names of tadpole, pollywog, toe-biter, or horsenail.

As it is intended for the present to lead an aquatic life, its breathing apparatus is formed on the same principle as the gills of a fish, but is visible externally, and when fully developed consists of a double tuft of finger-like appendages on each side of the head. The tadpole, with the fully developed branchiæ, is shown at Fig. 6, on the accompanying illustration. No sooner, however, have these organs attained their size than they begin again to diminish, the shape of

the body and head being at the same time much altered. In a short time they entirely disappear, being drawn into the cavity of the chest, and guarded externally by a kind of gill cover. This is shown in Figs. 7 and 8.

Other changes are taking place meanwhile. Just behind the head two little projections appear through the skin, which soon develop into legs, which, however, are not at all employed for progression, as the tadpole wriggles its way through the water with that quick undulation of the flat tail which is so familiar to us all. The creature then bears the appearance represented in Fig. 10.

Presently another pair of legs make their appearance in front, the tail is gradually absorbed into the body—not falling off, according to the popular belief—the branchiæ vanish, and the lungs are developed. Figs. 11 and 12 represent a young Frog in a state absorbing the tail.

The internal changes are as marvellous as the external. When first hatched, the young tadpole is to all intents and purposes a fish, has fish-like bones, fish-like gills, and a heart composed of only two chambers, one auricle and one ventricle. But in proportion to its age, these organs receive corresponding modifications, a third chamber for the heart being formed by the expansion of one of the large arteries, the vessels of the branchiæ becoming gradually suppressed, and their place supplied by beautifully cellular lungs, formed by a development of certain membranous sacs that appear to be analogous to the air-bladders of the fishes.

The Frog, contracted as are its intellectual powers, is yet susceptible to human influence, and can be tamed by kind treatment. Mr. Bell mentions a curious instance where one of these creatures became so completely domesticated, that it used to come nightly from a hole in the skirting-boards where it had established itself, partake of food offered to it by the members of the family, and even jump upon the hearth-rug in winter in order to enjoy the warmth of the fire. A favorite cat, which inhabited the same house, took a strange fancy to the Frog, and these seemingly incongruous companions were to be constantly seen sitting together on the hearth-rug, the Frog nestling under the soft warm fur of the cat. The Frog was, however, more than a year an inmate of the house before it became domesticated, and for many months would retreat to its stronghold when approached.

Stories of so-called "showers of Frogs" are often seen in the papers, and as a general rule are little to be credited, the solution of the supposed phenomenon being merely that a shower of rain has induced the creatures to come simultaneously from their retreats. There are, however, instances where credible spectators have seen them fall, and in such cases the little creatures were probably sucked up by a waterspout, or even by a brisk whirlwind, together with the water in which they were disporting, carried away for some distance, and at last dropped on the ground, as is sometimes the case with sticks, stones, and leaves, picked up by a passing whirlwind.

The general color of the common Frog is greenish-yellow, or brown, the same individual often passing through all these colors in a few days. A long patch of blackish-brown or warm brown is placed behind each of the eyes, and it is yellowish-white below. There are no teeth in the lower jaw, and only a single row of very tiny teeth in the upper jaw and on the palate. The ordinary length of the Frog is rather less than three inches, and the total length of the hinder leg is about four inches.

A VERY pretty species of this genus is found in Southern Africa. This is the BANDED FROG, remarkable for the beautiful stripes which adorn its body, and the inordinate length of the second toe of the hind-foot.

This pretty creature is not very plentiful in any one locality, but is spread widely throughout the Cape district and the whole of Southern Africa. It is very active, being a good leaper, and brisk in all its movements. The second toe of the hind-foot is truly remarkable. The whole of the toes are but slightly webbed, and project boldly beyond the connecting membrane; but the second toe is nearly as long as the whole body, which is longer than in the generality of Frogs. The object of this exceeding development is not very clear.

The general color of this species is wood-brown, upon which are drawn six dark streaks,

the two centre stripes running nearly the entire length of the body. The hinder part of the thigh is orange-brown, and the under parts are yellowish-white. The length of the head and body is nearly two inches.

THE celebrated EDIBLE FROG, or GREEN FROG of Europe (*Rana esculenta*), also belongs to this large genus. This handsome species is common in all the warmer parts of that Continent, but in the vicinity of large cities is seldom seen, except in the ponds where it is preserved, and whence issues a horrid nocturnal concert in the breeding-time. The proprietors of these froggeries supply the market regularly, and draw out the Frogs with large wooden rakes as they are wanted. In Paris these creatures are sold at a rather high price for the table, and as only the hind-legs are eaten, a dish of Frogs is rather an expensive article of diet.

It is needful to make a very early visit to the market, four or five A. M. being about the best time, to see the manner in which the Frogs are brought to market. They are generally sold by women, each of whom has by her side two tubs or barrels, one containing living Frogs, and the other having a leather band nailed to the side, in which is stuck a sharp, broad-bladed knife. When the purchaser has bargained for a certain number, the seller plunges her left hand into the one barrel, brings out a Frog by its legs, lays it across the edge of the second barrel, and with a single cut of the knife, severs the hind-legs just above the pelvis, leaving the whole of the body and fore-quarters to fall into the tub. The hind-legs are then carefully skinned, and dressed in various ways, that with white sauce seeming to be the best, at all events according to my own taste. They require considerable cooking, but when properly dressed have a most delicate and peculiar flavor, which has been compared, but not very happily, to the wing of a chicken. I would suggest that a mixture of the smelt and the breast of the spring chicken would convey a good idea of the Edible Frog when cooked.

Poachers are very apt to invade the froggeries, and without entering the boundaries often contrive to kidnap a goodly number of the inmates by a very curious mode of angling, something like "bobbing" for eels. They get a very long fishing-rod, tie a line of sufficient length to the tip, and at the end of the line they fasten, in place of a hook and bait, a simple piece of scarlet cloth. Thus prepared, they push the rod over the fence, let the scarlet rag just touch the surface of the water, and shake the rod so as to make the rag quiver and jump about. The Frog, thinking that it has found a very savory morsel, leaps at the rag, closes its mouth firmly upon it, and is neatly tossed out of the water and over the hedge before it can make up its mind to loosen its hold.

The color of this species is bright green spotted with black, and having three bold yellow stripes along the back. The under parts are yellowish. In size it is rather larger than the common species.

THE remarkable HORNED FROG is one of the quaintest species among the Frog tribe.

There are several species belonging to this genus, all inhabiting Southern America, and all notable for the singular development of the upper eyelids, which are prolonged into hard, horn-like points. In the present species the back is furnished with a bony shield, and the prominences over the eyes are bold and well defined. The body is short, stout, and squat, the skin covered with tubercles and folds, and the opening of the mouth enormous. It is a large and voracious species, one specimen when opened being found to have swallowed a full-grown land-Frog (*Cystignathus fuscus*), belonging to the same genus as our next example. The toes are long, powerful, and with hardly a vestige of web except just at the base.

THE little ORNATE LAND-FROG affords a remarkable contrast to the last-mentioned species on account of its small dimensions, the activity of its movements, and the beauty of its coloring.

It is found in Georgia and South Carolina, and is always seen on land and dry spots, its thirsty frame being amply supplied by the dews and casual rains without needing immersion in water. Indeed, this Frog is so little conversant with the element usually so familiar to all its tribe, that if thrown into water, it makes no attempt to swim, but lies

helplessly sprawling on the surface. On land, however, it displays wonderful activity, being of an extremely lively nature, and making long and bold leaps in rapid succession, so that it is not to be captured without considerable difficulty.

The color of this species is rather variable, but is generally of a soft dove tint, on which are placed several oblong marks of deep rich brown, edged with golden yellow. Below it is silvery-white granulated with gray. It is a very little species, measuring only one inch and a quarter when full-grown.

ANOTHER species of this genus, the SENEGAL LAND-FROG (*Cystignathus senegalensis*), inhabits Southern Africa.

It resides in burrows in the ground, and is tolerably quiet, except before rain or on a dull day, when it begins to pipe, and continues its curious cry for several hours together. The voice of this Frog is a sharp piping whistle several times repeated. Dr. A. Smith relates that he was greatly puzzled on hearing this strange whistling sound, and made many a fruitless search after the utterer. At last one of the Hottentots showed him the animal in its burrow, and after that time he was able to procure as many as were desired.

The head and body of this species are short, puffy, and smooth, and the color is yellowish-gray, with three longitudinal bands. Below, it is yellowish-white without any mottlings. Its length is about two inches.

THE pretty PAINTED FROG is a European species, being found in Greece, Sicily and Sardinia. It has a rather wide range of locality, as it is not uncommon in Northern Africa, along the banks of the Nile, and is tolerably plentiful along the shores of the Mediterranean.

It is fond of water, but seems careless whether it be salt or fresh, and is found indifferently in rivers, streams, lakes, and the saline morasses. The common esculent Frog possesses similar habits, and the two species are often seen in company. The food of the Painted Frog consists of insects, spiders, slugs, and snails, both terrestrial and aquatic. There is a difference in the web of the toes in the sexes, those of the female being scarcely webbed at all, while in the male the membrane extends to half their length. The thumb is quite rudimentary, and its place is indicated by a small tubercular projection.

The color and general aspect of the skin are extremely variable, the difference seeming to be quite capricious, and not depending on sex or locality. The ground color is usually yellowish-green or olive, decorated with spots and having several white longitudinal streaks. In some specimens the skin is smooth, while in others it is covered with tubercles, and the spots are seldom alike in two individuals, sometimes running together so as to form continuous bands. The white lines too are often partially, and sometimes wholly absent. In this species the male does not possess any vocal sacs.

THE reader will remember that in the description of the Surinam Toad, on page 150, mention was made of the curious manner in which the female carries her eggs upon her back until they have passed through their preliminary stages of existence. A noteworthy analogy, close in some respects, but failing singularly in others, is to be found in the NURSE FROG of Europe (*Alytes obstetricans*).

In this species it is the male that undergoes the anxieties of watching over the young offspring, his mate being comparatively free from that duty.

When the eggs, about sixty in number, are laid, he takes possession of them, and fastens them to his legs by means of a glutinous substance, and carries them about with him wherever he goes. In process of time, the eggs swell, and become so transparent that the black eyes of the future young are seen through their envelopes. Their careful parent then proceeds to some spot where he can find still water, deposits them, and departs, rejoicing in his freedom. The young soon burst their way through the envelopes in which they had been surrounded, and swim off merrily.

Except at such times, the Nurse Frog is seldom seen in the vicinity of water, and even at

that season, the creature does not care to swim about, or even to enter the water. The color of this species is olive-brown with small dark spots.

THE very odd-looking species which is popularly and appropriately termed the SOLITARY FROG is a native of North America, and is remarkable for several peculiarities of form, the eye and the foot being chiefly notable.

It is a land-loving species, never seen in or near water except during the breeding-season. During the greater part of the year it resides in holes which it scoops in the sandy soil, and at the bottom of which it sits watching for prey, much like a gigantic ant-lion. In order to assist it in digging, the animal is furnished with a flat, sharp-edged spur, with which it scoops out the loose soil. Sometimes, however, it wedges itself into the sand, tail foremost, and shovels its way downwards much after the fashion of the crab. The hole is about six inches in depth.

Quick though it is in this labor, it is but a sluggish and inactive creature when compared with most of its kin, being a very poor leaper, and slow in most of its movements. It is generally to be seen in the month of March, just after the spring rains, and is a very hardy species, caring little for cold, and traversing the snow without apparent inconvenience.

The eye of the Solitary Frog is very beautiful, and at the same time most remarkable. It is large, full, and of a rich topaz hue, and across its centre run two bold black lines at right angles to each other, so as to form a cross very like that which is seen upon starch grains when viewed by polarized light.

Altogether, the aspect of this species is very unique. It looks much more like a toad than a frog, and has a remarkably blunt snout. Its general color is olive, mottled with brown above, and covered with tubercles. Along each side of the spine runs a line of "king's yellow," and the under parts are yellowish-white. The average length of the Solitary Frog rather exceeds two inches.

THE last of the true Frogs which can be mentioned in this work is the BOMBARDIER (*Bombinator igneus*), a native of many parts of Europe, and common in France.

It is fond of water, and seldom found in very dry localities. When disturbed, it has the power of emitting a strong and very unpleasant odor of garlic, which serves it as a means of defence, like the penetrating scent of the common ringed snake. It is active, and can both swim and leap well. The eggs are laid in long strings, and the tadpole is of a very large size when compared with the earliest state of its perfect existence, and, like the paradoxical Frog already described, is larger in the tadpole state than after it has assumed its perfect form.

The color of the Bombardier is grayish-brown above, and orange below, marbled or spotted with blue-black.

WE now arrive at another section of Batrachians, including those creatures which are known under the title of TOADS, and of which the COMMON TOAD of Europe is so familiar an example. The members of this section may be known by the absence of teeth in the jaws and the well-developed ears.

The general aspect and habits of this creature are too well known to require more than a cursory notice. Few creatures, perhaps, have been more reviled and maligned than the Toad, and none with less reason. In the olden days, the Toad was held to be the very compendium of poison, and to have so deadly an effect upon human beings, that two persons were related to have died from eating the leaf of a sage bush under which a Toad had burrowed. Still, even in those times, it was held to possess two virtues, the one being the celebrated jewel supposed to be found in its head, and the other the power of curing bleeding at the nose.

This jewel could not be procured by dissection, but must be obtained by causing the owner to eject it. "But the art," says one of the quaint old writers, "is in taking of it out, for they say it must be taken out of the head alive before the Toad be dead, with a piece of cloth of the color of red Scarlet, wherewithal they are much delighted, so that while they stretch out themselves as it were in sport upon that cloth, they cast out the stone of their head, but instantly they sup it up again, unless it be taken from them through some secret hole in the said cloth,

whereby it falleth into a cistern or vessel of water into which the Toad dareth not enter, by reason of the coldnesse of the water. . . . The probation of this Stone is by laying of it to a live Toad, and if she lift up her head against it, it is good, but if she run away from it, it is a counterfeit."

The same writer gives, in his own racy language, an account of the use to which even so venomous an animal as a Toad may be put by those who know how to employ the worst things for the best purposes. "Frederic, the Duke of Saxony, was wont to practis in this manner. He had ever a Toad pierced through with a piece of wood, which Toad was dryed in the smoak or shadow, this he rowled in a linnen cloth; and when he came to a man bleeding at the nose, he caused him to hold it fast in his hand until it waxed hot, and then would the bloud be stayed. Whereof the Physitians could never give any reason, except horreur and fear constrained the bloud to run into his proper place, through fear of a Beast so contrary to humane nature. The powder also of a Toad is said to have the same vertue."

For these and other similar opinions too numerous for mention, there is some little foundation. The skin of the Toad's back is covered thickly with little glands, and some larger glands are gathered into two sets, one at each side of the back of the head, and secrete a liquid substance, with sufficient acridity to make the eyes smart should they be touched with this fluid, and to force a dog to loose his hold, if he should pick up a Toad in his mouth, and run away with open jaws and foaming mouth. The glands at the back of the head secrete a large quantity of liquid, and if pressed, will eject it in little streams to the distance of a few inches.

In France, this poor creature is shamefully persecuted, the idea of its venomous and spiteful nature being widely disseminated and deeply rooted. The popular notion is that the Toad is poisonous throughout its life, but that after the age of fifty years it acquires venomous fangs like those of the serpents. I once succeeded, but with great difficulty, in saving the life of a fine fat Toad that was leisurely strolling in the Forest of Meudon and had got into a rut too deep for escape. I had stooped down to remove the poor creature from danger, but was dragged away by the by-standers, who quite expected to see me mortally bitten, and who proceeded to slaughter the Toad on the spot. "Every one kills Toads in France," said they.

Hearing from them, however, that tobacco was instantaneously fatal to Toads, I made a compromise that they might kill it by putting tobacco on it, but in no other way. The experiment was accordingly tried, and I had the pleasure of seeing the creature walk away with the tobacco on its back, quite unconscious that it ought to have been dead. One of the spectators not only insisted upon the quinquegenarian fangs, but averred that he had a pair at home in a box. However, I never could induce him to show them to me.

In point of fact, the Toad is a most useful animal, devouring all kinds of insect vermin, and making its rounds by night when the slugs, caterpillars, earwigs, and other creatures are abroad on their destructive mission. Many of the market-gardeners are so well aware of the extreme value of the Toad's services, that they purchase Toads at a certain sum per dozen, and turn them out in their grounds.

Dull and apathetic as the Toad may seem, it has in it an affectionate and observant nature, being tamed with wonderful ease, and soon learning to know its benefactors and to come at their call. Mr. Bell had one of these creatures, which was accustomed to sit on one hand and take its food out of the other. Many persons have possessed tame Toads, which would leave their hiding-place at the sound of a whistle or a call, and come hastily up to receive a fly, spider, or beetle. Toads can be rendered useful even in a house, for they will wage unceasing war against cockroaches, crickets, moths, flies, and other insect pests.

It is worthy of notice, that the Toad will never catch an insect or any other prey as long as it is stationary, but on the slightest movement, the wonderful tongue is flung forward, picks up the fly on the tip, and returns to the throat, placing the morsel just in the spot where it can be seized by the muscles of the neck, and passed into the stomach. So rapidly is the act performed, that Mr. Bell has seen the sides of a Toad twitching convulsively from the struggles of a beetle just swallowed, and kicking vigorously in the stomach.

Entomologists sometimes make a curious use of the Toad. Going into the fields soon after daybreak, they catch all the Toads they can find, kill them, and turn the contents of their

stomachs into water. On examining the mass of insects that are found in the stomach, and which are floated apart in the water, there are almost always some specimens of valuable insects, generally beetles, which from their nocturnal habits, small dimensions, and sober coloring, cannot readily be detected by human eyes.

The Toad will also eat worms, and in swallowing them it finds its fore-feet of great use. The worm is seized by the middle, and writhes itself frantically into such contortions that the Toad would not be able to swallow it but by the aid of the fore-feet, which it uses as if they were hands. Sitting quietly down with the worm in its mouth, the Toad pushes it further between the jaws, first with one paw and then with another, until it succeeds by alternate gulps and pushes to force the worm fairly down its throat.

These paws are also useful in aiding it to rid itself of its cuticle, which is shed at intervals, as is the case with many reptiles and Batrachians. The process is so singular, and so admirably described by Mr. Bell, that it must be given in his own words:—

“I one day observed a large Toad, the skin of which was particularly dry and dull in its color, with a light streak down the mesial line of its back; and on examining further, I discovered a corresponding line along its belly. This proved to arise from an entire slit in the old cuticle, which exposed to view the new and brighter skin underneath. Finding, therefore, what was going to happen, I watched the whole detail of this curious process.

“I soon observed that the two halves of the skin, thus completely divided, continued to recede farther and farther from the centre, and became folded and rugose; and after a short space, by means of the continued twitching of the animal’s body, it was brought down in folds on the sides. The hinder leg, first on one side and then on the other, was brought forward under the arm, which was pressed down upon it, and on the hinder limb being withdrawn, its cuticle was left inserted under the arm, and that of the anterior extremity was now loosened, and at length drawn off by the assistance of the mouth. The whole cuticle was thus detached, and was now pushed by the two hands into the mouth in a little ball, and swallowed at a single gulp. I afterwards had repeated opportunities of watching this curious process, which did not materially vary in any instance.”

Though apparently unfit for food, the Toad is eaten by some nations, and certainly is not more unprepossessing than the iguana. The Chinese, however, are in the habit of eating a species of Toad for the purpose of increasing their bodily powers, thinking that the flesh of this creature has the property of strengthening bone and sinew.

This animal is extremely tenacious of life, and is said to possess the power of retaining life for an unlimited period if shut up in a completely air-tight cell. Many accounts are in existence of Toads which have been discovered in blocks of stone when split open, and the inference has been drawn that they were inclosed in the stone while it was still in the liquid state, some hundreds of thousands of years ago, according to the particular geological period, and had remained without food or air until the stroke of the pick brought them once more to the light of day.

Such an account appears at once to be so opposed to all probability as to challenge a doubt; but if there had been sufficient testimony, even to one such fact, an unprejudiced thinker would be justified in placing it among the wonderful but veritable occurrences that occasionally startle mankind. But there really seems to be no account which is sufficiently accurate to permit of such a conclusion. In more than one case, the whole story has proved to be nothing more than an imposition; and in others, there is hardly sufficient evidence to show that some crevice did not exist, which would supply the inclosed animal with sufficient air for its narrow wants, and permit many minute insects to crawl into the cavity which held the imprisoned Toad.

There is no doubt that in many cases a little Toad has crept into a rocky crevice after prey or in search of a hiding-place, and by reason of its rapid increase in size been unable to make its exit. As, moreover, the creature is very long lived, it would, by frequent movements, give a polish to the walls of its cell in a few years; a circumstance that has been employed as a proof of the antiquity of the Toad and its residence. Similar instances are known where the animal has been found inclosed in timber. Here, however, is less difficulty

in accounting for the fact, because the growth of wood over a wounded part is often extremely rapid, and has been known to cause the inclosure of nails, tools, and even birds' nests with their eggs. Even in such a case, there is not sufficient evidence to prove that the closure was absolutely perfect, and that the Toad was hermetically sealed in the wooden walls of its cell.

Dr. Buckland made some experiments on this supposed property of the Toad, and inclosed a number of these creatures in artificial chambers, made to represent as nearly as possible the rock and wood in which the imprisoned Toads have been found. None of these experiments met with success; and in those cases where the Toads lived longest, the plaster was found imperfect. Some of the Toads whose cells were really air-tight died in a month or two.

It may, however, be reasonably urged that such experiments do not fairly represent the original conditions under which an animal could survive for so long a period, and that in order to carry out the experiment in a consistent manner, the Toads ought to have been procured when very young, inclosed in a chamber with a moderate aperture, and that aperture lessened gradually, so as to prepare the creature by degrees for its long fast and deprivation of air. For a good summary of this subject and a collection of almost every narrative, I may refer the reader to Mr. Gosse's "Romance of Natural History," second series.

The development of the Toad is much like that of the Frog, except that the eggs are not laid in masses, but in long strings, containing a double series of eggs placed alternately. These chains are about three or four feet in length, and one-eighth of an inch in diameter. They are deposited rather later than those of the Frog, and the reptiles, which are smaller and blacker than the Frog larvæ, do not assume their perfect form until August or September. The general color of the Toad is blackish-gray with an olive tinge, and the tubercles which stud the surface are brown. Beneath, it is yellowish-white, tinged with gray, and in some specimens spotted with black. The full size of the Toad is not well ascertained, as it seems to have almost unlimited capacities for increasing in size together with years. The length of a very large specimen is about three inches and a half.

The American Toad (*Bufo lentiginosus*) is exceedingly common in most parts of the United States. This species is peculiar in that it varies in several respects. An average specimen is about three inches in length, and two in breadth. Its general appearance is sufficiently familiar.

This humble appearing, and to some vicious, but perfectly harmless reptile, or batrachian, is regarded by American agriculturists as a valuable agent in suppressing certain damaging insects. Five varieties are known. Sixty-seven species and varieties of Frogs and Toads are known in North America.

ANOTHER species of Toad, the NATTERJACK, is found in many parts of Europe. It may be known from the common species by the short hind-legs, the more prominent eyes, the less webbed feet, the yellow line along the middle of the back, and the black bands on the legs. It is not so aquatic as the common Toad, haunting dry places, and seldom approaching water except during the breeding season. Its ordinary length is about three inches.

THE GREEN OR VARIABLE TOAD (*Bufo viridis*, or *variabilis*) is rather a handsome species, and is found plentifully in the South of France. It derives its popular names from the large spots of deep green with which its upper surface is adorned. Many of the Batrachians possess the capability of changing their hues according to locality or through mental emotion, and the Green Toad is extremely conspicuous in this respect, wearing different colors in light and shade, sleep and wakefulness.

THE WARTY TOAD of Fernando Po (*Bufo tuberósus*) is a singular looking species, remarkable for the extreme development of the hard tubercles on the back, and being among Batrachians analogous to the moloch among lizards, or the porcupine among mammalia. The whole upper surface of the body is thickly covered with large tubercles, each having a horny spine in the centre. The glands on the back of the head are large and very conspicuous. Even the under parts are covered with tubercles, but without the spine in the centre. Above

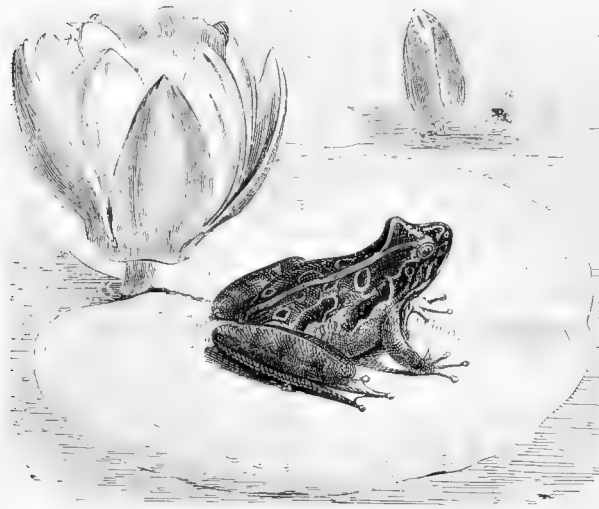
each eyelid is a group of horny tubercles, so that the creature presents a most remarkable appearance. Its length is about three inches.

OUR last example of these creatures is the large AGUA TOAD of America (*Bufo aqua*).

This large species digs holes in the ground, and resides therein. It is one of the noisiest of its tribe, uttering a loud snoring kind of bellow by night and sometimes by day, and being so fond of its own voice that even if taken captive it begins its croak as soon as it is placed on the ground. It is very voracious, and as it is thought to devour rats, has been imported in large numbers from Barbadoes into Jamaica, in order to keep down the swarm of rats that devastate the plantations. When these creatures were first set loose in their new home, they began to croak with such unanimous good-will that they frightened the inhabitants sadly, and caused many anxious householders to sit up all night.

This Toad grows to a great size, often obtaining a length of seven inches, and nearly the same measurement in breadth. It may be recognized by the great enlargement of the bone over the eyes, and the enormous dimensions of the glands behind the head. Its color is extremely variable.

WE now come to the Tree-Frogs, or Tree-Toads, so called from their habits of climbing trees, and attaching themselves to the branches or leaves by means of certain discs on the toes, like those of the geckos. In the first family the toes are webbed, and the processes of the vertebræ are cylindrical. A good example will be found in the SAVANNAH CRICKET FROG of America.



SAVANNAH CRICKET FROG.—*Acris gryllus*.

This species is very common in its own country, and is found throughout a very large range of territories, specimens having been taken from several Northern and Southern States of America. It is a light, merry little animal, uttering its cricket-like chirp with continual reiteration, even in captivity. Should it be silent, an event sometimes greatly to be wished, it can at any time be roused to utterance by sprinkling it with water. It is easily tamed, learns

to know its owner, and will take flies from his hand.

This species frequents the borders of stagnant pools, and is frequently found on the leaves of aquatic plants and of shrubs that overhang the water. It is not, however, possessed of such strongly adhesive powers as the true Tree-Frogs, and is unable to sustain itself on the under side of a leaf. It is very active, as may be surmised from the slender body and very long hind-legs, and, when frightened, can take considerable leaps for the purpose of avoiding the object of its terror.

The color of this species is greenish-brown above, diversified by several large oblong spots edged with white, and a streak of green, or sometimes chestnut, which runs along the spine and divides at the back of the head, sending off a branch to each eye. The legs are banded with dark-brown, and the under surface is yellowish-gray with a slight tinge of pink. It is but a little creature, measuring only an inch and a half in length.

Another species (*Hyla carolinensis*) is sometimes called by the same popular title, because its voice, like that of the preceding species, bears some resemblance to that of a cricket. Being one of the true Tree-Frogs, it is not a frequenter of the water, but proceeds to the topmost branches of trees, and there chirps during the night.

ANOTHER family, containing the well-known Tree-Frog of Europe, has the toes webbed, and the processes of the vertebræ flattened. The best-known species is the common GREEN

TREE-FROG of Europe, now so familiar from its frequent introduction into fern-cases and terrestrial vivaria.

This pretty creature is mostly found upon trees, clinging either to their branches or leaves, and being generally in the habit of attaching itself to the under side of the leaves, which it resembles so strongly in color, that it is almost invisible even when its situation is pointed out. When kept in a fern-case, it is fond of ascending the perpendicular glass sides, and there sticking firmly and motionless, its legs drawn closely to the body, and its abdomen flattened against the glass.

The food of the Tree-Frog consists almost entirely of insects, worms, and similar creatures, which are captured as they pass near the leaf whereto their green foe is adhering. It is seldom seen on the ground except during the breeding season, when it seeks the water, and there deposits its eggs much in the same manner as the common Frog. The tadpole is hatched rather late in the season, and does not attain its perfect form until two full months have elapsed. Like the Toad, the Tree-Frog swallows its skin after the change. The common Tree-Frog is wonderfully tenacious of life, suffering the severest wounds without seeming to be much distressed, and having even been frozen quite stiff in a mass of ice without perishing.



GREEN TREE-FROG.—*Hyla arborea*.

The following interesting account of a young Tree-Frog is by Mr. G. S. Ullathorne :—

“My acquaintance with this interesting reptile (which had already passed through all the stages of the tadpole state) began in the following manner :—

“I was at school in Hanover at the time, and used frequently to take walks in the neighboring woods, with a companion. During one of these walks we came across three Green Frogs (or rather they came across our path). Guessing at once they were Tree-Frogs, and thinking that they were just the things to keep, we were ‘down upon them,’ and tied them up in our handkerchiefs. I contented myself with one, and let my companion have the others. When I arrived safely at my journey’s end with my Frog, I procured for him a good-sized glass jar, put a little water in the bottom, a branched stick for him to climb up (though he generally preferred the sides of the glass), covered the top of the jar with a piece of muslin, and installed him on a shelf with a salamander (*Salamandra maculosa*), a ring snake (*Natrix torquata*), and various other ‘pets.’

“My great amusement was to watch the little creature eat. When I put a fly into his jar, as long as the fly remained quiet, the Frog took no notice of it, but directly the fly began

buzzing about, the Frog would wake up from his lethargic state, and on a suitable opportunity would make a leap at the poor fly, adroitly catch it in his mouth (though he sometimes missed his mark), and, I need hardly add, swallow it. On one occasion, I gave my little favorite a very large 'blue-bottle,' almost as large as himself, but nothing daunted, he caught it in his mouth and endeavored to swallow it, though in vain, for had I not been there I verily believe he would have been choked.

"Before he changed his skin, which he did now and then, his color became much darker and looked more dirty, and he went into quite a torpid state, but when the event was over, he appeared greener and livelier than ever. One day, after I had had him some time, I was playing upon the pianoforte, when I was astonished by an extraordinary sound, but on looking round I discovered the cause of the great noise, for there was my Frog swollen to an immense extent under the chin, and croaking in a very excited manner, making quite a loud noise. I mention this circumstance because it has been imagined that a *solitary* Tree-Frog will not croak, but mine certainly proved to the contrary, for though the first croaking was evidently the effect of the piano, yet he would frequently croak after that time without being excited by any apparent noise whatever. I may here mention that the noise of a quantity of Frogs croaking and nightingales singing, has frequently kept me awake for a considerable time during a spring night.

"And now comes the most melancholy part of my story. Leaving my Frog carelessly on the window-sill, I went to school; when I came back there was the glass certainly, and the Frog also, but oh! distressingly melancholy to relate, the water was quite hot from the intense heat of the sun, and the poor Frog was scorched, or rather boiled to death—he was quite discolored, being instead of green, a sort of yellow. And thus ends my tale."

The color of this species is green above, sometimes spotted with olive, and a grayish-yellow streak runs through each eye towards the sides, where it becomes gradually fainter, and is at last lost in the green color of the skin. In some specimens there is a grayish spot on the loins. Below, it is of a paler hue, and a black streak runs along the side, dividing the vivid green of the back from the white hue of the abdomen.

THE CHANGEABLE TREE-TOAD is a native of many parts of America, being found as far north as Canada, and as far south as Mexico. It is a common species, but owing to its faculty of assimilating its color to the tints of the object on which it happens to be sitting, it escapes observation, and is often passed unnoticed in spots where it exists in great numbers.

This is a curious and noteworthy species, as it possesses the capability of changing its tints to so great an extent that its true colors cannot be described. It is usually found on the trunks of trees and old moss-grown stones, which it so nearly resembles in color, that it can hardly be detected, even when specially sought. The skin of this creature will, in a short time, pass from white through every intermediate shade to dark-brown, and it is not an uncommon event to find a cross-shaped mark of dark-brown between the shoulders. Old and decaying plum-trees seem to be its favorite resting-places, probably because the insects congregate on such trees.

It is a noisy creature, especially before rain, and has a curious liquid note, like the letter *l* frequently repeated, and then ending with a sharp, short monosyllable. During the breeding season, this Frog leaves the trees and retires to the pools, where it may be heard late in the evening. In the winter it burrows beneath the damp soil, and there remains until the spring. The contour of this species is very toad-like in shape and general appearance, and this resemblance is increased by the skin glands, which secrete a peculiarly acrid fluid.

The upper surface of this creature is, as has already been remarked, too variable for description. There is always, however, a little bright yellow on the flanks, and the under surface is yellowish-white, covered with large granulations. The length of this species is about two inches.

IN the POUCHED FROG we find a most singular example of structure, the female being furnished with a pouch on her back, in which the eggs are placed when hatched, and carried about for a considerable period.

This pouch is clearly analogous to the living cradle of the marsupial animals. It is not merely developed when wanted, as is the case with the cells on the back of the Surinam Toad, but is permanent, and lined with skin like that of the back. The pouch does not attain its full development until the creature is of mature age, and the male does not possess it at all. When filled with eggs the pouch is much dilated, and extends over the whole back nearly as far as the back of the head. The opening is not easily seen without careful examination, being very narrow, and hidden in folds of the skin.

Its color is very variable, but green has the predominance. It is found in Mexico, but many specimens have been brought from the Andes of Ecuador.

A VERY curious species, called the LICHENED TREE-TOAD (*Trachycéphalus lichenátus*), inhabits Jamaica, and is described by Mr. Gosse in his "Naturalist's Sojourn" in that island.

It derives its name from the aspect of the head, which looks as if it was overgrown with lichens. It is generally found among the wild pine trees, and is very active, being able to take considerable leaps. Sometimes it puffs out its body, and causes a kind of frothy moisture to exhale from the skin. This moisture adheres to the fingers like gum, and causes the Frog to leave a trail behind it like that of a snail or slug.

The color of the Lichened Tree-Toad is pale red mottled with brown, and having a large patch of the same color between the shoulders. The muzzle and sides are pale green, spotted with dark reddish-brown, and below it is whitish-gray, the chin being speckled with reddish-brown. The head is flattened, sharply pointed at the muzzle, and studded with sharp bony ridges. Its ordinary length is about four inches.

ANOTHER species of the same genus, the MARBLED TREE-TOAD (*Trachycéphalus marmorátus*), is described by the same writer:—

"One of them was taken in a bedroom at Savannah-le-Mar, one night in October, having probably hopped in at the open window from the branches of a mango tree only a few feet distant. I was surprised at its change of color, in this respect resembling the chameleon and anoles, or still nearer, the geckos.

"When I obtained it, the whole upper parts were of a rich deep amber-brown, with indistinct black bands. On looking at it at night, to my surprise I saw a great alteration of hue. It was paler on the head and back, though least altered there; on the rump and on the fore and hind legs it was become a sort of semi-pellucid drab, marked with minute close-set dark specks. When disturbed, it presently became slightly paler still, but in a few minutes it had recovered its original depth of tint. In the course of half an hour it displayed again the speckled dark hue, and now uniformly so, save a black irregular patch or two on the head, and a dark patch between the mouth and each eye. The belly, which was very regularly shagreened, was of a dull buff, not susceptible of change. Its eyes retained their proverbial beauty, for the irides were of a golden-brown tint, like sun-rays shining through tortoise-shell.

"This specimen was about as large as a middling English Frog, being two inches and a quarter in length.

"While in captivity, if unmolested, it spent a good deal of time motionless, squatting flat and close, with shut eyes, as if sleeping, but sometimes it was active. I kept it in a basin covered with a pane of glass, for facility of observation. It would keep its face opposite the window, altering its position pertinaciously if the basin were turned, though ever so gently. It took no notice of cockroaches, nor of a large flesh-fly which buzzed about it, and even crawled over its nose. If taken in the hand, it struggled vigorously, so as to be with difficulty held; once or twice, while thus struggling, it uttered a feeble squeak; but if still retained, it would at length inflate the abdomen with air, apparently a sign of anger. It leaped, but not far."

A VERY odd-looking species is the BLUE FROG. It is the sole representative of a family, remarkable for having webbed toes, flattened processes of the vertebræ, and glands at the back of the head.

The Blue Frog, as it is called from its hue, inhabits Australia, and is not uncommon at Port Essington, whence several specimens have been brought to Europe. The head of this species is broader than long, the muzzle short and rounded, and the gape very large. The secreting glands at the back of the head are large, and extend in a curve over the ear as far as the shoulder. They are pierced with a large number of pores, and by their shape and dimensions give to the creature a very singular aspect. The discs of the fore-feet are extremely large, and the toes of the hind-feet are about three-quarters webbed. The color of the Blue Frog is light, uniform blue above, and below silvery-white. Its length is about three inches and a half.

THE large and handsome BICOLORED TREE-FROG is the only species at present known as belonging to the family.

In this creature the toes are not webbed, but in other respects the form resembles that of the preceding family, except, perhaps, that the processes of the vertebræ are wider in proportion to their volume. The Bicolored Tree-Frog inhabits South America, Brazil, and Guiana, and seems to be tolerably common. Possibly its bright and boldly contrasting colors render it more conspicuous than its green and olive relatives. The popular name of this creature is very appropriate, as the whole of the upper parts are intense azure, and the under parts pure white, or white tinged with rose. The thighs and sides are spotted with the same hue as the abdomen.

PASSING over the small section of Frogs (*Micrhyllina*) distinguishable by their toothed jaws and imperfect ears, and represented by a single species, we come to the third section of these animals (*Hylaplesura*), known by their toothless jaws and perfectly developed ears. Of this section, the TWO-STRIPED FROG affords a good example.

This species is a native of Southern Africa, and is chiefly found in the eastern and north-eastern parts of the colony of Cape Town. It lives almost entirely upon or in trees, and may be seen either in the cavities of a decaying trunk, or clinging to the bark in close proximity to one of these holes.

In Dr. A. Smith's "Illustrations of the Zoology of Southern Africa," there is so curious and important an account of the imprisonment of this species in the bole of a tree, that it must be given in his own words:—

"On the banks of the Limpopo River, close to the tropic of Capricorn, a massive tree was cut down to obtain wood to repair a wagon. The workman, while sawing the trunk longitudinally, nearly along its centre, remarked on reaching a certain point—'It is hollow, and will not answer the purpose for which it is wanted.'

"He persevered, however, and when a division into equal halves was effected, it was discovered that the saw in its course had crossed a large hole, in which were five specimens of the species just described, each about an inch in length. Every exertion was made to discover a means of communication between the external air and the cavity, but without success. Every point of the latter was probed with the utmost care, and water was left in each half for a considerable time, without any passing into the wood. The inner surface of the cavity was black, as if charred, and so was likewise the adjoining wood for half an inch from the cavity.

"The tree, at the part where the latter existed, was nineteen inches in diameter, the length of the trunk was eighteen feet; the age, which was observed at the time, I regret to say, does not appear to have been noted. When the Batrachia above mentioned were discovered, they appeared inanimate, but the influence of a warm sun, to which they were subjected, soon imparted to them a moderate degree of vigor. In a few hours from the time they were liberated, they were tolerably active, and able to move from place to place, apparently with great ease."



Animate Creation.

Testimonials to the "Tafeln" of Brehm's Thierleben.

The late CHARLES DARWIN writes:—"The illustrations are the best I ever saw in any work. I find it superfluous to enter here into particulars, as I already, in the 'Descent of Man,' have willingly and openly confessed how much I have profited by Mr. Brehm's book, and how highly I esteem it."

Sir JOHN LUBBOCK, Bart., D.C.L.:—"You have, I think, done good service in publishing them. They are certainly very admirable."
W. B. CARPENTER, M.D., LL.D., writes:—"I can quite endorse the favorable opinions already given by distinguished zoologists as to the high character of the illustrations generally."

WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston; who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet, etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield, and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities. Our endeavor has been to find an author whose work would be noted for its fund of anecdote and vitality rather than for merely anatomical and scientific presentation, and we arrived at the conclusion that we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work—a work most popularly approved by speakers of the English language. It would be superfluous to say one word concerning the standard character of his book, from the pages of which old and young at the other side of the Atlantic have obtained so much instruction and rational amusement. Avoiding the lengthened dissertations and minute classifications of specialists, he presents to his readers in popular terms a complete treatise on the Animal Kingdom of all climes and countries. The one objection that could be urged against it was, that animal life in America might be treated more fully and American forms given more consideration. In order to obviate this drawback and to do full justice to the creatures of our own country, we secured the aid of Dr. J. B. HOLDER, of the American Museum of Natural History in New York, an undoubted American authority, who has adapted Wood's work to American wants and given prominence to American forms of Animal life.

The splendid work on Rodentia, by Allen, Coues, and others, will be fully consulted. The valuable work on North American Birds, by Baird, Brewer, and Ridgway, will be the guide in the treatment of birds. The late arrangement of the classification and nomenclature of North American Birds, by Mr. Ridgway, and the Committee on that subject of the Ornithologists' Union, will be utilized in full. The arrangement of Mammals will be after the latest classification by Professor Flower, of the Zoological Society of London. So that this will be the first popular Natural History worthy of the name that has made its appearance here, which gives due and full recognition to the animate world surrounding us.

Terms of Publication.

The extent of the work will be 68 parts of 28 pages, at the price of 25 cents each. The entire publication will contain 34 Oleographs and 68 Full Page Engravings on Wood, besides many hundreds of exquisite Illustrations interspersed through the text. The parts will be issued every two weeks, and are payable only as delivered. No subscriber's name will be received for less than the entire work, and anyone removing, or not regularly supplied, will please address the Publisher by mail.

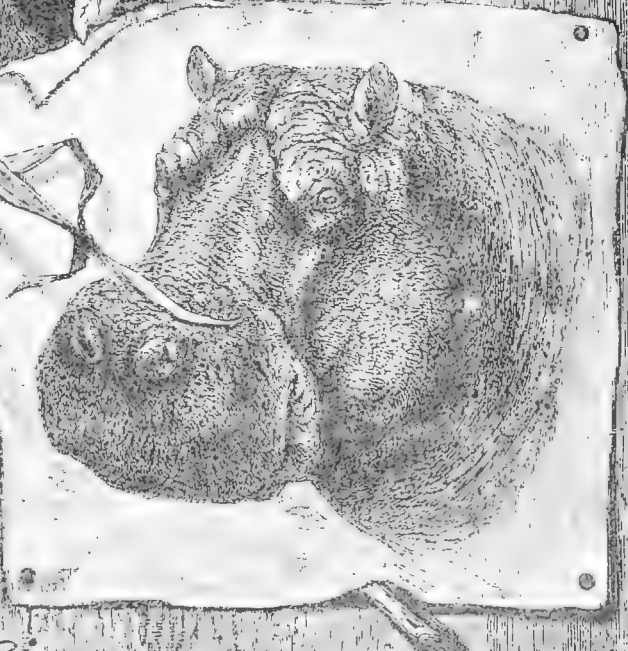
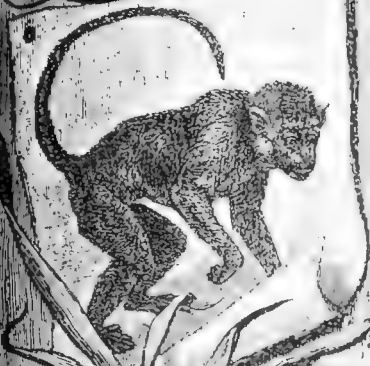
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Animate Creation

A popular edition
of the

Standard
Natural
History

"Our
Living
World"



Selmar Hess,
Publisher
New York



The color of this species is deep liver-brown above, with two longitudinal yellow stripes, beginning at the eyes and extending as far as the base of the hind-legs. A forked yellow mark appears between these stripes just where they end, and the limbs are liver-brown, spotted with yellow. The under parts are very pale brownish-red profusely variegated with pale yellow spots. In length it is nearly two inches. The generic name *Brachymerus* is derived from two Greek words, signifying short-thighed.

THE TINGEING FROG of Southern America (*Hylaplesia tinctoria*) is worthy of a casual notice.

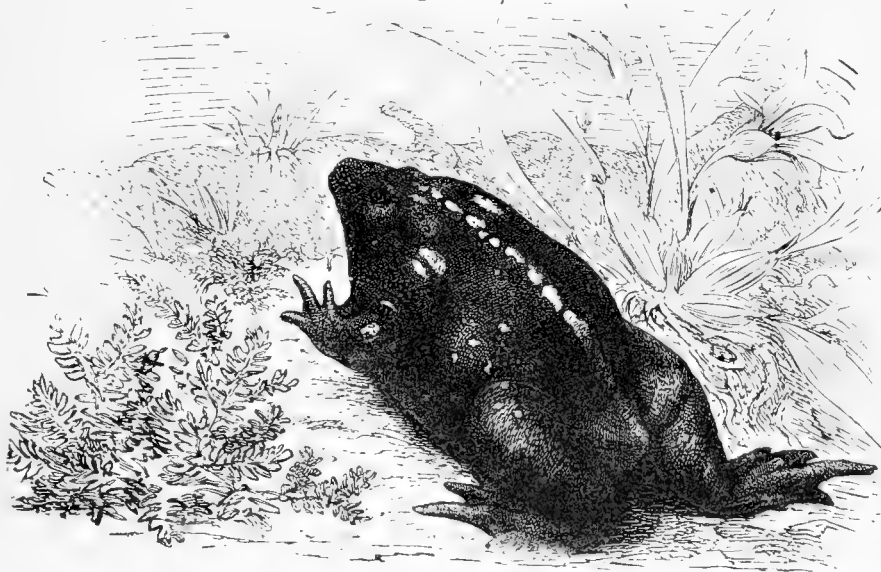
This creature is so called because the Indians are said to employ it for imparting a different tinge to the plumage of the green parrot. They pluck out the feathers on the spots where they desire to give the bird a different colored robe, and then rub the wounded skin with the blood of this Frog. The new feathers that supply the places of those that have been removed, are said to be of a fine red or yellow hue.

It is found in various parts of Southern America, and is common in Surinam, where it mostly inhabits the woods, traversing the branches and leaves by day, and at night concealing itself under the loose bark. Like the common Tree-Frog of Europe, it seldom visits the water except during the breeding-season, for the purpose of depositing its eggs.

In color it is extremely variable. Some specimens are black, with a white spot on the top of the head, and two stripes of the same color running from the head along each side. In certain individuals there are cross bands of white between the stripes. Other examples are gray above and black below; some are wholly black, spotted with large round white marks; others are black; others are gray, spotted with black; while a few specimens are brown, with a large white spot on each side, and two white bands on the fore limbs.

THE RHINOPHRYNE is remarkable as being the only known example among the Frogs where the tongue has its free end pointing forward, instead of being directed towards the throat.

This curious species inhabits Mexico, and can easily be recognized by the peculiar form of its head, which is rounded, merged into the body, and has the muzzle abruptly truncated, so as to form a small circular disc in front. The gape is extremely small, and the head would, if separated, be hardly recognizable as having belonged to a Frog. There are two glands by the ears, but although they are of considerable dimensions, they are



RHINOPHRYNE.—*Rhinophryne dorsalis*.

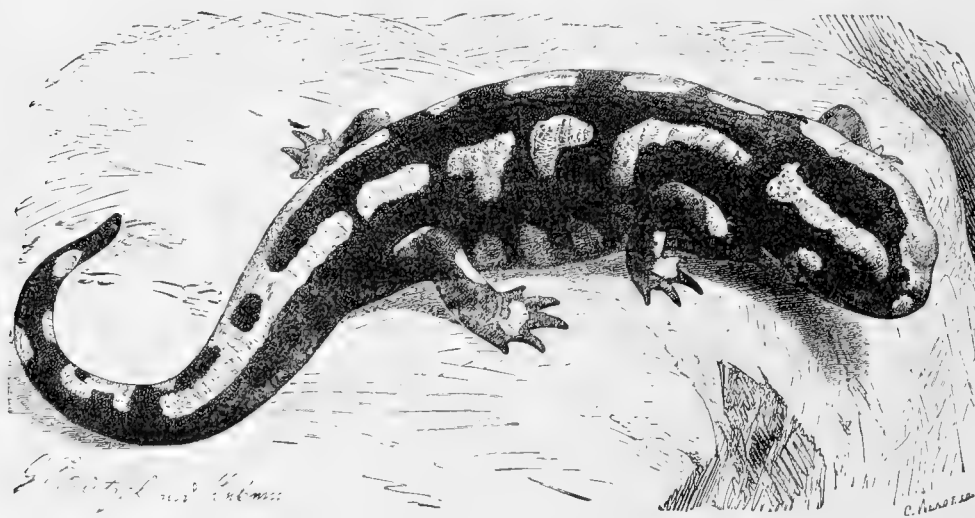
scarcely apparent externally, being concealed under the skin. The legs are very short and thick, and the feet are half-webbed. Each hind-foot is furnished with a flat, oval, horny spur formed by the development of one of the bones. There are no teeth in the jaws, and the

ear is imperfect. The color of the Rhinophryne is slate-gray, with yellow spots on the sides and a row of similar spots along the back. Sometimes these latter spots unite so as to form a jagged line down the back.

THE CRAWLING BATRACHIANS.

WE now arrive at the Crawling Batrachians, technically called Amphibia Gradientia. All these creatures have a much elongated body, a tail which is never thrown off as in the frogs and toads, and limbs nearly equal in development, but never very powerful. Like the preceding sub-order, the young are hatched from eggs, pass through the preliminary or tadpole state, and, except in a very few instances, the gills are lost when the animal attains its perfect form. Both jaws are furnished with teeth, and the palate is toothed in some species. The skin is without scales, and either smooth or covered with wart-like excrescences. There is no true breast-bone, but some species have ribs.

The development of the young from the egg is not quite the same as that of the tailless Batrachians. Instead of being deposited in masses or long strings, the eggs are laid singly, and are hatched in succession. When the young are first hatched they bear some resemblance to the tadpole of the frog, the gills being very conspicuous. In these creatures, however, the fore-legs make their appearance first, and are soon followed by the hinder pair, whereas in the frogs the hind-legs are seen for some time before the fore-limbs are visible externally. Further remarks will be made on this subject when we come to the well-known representative of this sub-order, the common newt or eft.



SALAMANDER. — *Salamandra maculosa*.

THE celebrated SALAMANDER, the subject of so many strange fables, is a species found in many parts of the continent of Europe.

This creature was formerly thought to be able to withstand the action of fire, and to quench even the most glowing furnace with its icy body. It is singular how such ideas should have been so long promulgated, for although Aristotle repeated the tale on hearsay, Pliny tried the experiment, by putting a Salamander into the fire, and remarks, with evident surprise, that it was burned to a powder. A piece of cloth dipped in the blood of a Salamander was said to be unhurt by fire, and certain persons had in their possession a fire-proof fabric made, as they stated, of Salamander's wool, but which proved to be asbestos.

Another fable related of this creature still holds its ground, though perhaps with little reason. I have already mentioned one or two instances of the prejudices which are so deeply ingrained in the rustic mind, and given a short account of the superstitions prevalent in France

regarding toads. The Salamander there suffers an equally evil reputation with the toad, as may be seen by the following graphic and spirited letter:—

“Returning homeward a few evenings ago from a country walk in the environs of D—, I discovered in my path a strange-looking reptile, which, after regarding me steadfastly for a few moments, walked slowly to the side of the road, and commenced very deliberately clambering up the wall. Never having seen a similar animal, I was rather doubtful as to its properties; but, reassured by its tranquil demeanor, I put my pocket-handkerchief over it, and it suffered itself to be taken up without resistance, and was thus carried to my domicile. On arriving *chez moi*, I opened the basket to show my captive to the servants (French), when, to my surprise and consternation, they set up such a screaming and hullabaloo, that I thought they would have gone into fits.

“‘*Oh! la, la, la, la, la!—Oh! la, la, la, la, la!*’ and then a succession of screams, in altissimo, which woke up the children, and brought out the neighbors to see what could be the matter.

“‘*Oh, monsieur a rapporté un sourd!*’

“‘*Un sourd!*’ cried one.

“‘UN SOURD!’ echoed another.

“‘UN S-O-U-R-D!!!’ cried they all in chorus; and then followed a succession of shrieks.

“When they calmed down into a mild sample of hysterics, they began to explain that I had brought home the most venomous animal in creation.

“‘*Oh! le vilain bête!*’ cried Phyllis.

“‘*Oh! le méchant!*’ chimed in Abigail; ‘he kills everybody that comes near him; I have known fifty people die of his bite, and no remedy in the world can save them. As soon as they are bitten they *gonflent, gonflent*, and keep on swelling till they burst, and are dead in a quarter of an hour.’

“Here I transferred my curiosity from the basket to a glass jar, and put a saucer on the top to keep it safe.

“‘*Oh! Monsieur*, don’t leave him so; if he put himself in a rage, nothing can hold him. He has got such force, that he can jump up to the ceiling; and wherever he fastens himself he sticks like death.’

“‘Ah! it’s all true,’ cried my landlady, joining the circle of gapers. ‘*Oh! la, la! Ça me fait peur; ça me fait tr-r-r-embler!*’

“‘Once I saw a man in a hay-cart try to kill one, and the *bête* jumped right off the ground at a bound and fasten itself on the man’s face, when he stood on the hay-cart, and nothing could detach it till the man fell dead.’

“‘*Ah! c’est bien vrai,*’ cried Abigail; ‘they ought to have fetched a mirror and held it up to the *bête*, and then it would have left the man and jumped at its *image*.’

“The end of all this commotion was that, while I went to inquire of a scientific friend whether there was any truth in these tissue of *bêtises*, the whole household was in an uproar, *tout en émoi*, and they sent for a *commissionnaire* and an ostler with a spade and mattock, and threw out my poor *bête* into the road, and foully murdered it, chopping it into a dozen pieces by the light of a stable lantern; and then they declared that they could sleep in peace!—*les misérables!*

“But there were sundry misgivings as to my fate, and as with the Apostle, ‘they looked when I should have swollen or fallen down dead suddenly; and next morning the maids came stealthily and peeped into my room to see whether I was alive or dead, and were not a little surprised that I was not even *gonflé*, or any the worse for my *rencontre* with a *sourd*.’

“And so it turned out that my poor little *bête* that had caused such a disturbance was nothing more nor less than a Salamander—a poor, inoffensive, harmless reptile, declared on competent authority to be no ways venomous; but whose unfortunate appearance and somewhat Santanic livery have exposed it to obloquy and persecution.”

This notion of the poisonous character of the Salamander is of very old date, as the reader may see by referring to any ancient work on Natural History. One of the old writers advises any one who is bitten by a Salamander to betake himself to the coffin and winding-sheet, and remarks that a sufferer from the bite of this animal needs as many physicians as the Salamander has spots. If the Salamander crawled upon the stem of an apple-tree, all the crop of fruit was supposed to be withered by its deadly presence, and if the heel of a man should come in contact with the liquid that exudes from the skin, all the hair of his head and face would fall off.

There is certainly an infinitesimally minute atom of truth in all this mass of absurdities, for the Salamander does secrete a liquid from certain pores in its surface, which, for the moment, would enable it to pass through a moderate fire, and this secretion is sufficiently acrid to affect the eyes painfully, and to injure small animals if taken into the mouth.

The Salamander is a terrestrial species, only frequenting the water for the purpose of depositing its young, which leave the egg before they enter into independent existence. It is a slow and timid animal, generally hiding itself in some convenient crevice during the day, and seldom venturing out except at night or in rainy weather. It feeds on slugs, insects, and similar creatures. During the cold months it retires into winter-quarters, generally the hollow of some decaying tree, or beneath mossy stones, and does not reappear until the spring.

The ground color of this species is black, and the spots are light yellow. Along the sides are scattered numerous small tubercles.

THE YELLOW SALAMANDER (*Amblystoma xiphias*), called also Desmognath, inhabits the Alleghanies. The Dusky Salamander (*A. obscurum*) inhabits from Ohio to Massachusetts, and southward, and is one of the commonest species in our springs and brooks. The Black Salamander is the largest of the Eastern species, inhabiting from Pennsylvania southward.

RED-BACKED SALAMANDER (*Plethodon cinereus*) is common in the Eastern States. A variety is noticed with no red dorsal band. The Viscid Salamander (*P. glutinosus*) is chiefly terrestrial; like the preceding, inhabits the same localities.

TWO-STRIPED SALAMANDER (*Speleperes bilineatus*), called Cave Salamander and Green's, inhabits from Maine to Wisconsin, and southward. *S. longicaudus* abounds in the caves from Maine to Kentucky. The Red Triton (*S. ruber*), inhabits from Maine to Nebraska, and southward.

THE PURPLE SALAMANDER (*Gyrinophilus porphyriticus*), a large aquatic species, inhabits the Alleghany Mountain region. It is said to be the only Salamander that exhibits any attempt at self-defense, the others being too sluggish.

THE COMMON NEWT, ASKER, EFFET, EFT, or EVAT, as it is indifferently termed, is well known throughout Europe. At least two species of Newt inhabit the northern parts of Europe, and some authors consider that the number of species is still greater. According to the system employed in this work, we accept only two species, the others being merely noted as varieties.

THE CRESTED NEWT derives its popular name from the membranous crest which appears on the back and upper edge of the tail during the breeding-season, and which adds so much to the beauty of the adult male.

This creature is found plentifully in ponds and ditches, during the warm months of the year, and may be captured without difficulty. It is tolerably hardy in confinement, being easily reared even from a very tender age, so that its habits can be carefully noted.

I had some of these animals in a large slate tank through which water was constantly running, and which was paved with pebbles, and furnished with vallisneria and other aquatic

plants, for the purpose of imitating as nearly as possible the natural condition of the water from which the creatures had been taken. Here they lived for some time, and here the eggs were hatched and the young developed.

It was a very curious sight to watch the clever manner in which the female Newts secured their eggs; for which purpose they used chiefly to employ the *vallisneria*, its long slender blades being exactly the leaves best suited for that purpose. They deposited an egg on one of the leaves, and then, by dexterous management of the feet, twisted the leaf round the egg, so as to conceal it, and contrived to fasten it so firmly that the twist always retained its form. The apparent shape of the egg is oval, and semi-transparent; but on looking more closely, it is seen to be nearly spherical, of a very pale yellow-brown, and inclosed within an oval envelope of gelatinous substance.

When the young Newt is hatched, it much resembles the common tadpole, but is of a lighter color, and its gills are more developed. It rapidly increases in size, until it has attained a length of nearly two inches, the fore-legs being then tolerably strong, and the hinder pair very small and weak. The gills are at this time most beautiful objects; and if the young creature be properly arranged under the microscope, the circulation of the blood, as seen through their transparent walls, is one of the most exquisite sights that the microscope can afford.

The legs now attain greater strength, the gills become gradually more opaque and slowly lessen in size, being at last entirely absorbed into the body. In exact proportion to the diminution of the gills, the lungs increase in size; and the animal undergoes exactly the same metamorphosis as has already been related of the frog, being changed, in point of fact, from a fish into a batrachian. The tail, however remains, and is made the principal, if, indeed, not the only means by which the Newt propels itself through the water.

When it has passed through its changes, the Newt is no longer able to lead a sub-aquatic life, but is forced to breathe atmospheric air. For this purpose it rises to the surface at tolerably regular intervals, puts its snout just out of the water, and, with a peculiar little popping sound, ejects the used air from its lungs and takes in a fresh supply.

Towards the breeding-season, the male changes sensibly in appearance; his colors are brighter, and his movements more brisk. The beautiful waving crest now begins to show itself, and grows with great rapidity, until it assumes an appearance not unlike that of a very thin cock's comb, extending from the head to the insertion of the hinder limbs, and being deeply toothed at the edge. The tail is also furnished with a crest, but with smooth edges. When the animal leaves the water, this crest is hardly visible, because it is so delicate that it folds upon the body and is confounded with the skin; but when supported by the water, it waves with every movement of its owner, and has a most graceful aspect.

After the breeding-season, the crest diminishes as rapidly as it arose, and in a short time is almost wholly absorbed. Some remnants of it, however, always remain, so that the male may be known, even in the winter, by the line of irregular excrescences along the back. The use of this crest is not known, but it evidently bears a close analogy to the gorgeous nuptial plumage of many birds, which at other times are dressed in quite sober garments.

The Newt feeds upon small worms, insects, and similar creatures, and may be captured by the simple process of tying a worm on a thread by the middle, so as to allow both ends to hang down, and then angling as if for fish. The Newt is a ravenous creature, and when it catches a worm, closes its mouth so firmly that it may be neatly landed before it loses its hold. Some writers recommend a hook; but I can assert, from much practical experience, that the hook is quite needless, and that the Newt may be captured by the simple worm and thread, not even a rod being required.

It is curious to see the Newt eat a worm. It seizes it by the middle with a sudden snap, as if the jaws were moved by springs, and remains quiet for a few seconds, when it makes another snap, which causes the worm to pass farther into its mouth. Six or seven such bites are usually required before the worm finally disappears.

The skin or epidermis of the Newt is very delicate, and is frequently changed, coming off in the water in flakes. I found that my own specimens always changed their skin as often as

I changed the water; and it was very curious to see them swimming about with the flakes of transparent membrane clinging to their sides. The skin of the paws is drawn off just like a glove, every finger being perfect, and even the little wrinkles in the palms being marked. These gloves look very pretty as they float in the water, but if removed they collapse into a shapeless lump.

The food of the Newt consists of worms, insects, and even the young of aquatic reptiles. I have seen a large male Crested Newt make a savage dart at a younger individual of the same species, but it did not succeed in eating the intended victim.

This creature is very tenacious of life, and the muscular irritability of the body seems to endure for a long time after the creature is dead. One of these animals, that had been dead for some time, whose heart and lungs had been removed, and whose limbs had been pinned out ready for dissection, was so retentive of this singular irritability, that when the tail was touched with the point of a scalpel, the body and limbs writhed so actively as to free the limbs from their attachments. On repeating the experiment, it was found that this susceptibility gradually departed, lingering longest towards the body. The eel possesses an even greater degree of this muscular irritability, as is well known by all who have made an eel-pie or seen it prepared. The tail of the blind-worm, too, which has already been described, is equally irritable when separated from the body.

The color of the Crested Newt is blackish or olive-brown, with darker circular spots, and the under parts are rich orange-red, sprinkled with black spots. Along the sides are a number of white dots, and the sides of the tail are pearly-white, becoming brighter in the spring. The length of a large specimen is nearly six inches, of which the tail occupies rather more than two inches and a half.

THE STRAIGHT-LIPPED NEWT of Mr. Bell (*Triton bibronii*) is only ranked as a variety of this species. In this variety the upper lip does not overhang the lower, and the skin is more tubercular than in the ordinary examples.

THE MARBLED NEWT (*Triton marmoratus*) is a continental species, and is found plentifully in the southern parts of France.

It is a much larger species than the preceding, often attaining the length of eight or nine inches. It mostly lives in the water, but will leave that element voluntarily when the weather is stormy, or even if the hot sunbeams are too powerful to please its constitution. A rather powerful and not very pleasant odor is exhaled from this creature. During the winter it leaves the water, seeks for some hole in a decaying tree, and there remains until the following spring. The color of the Marbled Newt is olive-brown above, marbled with gray and dotted with white on the back. The head is gray, with black dots and spots. Along the centre of the back runs a streak of white and orange, and the under parts are dotted with white.

THE SMOOTH NEWT is more terrestrial in its habits than the crested species, and is often seen at considerable distances from water.

By the rustics this most harmless creature is dreaded as much as the salamander in France, and the tales related of its venom and spite are almost equal to those already mentioned. During a residence of some years in a small village, I was told some very odd stories about this Newt, and my own powers of handling these terrible creatures without injury was evidently thought rather supernatural. Poison was the least of its crimes, for it was a general opinion among the rustics in charge of the farm-yard that my poor Newts killed a calf at one end of a farm-yard, through the mediumship of its mother, who saw them in a water-trough at the other end; and that one of these creatures bit a man on his thumb as he was cutting grass in the church-yard, and inflicted great damage on that member.

The worst charge, however, was one which I heard from the same person. A woman, he told me, had gone to the brook to draw water, when an Effert, as he called it, jumped out of

the water, fastened on her arm, bit out a piece of flesh, and spat fire into the wound, so that she afterwards lost her arm.

All the Newts possess singular powers of reproducing lost or injured members, this faculty proving them to hold a rather low place in the scale of creation. The Smooth Newt has been known to reproduce the tail, and even the limbs; and in one case an eye was removed entirely, and reproduced in a perfect state by the end of the year.

This species may be known by its smooth and non-tubercular skin, and its small size. During the breeding-season the male wears a crest, which runs continuously from the head to the end of the tail, and is not so deeply cleft as that of the crested species.

This ornament is very delicate and beautiful, and at the height of the season is often edged with beautiful carmine or violet. The color is brownish-gray above and bright orange below, covered with round spots of black. In the autumn and during the winter, the abdomen becomes much paler. The length of this species is about three inches and a half.

THE PALMATED WATER NEWT of Mr. Bell (*Lissotriton palmipes*) is held to be merely a variety of this species.

WE now arrive at another family, known by the curious manner in which the teeth of the palate form a broken cross-series.

The first example is the JAPANESE SALAMANDER (*Onychodactylus japonicus*), remarkable for having, during the larval state and in the breeding-season, claws upon the toes. Its color is purplish-black, variegated irregularly with white, and the claws are black. It is thought by the natives to possess medical properties, and they employ its flesh in sundry ailments, killing, and drying it in the sun for better preservation.

ANOTHER example of this family is the AMBLYSTOME, or SPOTTED EFT, of North America.

This species is not uncommon in the countries which it inhabits, and is found in some numbers in Pennsylvania. The eggs of this creature are not deposited singly and in the water, as is the case with the newts, but are laid in small packets, and placed beneath damp stones. The head of the Amblystome is thick, convex, and with the muzzle rounded. Its color is deep violet-black above, and purple-black below, with a row of circular or oval yellow spots along the sides. These spots are large in proportion to the dimensions of the individual, and have a very bold effect. The genus is rather large, containing about eleven acknowledged species. One of them, *Amblystoma talpoideum*, or Mole-like Amblystome, derives its name from its habit of burrowing in the ground after the fashion of the mole. It lives in South Carolina, and is found on the sea-islands. The fore-limbs are peculiarly short and stout, and the body is rather thick and clumsily made.

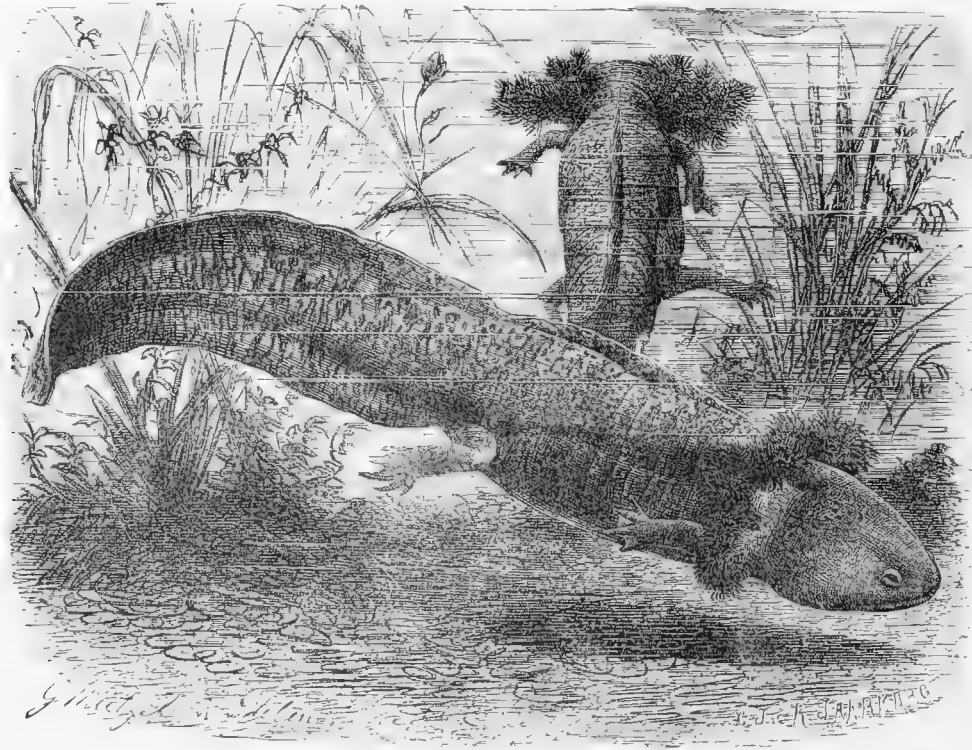
It is found northward as far as Illinois. There are eight other species enumerated, found, respectively, in Ohio, New Jersey, and the Southern States. Specimens kept in the New York Aquarium during the year 1878, passed through the usual and various stages of transformation. The tail was first noticed to be growing gradually smaller, and on absorption of the branchiæ, the transformation was seen to be complete. The more delicate and comely Salamander, with proper lungs, and its body prettily decorated with round spots, was the perfect and permanent form. This process of change was clearly visible in the well-arranged tanks of the Aquarium. The larva state of one species is the celebrated Axolotl of Mexico, and Lake Como one of the western territories.

One genus and nineteen species are recorded as embraced under the family *Amblystomidæ*, all found in North America. They are particularly abundant in the South and West.

WE now come to a very remarkable creature, the AXOLOTL, which is presumed to be but the larva or tadpole state of some very large batrachian. Like many other enigmatical animals, it has been bandied about considerably in the course of investigation, and, according to the latest observations, the original opinion seems to be correct, namely, that it is not an adult

crawling batrachian with perpetual gills, but that it is in its preliminary or tadpole stage of existence. Mr. Baird makes the following sensible remarks on this subject:—

“It so much resembles the larva of *Amblystoma punctatum*, in both external form and internal structure, that I cannot but believe it to be the larva of some gigantic species of this genus. It differs from all other perennibranchiates in possessing the larval character of the gular or opercular flap, this being unattached to the adjacent integuments, and free to the extremity of the chin. The non-discovery of the adult is no argument against its existence. I had caught hundreds of the very remarkable larva of *Pseudotriton salmoneus* before I found an adult. Until then I knew nowhere to refer the animal, supposing this species to exist no nearer than the mountains of New York and Vermont.”



LARVA OF AXOLOTL.

As may be seen from the illustrations, the gills or branchiæ are quite as large in proportion as those of the newt in its larval state. They are furnished with fringes.

The Axolotl inhabits Mexico, where it is tolerably plentiful, and in some places is found in such numbers that it is sold in the markets for the table. It frequents the lake surrounding the city of Mexico, and, according to Humboldt, is also found in the cold waters of certain mountain lakes at a considerable elevation above the sea.

The color of this remarkable creature is rather dark grayish-brown, covered thickly with black spots. The length varies from eight to ten inches.

ANOTHER small order now comes before us, containing a few species, and only two very small families. In all these creatures the body is long and lizard-like, the legs four and feeble, and the gills internal, but permanent throughout life.

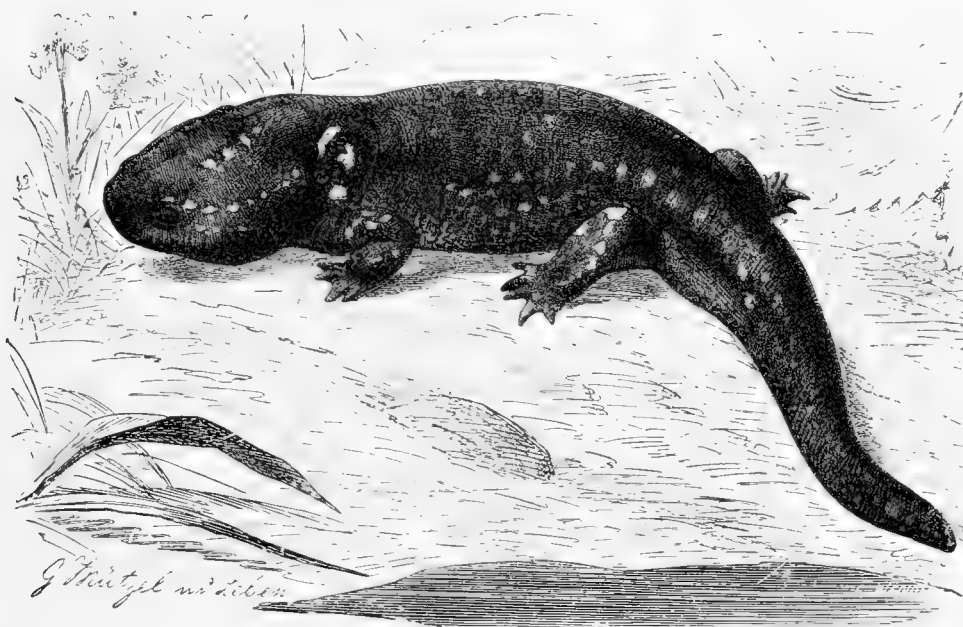
OUR first example of this family is the now celebrated GIGANTIC SALAMANDER.

This is undoubtedly one of the least attractive of the vertebrate animals, being dull in habits, sombre in color, with a sort of half-finished look about it, and not possessing even that savage ugliness which makes many a hideous creature attractive in spite of its uncomeliness. It is a native of Japan, and even in that country seems to be rare, a large sum being asked for

it by the seller. It lives in the lakes and pools that exist in the basaltic mountain ranges of Japan.

Dr. Von Siebold brought the first living specimen to Europe, and placed it in a tank at Leyden, where it was living when the last accounts were heard, having thus passed a period of many years in captivity. Its length is about a yard. Two specimens were brought over at the same time, being of different sexes, but on the passage, the male unfortunately killed and ate his intended bride, leaving himself to pass the remainder of his life in celibacy. It fed chiefly on fish, but would eat other animal substances.

Another fine specimen attracted much notice in spite of its ugliness and almost total want of observable habits. It is very sluggish and retiring, hating the light, and always squeezing itself into the darkest corner of its tank, where it so closely resembles in color the rock-work near which it shelters itself, that many persons look at the tank without even discovering its presence. The length of this specimen is about thirty-three inches, and if it survives, it may possibly attain even a larger size. The specimen shown in the engraving on next page is reduced to one-fifth of its natural size.



AXOLOTL.—*Aroloteles guttatus*.

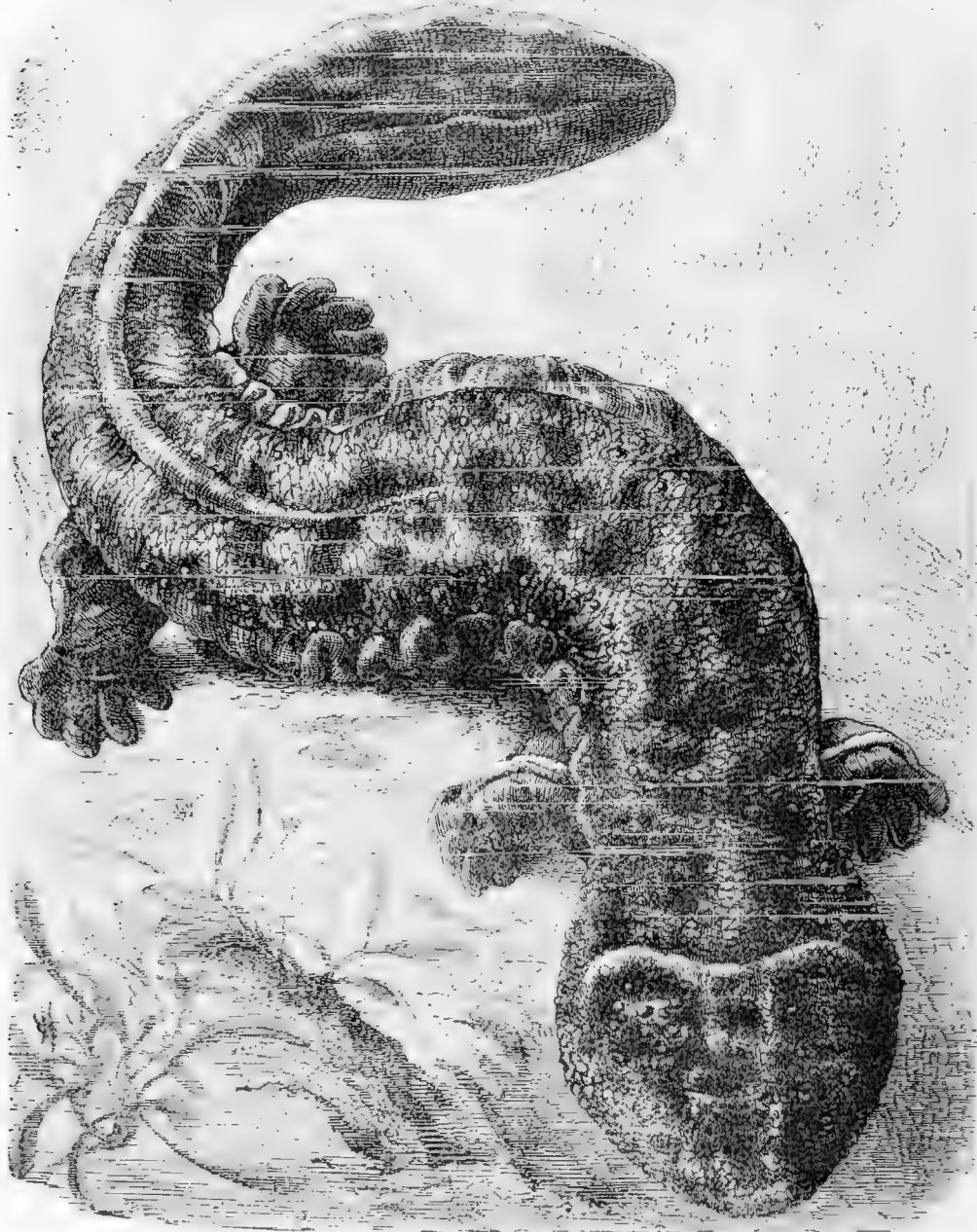
The head of this creature is large, flattened, and very toad-like in general aspect, except that it is not furnished with the beautiful eyes which redeem the otherwise repulsive expression of the toad. The head is about four inches wide at the broadest part, and is covered with innumerable warty excrescences. The eyes are extremely small, placed on the fore part of the head, and without the least approach to expression, looking more like small glass beads than eyes.

The whole upper part of the body is covered thickly with excrescences, and even the under part of the rounded toes are studded with little tubercles, which can be plainly seen with a magnifying lens as the creature presses its feet against the glass wall of its tank. Despite of its sluggish nature, it is quite able to obtain its own subsistence by catching the fish on which it feeds, and the keeper told me that even in captivity it easily catches the fish that are put into its tank. On the journey, it was mostly fed upon eels, and at the present time it eats eels as well as other fish, provided they are rather small.

It is well to mention casually in this place that the human-looking skeleton, discovered at Eningen in 1726, and long supposed to be the fossil skeleton of a man who had perished in the deluge, is nothing more than the bones of a huge Salamander, closely allied to the present species. The color of the Gigantic Salamander is a very dark brown, with a tinge of chocolate, and taking a lighter and more yellowish hue upon the under surface of the feet.

THE great MENOPEME of America (*Menopoma alleghaniense*) has been honored with a large array of names, among which are TWEEG, HELLBENDER, MUD DEVIL, and GROUND PUPPY, the first being an Indian name, and the others given to the creature in allusion to its mud-loving habits or the ferocity of its disposition.

The Menopome inhabits the Ohio and Alleghany rivers, and it is a fierce and voracious animal, so dangerous a foe to fish and other living beings that it is in some places known by



GIGANTIC SALAMANDER.—*Cryptobranchus maximus*.

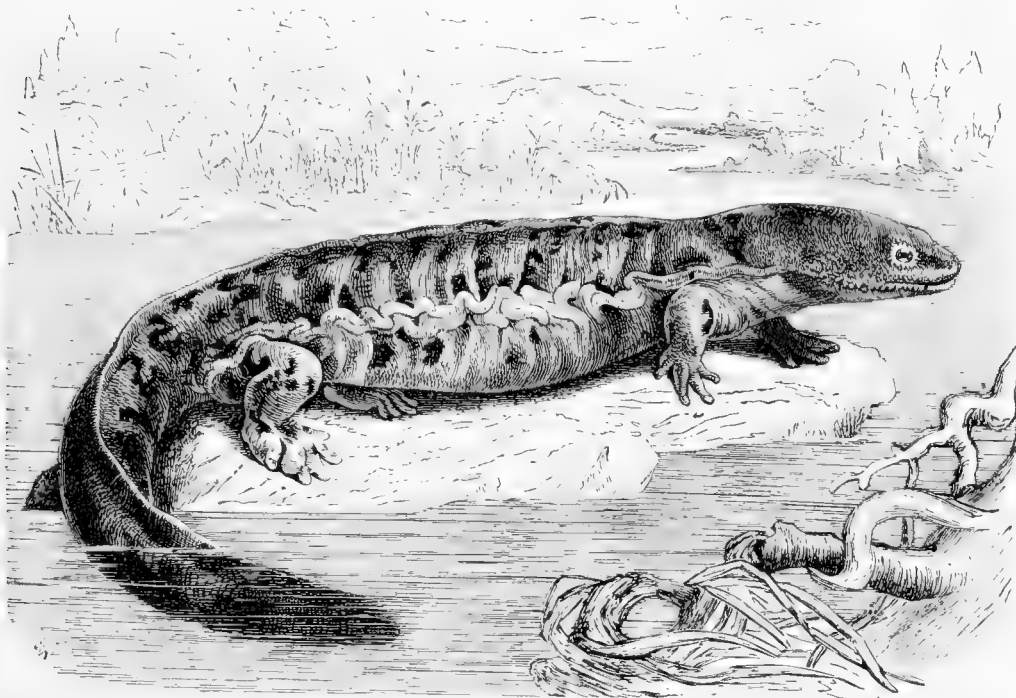
the name of Young Alligator. It is very ugly, and rather revolting in appearance, so that the fishermen stand in great awe of the fierce, active beast, and think it to be venomous as well as voracious. The teeth, however, are very small in proportion to the size of the creature. Its color is slaty-gray, with dark spots, and a dark streak runs through the eye. Its length is about two feet.

It is also called Big Water Lizard by the inhabitants along the Ohio and other interior portions. This as well as the other members of the group is harmless, though seemingly ferocious and venomous. Specimens were kept in the New York Aquarium, and much additional knowledge was thereby gained of its habits.

THE second family of this order is represented by its typical species, the CONGO SNAKE.

This curious creature is a native of America, and is found rather plentifully near New Orleans, in Florida, Georgia, and South Carolina. It is fond of burrowing in mud, and will often descend to a depth of three feet below the surface of the soil, acting indeed more like an earth-worm than a vertebrate animal. Many of these creatures have been accidentally dug out while deepening or clearing ditches. The negroes are much afraid of the Congo Snake, and think it to be poisonous, a belief which has its only foundation in fear, generated by ignorance.

The legs are extremely small and feeble, and there are only two toes on each foot. Its color is dark blackish-gray above, and lighter beneath. Another species, the THREE-TOED



MENOPOME.—*Protonopsis horrida*.

CONGO SNAKE (*Murænopsis tridáctylus*), is much like the common Congo Snake, from which it may be distinguished by possessing three toes on each foot instead of two. The length of both these creatures is from two to three feet. These two species constitute the whole of the family to which they belong.

THE TAILED BATRACHIANS (*Proteida*) are now regarded as differing sufficiently from near forms to belong to a distinct order. The family *Proteida*—MUD PUPPIES—embraces one genus and one species.

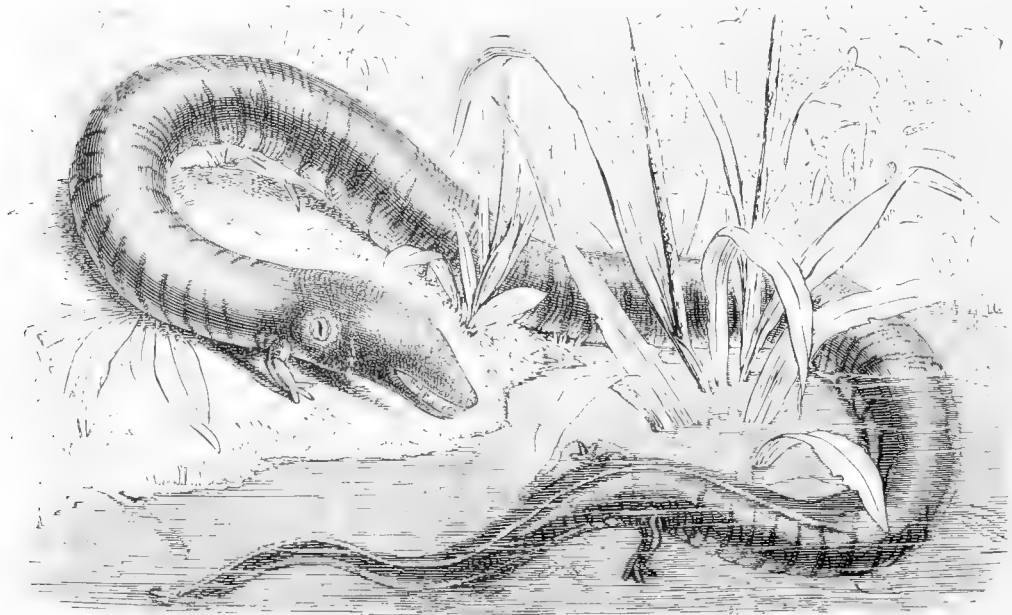
THE *Necturus* is called in the Middle States MUD PUPPY, WATER DOG, MENOBRANCHIUS, and DOG-FISH. It is common north and west of the Alleghanies, and is abundant in the Great Lake region.

THE great SIREN (*Siren lacertina*) is a species consisting of the entire family *Sirenida*. This creature has a most remarkably long, eel-like form.

AMONG these remarkable animals, the orders multiply themselves rapidly. The Pseudophidia, or False Serpents, include some very curious species, whose position remained long unsettled. There is but one family, and all its members have very long and cylindrical bodies, no limbs, a very short tail, and a smooth wrinkled skin, in which are embedded a multitude of minute scales. The two worm-like creatures, the White-bellied Cæcilia and the Slender Cæcilia, are good examples of this very remarkable family.

The name Cæcilia is derived from a Latin word signifying blindness, and is given to the creature because the eyes are always minute, and in some species are hidden under the skin. The WHITE-BELLIED CÆCILIA inhabits Southern America, and, like the rest of its kin, burrows under the ground after the fashion of the earth-worm, to which it bears so strong an external resemblance, preferring wet and marshy ground to dry soil. Its body is rather thick and cylindrical, and is surrounded by about one hundred and fifty incomplete rings. The muzzle is rounded and so is the tail. There are teeth in the jaws and on the palate, all of which are short, strong, and conical; the tongue has a curiously velvety feel to the touch. Below each nostril there is a small pit, sometimes taken for a second nostril.

The color of the White-bellied Cæcilia is blackish, marbled with white along the under surface.



THREETOED CONGO SNAKE.—*Murenopsis tridactyla*.

THE SLENDER CÆCILIA derives its name from its slight form. In this species the body is smooth throughout the greater part of its length, but towards the tail the skin is gathered into fifteen circular folds pressed closely together. The muzzle is rather broad and rounded. The body of the Slender Cæcilia is extremely elongated, being about two feet in length, and not thicker than an ordinary goose-quill. Its color is almost wholly black.

THE small but very remarkable order of animals which stands next in our list, has proved an insoluble enigma to the systematic zoologists, who not only are unable to decide upon any order to which it may belong, or in what precise relation it stands to other reptiles, but are not even able to announce positively its class, or to say whether it is a reptile or a fish. The three species which comprise this order—if indeed they do not form a separate class—are so fish-like in most parts of their anatomy and their general habits, that they might be regarded as belonging to the fishes, were not they allied to the reptiles by one or two peculiarities of their structure. Some accurate and experienced anatomists accordingly place these creatures among the fishes, while others, equally experienced, consider them as belonging to the reptiles.

In fact, the position in which these creatures are placed depends wholly on the amount of importance given to the reptilian or piscine characters.

THE species known by the name of LEPIDOSIREN, or MUD-FISH, is found in Africa, inhabiting the beds of muddy rivers.

The habits of this creature are very remarkable. Living in localities where the sun attains a heat so terrific during a long period of the year that the waters are dried and even their muddy beds baked into a hard and stony flooring, these animals would be soon extirpated unless they had some means of securing themselves against this periodical infliction, and obtaining throughout the year some proportion of that moisture for lack of which they would soon die. The mode of self-preservation during the hot season is very like that which has already been mentioned in the case of certain frogs and other similar creatures, but is marked by several curious modifications.

When the hot season has fairly commenced, and the waters have begun to lessen in volume, the Lepidosiren wriggles its way deeply into the mud, its eyes being so constructed that the wet soil cannot injure them, and the external nostrils being merely two shallow blind sacs. After it has arrived at a suitable depth, it curls itself round, with its tail wrapped partly over the head, not unlike the peculiar attitude assumed by fried whittings, except that its flexible spine enables it to squeeze the two sides closer together than can be accomplished in that fish, and in that position awaits the coming rains. It will lie in a torpid condition for a very considerable space of time, depending entirely on the advent of rain for the re-assumption of vitality.

After it has curled itself up and resigned itself to the exigencies of its condition, a large amount of a slimy substance is secreted from the body, which has the effect of making the walls of its cell very smooth, and probably aids in binding the muddy particles together. When the rains fall, the moisture penetrates rapidly through the fissures of the earth, cracked in all directions by the constant heat, reaches the cell of the Lepidosiren, dissolves its walls, and restores the inhabitant to life and energy.

Several specimens have been brought to Europe, most of which I have had opportunities of seeing while alive, as well as of examining parts of their structure after death.

While retained in an ordinary aquarium, it passes much of its time in an apparently semi-torpid condition at the bottom of the tank, generally seeking the darkest corner and squeezing itself along one of the perpendicular angles of the case. It was found, however, that whenever the surface of the water was disturbed, the creature woke up, as it were, and rose to see what was the matter. In this way it could be induced to come at a signal to take the food on which it lived.

Further investigations and experiments on a larger scale, afforded a considerable insight into the habits of this singular creature.

Several batches of these animals have been kept alive, all of which have died, some after a life of only a few weeks, and others after surviving for three years. It will, however, be useless to follow the fortunes of each separate individual, and we will therefore only examine the general habits which seem to be common to all.

The Lepidosirens, or Mud-fish as they are popularly called, were sent while still in their muddy nests, or "cocoon," according to the technical term, and, in one instance, three specimens were inclosed in a single lump of hard mud, weighing when dry about twenty pounds.

One of the cocoons is now lying before me, together with the dried and shrivelled body of its former inhabitant, still curled up in the singular fashion already mentioned. The walls of the cocoon are composed of a thick, grayish clay, quite hard and dry, and intermixed here and there with remnants of vegetable matter. The hollow in which the Lepidosiren resided is quite smooth in the interior, but gives no idea of the real shape of the inhabitant, the cell seeming to be somewhat large, most probably on account of the coat of mucous substance with which it was lined, and part of which is to be seen still adhering, like flakes of dry membrane, to the sides of the cell.

By rapidly tearing this membranous substance with an oblique bearing, it can be in some places split like a scrap of paper under similar circumstances; but when placed under the microscope, it shows no signs of organization, being of a light brown color, irregularly mottled with black. When burned, it rapidly takes fire and bursts into flame, giving out a very nauseous odor, like that which is perceived on burning the wing-case of a beetle, and leaves a firm black ash, of nearly the same shape and form as before the light was applied to it.

The remainder of this substance is found loosely adhering to the body of the former inhabitant, and can be easily stripped off.

On being immersed in water, the earthy cocoons fell to pieces as if they had been made of sugar, and the imprisoned creatures were thus released. At first they were exceedingly sluggish, and hardly stirred, but after the lapse of an hour or two they became tolerably alert.

One of these specimens died after it had been kept about six weeks, and a good plaster-cast of it is now before me. Its length is ten inches, and the circumference of the head, just in front of the fore pair of limbs, is exactly three inches. The scales are tolerably well marked, and are shown even in the plaster-cast, though in the living animal there is hardly a trace of them. They are also very evident after the creature has been immersed in spirits for some time. In taking a cast of the *Lepidosiren*, the mucous secretion with which the body is covered affords a serious obstacle to the correctness of the image, as it is apt to adhere to the plaster, and pull away with it some portions of the skin.

A fellow-specimen, that floated dead from its cocoon, is also before me, bent on itself in the manner usual among these creatures, and with its mouth widely open, showing the peculiar teeth.

Finding, as has already been mentioned, that the *Lepidosiren* would rise to the surface of the water when a splashing was made, the attendants used to feed it by paddling about with the finger, and then holding a piece of raw beef in the spot where the disturbance had been made. The creature used to rise deliberately, snatch the meat away, and, with a peculiarly graceful turn of the body, descend to its former resting-place for the purpose of eating its food.

The mode of eating was very remarkable. Taking the extreme tip of the meat between its sharp and strongly formed teeth, it would bite very severely, the whole of the head seeming to participate in the movement, just as the temporal muscles of the human face move when we bite anything hard or tough. It then seemed to suck the meat a very little farther into its mouth and gave another bite, proceeding in this fashion until it had subjected the entire morsel to the same treatment. It then suddenly shot out the meat, caught it as before by the tip, and repeated the same process. After a third such manœuvre, it swallowed the morsel with a quick jerk. The animal always went through this curious series of operations, never swallowing the meat until after the third time of masticating.

After a while, it was thought that the water in which it lived was not sufficiently warm to represent the tepid streams of its native land, and its tank was consequently sunk in a basin, where the water is kept at a tepid heat for the purpose of nourishing the tropical plants which grow in it. Here the creature remained for some time, but at last contrived to wriggle itself over the side of its tank, and roam about in the large basin quite at liberty.

It remained here for some time, and being deprived of its ordinary supply of raw beef, took to foraging for itself. The gold-fish with which the basin is stocked became its victims, and it was quite as destructive as an otter would have been. It had quite a fancy for attacking the largest fish; and though apparently slow in its movements, could catch any fish on which it had set its wishes. As the fish was quietly swimming about, suspecting no evil, the *Lepidosiren* would rise very quietly beneath it until quite close to its victim, just as the terrible ground-shark rises to take its prey. It then made a quick dart with open mouth, seized the luckless fish just by the pectoral fins, and with a single effort bit entirely through skin, scales, flesh, and bone, taking out a piece exactly the shape of its mouth, and then sinking to the bed of the basin with its plunder. The poor fish was never chased, but was suffered to float about in a half-dead state, and numbers of mutilated gold-fish were taken out of the basin.

I have several times seen the creature while swimming about in search of a dinner, and have been much struck with the exceeding grace of its movements, which, indeed, very strongly resemble those of the otter.

At last its depredations were checked, for when the basin was cleansed, according to custom, a portion was fenced off, so that the *Lepidosiren* could not get out, and the gold-fish could not get in.

Not choosing to supply a succession of gold-fish, out of each of which the fastidious creature would only take one bite, the superintendent bethought himself of frogs, and fed the animal regularly with these batrachians. But having been warned, by the effects on the gold-fish, not to trust his fingers within reach of the teeth that could inflict such very effective bites, he got a long stick, cleft one end of it, put one hind-foot of the frog into the cleft, and held it on the surface of the water, so that the struggles of the intended victim should agitate the surface, and warn the *Lepidosiren* that its dinner was ready. No sooner did the frog begin to splash, than the *Lepidosiren* rose rapidly beneath it, seized it in its mouth, dragged it off the stick like a pike striking at a roach, and sunk to the bottom with its prey. Not a vestige of the frog was ever seen afterwards; and Mr. Wilson naturally conjectures that the poor victim was gradually chewed up, like the beef with which the creature was formerly fed.

Under this regimen the *Lepidosiren* grew apace, and in three years had increased from ten inches in length and a few ounces in weight, to thirty inches long, and weighing six pounds and a quarter. The rapidity of its growth may be accounted for by the fact, that it had fed throughout the entire year, instead of lying dormant for want of water during half its existence, and its size was apparently larger than it would be likely to attain in its native state.

Thinking that perhaps the creature might need its accustomed season of repose—happily called *æstivation*, in opposition to the term *hibernation*—it was well supplied with clay similar to that from which its cocoon had been formed, but without any result, the animal evincing no disposition to avail itself of the stores so thoughtfully collected in its behalf. This is, I think, a very interesting example of the manner in which nature accommodates herself to circumstances, and is paralleled by many other instances in the several departments of Natural History. Bees, for example, on finding themselves within easy distance of a sugar plantation, have been known to decline honey making; and the same result has occurred when they were transported to fertile localities where the honey-bearing flowers are in blossom throughout the year.

As an example of a similar phenomenon occurring in the vegetable kingdom, I may instance some Australian flowers brought over by Mr. Howitt, and planted in his garden. These plants were at first sadly puzzled by the seasons, wanting to blossom just as our winter had set in, but in the course of a few years they grew gradually later in blossoming, until they had found the proper season, and then were content to put forth their leaves and flowers at the same time as the indigenous plants.

The cause of this specimen's regretted death was rather curious. In the winter time, when the basins were cleaned, the animal was removed from one basin to another, while the former was being emptied. Unfortunately, the fires which warmed the water were suffered to expire during the night, and in the morning the poor *Lepidosiren* was found chilled to death.

The history of this creature is not only interesting, but is valuable as it shows the comparative advantages of watching the habits of animals in large and small habitations. Had, for example, the creature lived from the first in the large basin, its remarkable mode of eating its food could not have been observed, as it always seeks the bottom of its prison for that purpose; while, had it been always kept in the glass tank, its graceful movements and fish-eating propensities would never have been discovered.

The bones of the *Lepidosiren* are, when first taken from the body, of a bright green color, and so gelatinous in structure, that if left in the water they would probably dissolve. After a time, however, the green color fades, though traces of it can still be discerned. The bones

of the head are, however, of a firmer character, as is needful for the management of the sharp and powerful teeth; and in the skull of the above-mentioned specimen, the green tint still lingers on several of the bones.

The teeth are most remarkable, looking as if they were made from a ribbon of enamel-covered bone, plaited in a series of very deep undulations in front, and sweeping off at each side with a bold curve. Those of the palate and lower jaw are so made that they lock into each other, the folds exactly corresponding, and fitting into each other with such exactness, that no creature when seized could hope to escape without much detriment. The edges of this continuous tooth-ribbon, if I may so call it, are very sharp, and armed with small saw-like teeth, rather worn away in front, but very perceptible on the sides. In the very front of the upper jaw are two little pointed teeth set apparently loosely in the soft parts of the nose, and quite useless for biting. When, however, the skull is removed from the body, and cleared of muscle and other soft parts, these teeth retain their place, and by the hardening of their attachments become tightly fixed in the skull.

During life the points of these teeth project very slightly through those two little holes just inside the upper lip, which are considered as the internal nostrils. While the creature is alive, the teeth cannot be seen even when the mouth is open, being covered by a very soft and yielding substance, through which they seem to cut when in use.

The external aspect of this creature is very singular, the chief characteristics being its eel-like form, and the four long slender projections which stand in the place of limbs, and are analogous to similar structures in certain reptiles already described and figured. These are not true limbs, and the cartilaginous ray by which they are supported has no joint. They are quite soft and flexible, as if they were made of leather, and are of very trifling use in locomotion. The two fore-limbs are set at the shoulders, just behind the head, and widely separated from each other, while the hinder pair are quite close together at their bases. In the species just described, two short tubercular appendages, about an inch in length, accompany the larger limb-like projections, and, except in dimensions, bear a close resemblance to those organs. I may take this opportunity of remarking that the creature is not known to leave the water and to crawl on land.

Another specimen has not attained to any great size, being scarcely half as large as the individual just described, though it has lived in captivity for three years. The tank in which it resided was small, and may have probably accounted for the slight increase in dimensions. It was interesting to watch this creature move about its prison, as the peculiar screw-like or spiral movement of the limbs was well exhibited. The whole body was covered with rather large scales, embedded deeply in the skin, and not easily to be seen in living specimens.

The name of *Lepidosiren*, or Scaly Siren, is given to this creature on account of its scaly covering. At about one-third of the distance from the head to the tip of the tail a rather narrow and fin-like membrane arises, which runs completely round the tail until it is terminated close to the bases of the hind pair of limbs. It is strengthened throughout by a series of soft jointed rays.

The flesh of the *Lepidosiren* is very soft and white, and is thought to be excellent for the table, so that in its native country it is dug up from its muddy bed and used for food. It usually burrows to a depth of eighteen inches. This creature possesses both lungs and gills, the latter organs being twofold, the external gills being tufted on the under side, and the internal gills being placed on the edge of the divisions between the gill openings on the side of the neck. The heart is more reptilian than piscine, having three compartments, two auricles and one ventricle, and affords one of the strongest reasons for ranking the creature among the former class.

There are several species of *Lepidosiren*, divided into two genera, distinguished from each other by the number of ribs. The species which is found in Southern America, and is there known under the popular name of CARAMURU (*Lepidosiren paradoxa*), has fifty-five pairs of ribs, whereas the African species has only thirty-six pairs. The color of the *Lepidosiren* is darkish brown with a wash of gray.

THE next order of Crawling Batrachians is called by the name of Meantia, and contains a very few but very remarkable species. In all these creatures the body is long and smooth, without scales, and the gills are very conspicuous, retaining their position throughout the life of the animal. There are always two or four limbs, furnished with toes, but these members are very weak, and indeed rudimentary, and both the palate and the lower jaw are toothed.

The first example of this order is the celebrated PROTEUS, discovered by the Baron de Zois, in the extraordinary locality in which it dwells.

At Adelsberg, in the duchy of Carniola, is a most wonderful cavern, called the Grotto of the Maddalena, extending many hundred feet below the surface of the earth, and consequently buried in the profoundest darkness. In this cavern exists a little lake, roofed with stalactites, surrounded with masses of rock, and floored with a bed of soft mud, upon which the Proteus may be seen crawling uneasily, as if endeavoring to avoid the unwelcome light by which its presence is known. These creatures are not always to be found in the lake, though after heavy rains they are tolerably abundant, and the road by which they gain admission is at present a mystery.

The theory of Sir H. Davy is, "that their natural residence is a deep subterraneous lake, from which in great floods they are sometimes forced through the crevices of the rocks into the places where they are found; and it does not appear to me impossible, when the peculiar nature of the country is considered, that the same great cavity may furnish the individuals which have been found at Adelsberg and at Sittich."

Whatever may be the solution of the problem, the discovery of this animal is extremely valuable, not only as an aid to the science of comparative anatomy, but as affording another instance of the strange and wondrous forms of animal life which still survive in hidden and unsuspected nooks of the earth.

Many of these animals have been brought in a living state to England, and have survived for a considerable time when their owners have taken pains to accommodate their condition as nearly as possible to that of their native waters. I have had many opportunities of seeing some fine specimens, brought by Dr. Lionel Beale from the cave at Adelsberg. They could hardly be said to have any habits, and their only custom seemed to be the systematic avoidance of light. Dr. Beale has kindly forwarded to me the following account of these curious creatures:—

"One of the Proteuses I brought over from Adelsberg lived for five years, and, what is very interesting, passed four years of his life in the same water, a little fresh being added from time to time to make up for the loss by evaporation. He lived in about a quart of water, which was placed in a large globe, this being kept dark by an outer covering of green baize. Perhaps half a pint of water may have been added during two years.

"He was not once fed while he was in confinement, and one of his companions died soon after taking a worm before he had been two years in this country.

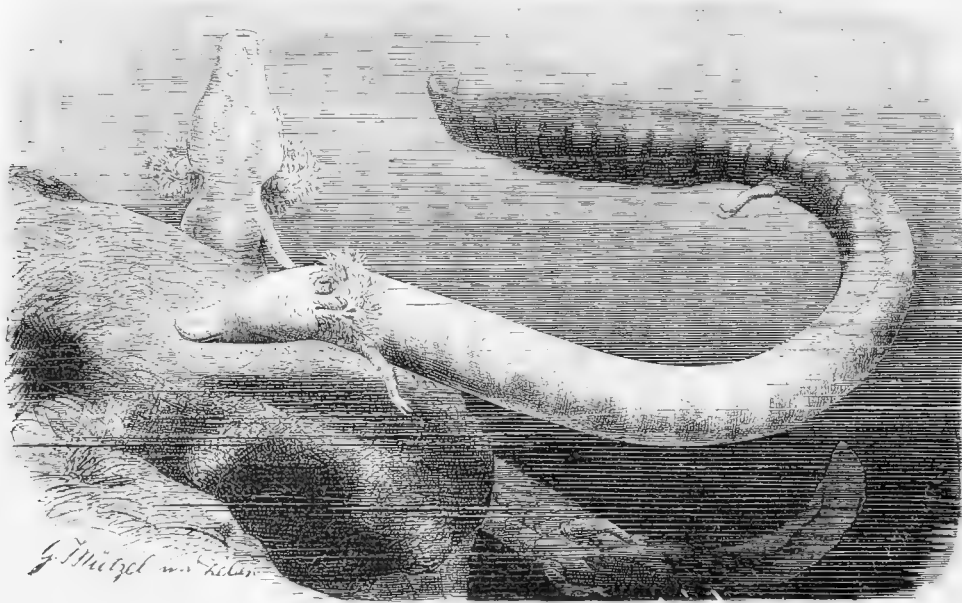
"The one I kept was very active, and his movements were as rapid as those of an eel. He was thinner just before death than when he was brought from the cave, but the loss of substance was so very slow as not to be perceptible from year to year, and to the last he retained the power of performing very active muscular movements.

His external gills always contracted when a strong light was thrown upon them. The circulation of the blood in the vessels of these organs was very often exhibited; the animal being placed in a long tube with a flat extremity, provided with an arrangement for the constant supply of water, and on several occasions some of the large blood corpuscles were removed for the purpose of microscopical examination, so that the animal was not placed under the most favorable circumstances for living without food.

"There are probably very few more striking examples of very slow death from starvation than this, and it is probable that the ultimately fatal results were as much caused by confinement, change of air and temperature, and occasional exposure to light for some hours, as from mere starvation. It is well known, for example, that, as a general rule, the Batrachia endure starvation most remarkably."

The gills of the Proteus are very apparent, and of a reddish color, on account of the blood that circulates through them. I have often witnessed this phenomena by means of the ingenious arrangement invented by Dr. Beale, by which the creature was held firmly in its place while a stream of water was kept constantly flowing through the tube in which it was confined. The blood discs of this animal are of extraordinary size; so large, indeed, that they can be distinguished with a common pocket magnifier, even while passing through the vessels. Some of the blood corpuscles of the specimen described above, are now in my possession and, together with those of the lepidosiren, form a singular contrast to the blood corpuscles of man, the former exceeding the latter in dimensions as an ostrich egg exceeds that of a pigeon.

The color of the Proteus is pale faded flesh tint, with a wash of gray. The eyes are quite useless, and are hidden beneath the skin, those organs being needless in the dark recesses where the Proteus lives. Its length is about a foot. What are the natural habits of this strange animal, what is its food, of what nature is its development, and what is its use, are a series of problems at present unanswered. By some writers it has been thought to be merely



PROTEUS. *Proteus anguineus*.

the larval state of some large Batrachian at present unknown; but the anatomical investigations that have been made into its structure seem to confirm the idea that it is a perfect being, and one of those species which carry the gills throughout their whole existence.

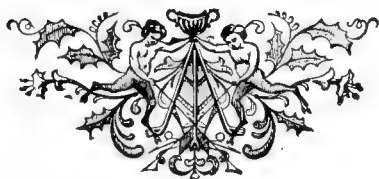
IN the NECTURUS, the head is much broader and flatter and the tail shorter than in the preceding species. This animal belongs to the same family as the proteus, but is a native of America, being found in the Mississippi and several of the lakes. It is rather a large animal, attaining, when adult, a length of two or three feet, and being of a thick and sturdy make. The gills of this creature are large and well tufted, and the limbs are furnished with four toes on each foot, but without claws.

The general color of this creature is olive-brown above, dotted with black, and with a black streak from the nostril through the eye, and along each side to the tail. Below it is blackish-brown with olive spots.

OUR last example of the Batrachians is the curious SIREN, or MUD-EEL, as it is sometimes called, on account of its elongated eel-like form and its mud-loving habits.

It is a native of several parts of America, and is found most plentifully in Carolina, where it haunts the low-lying and marshy situations. The rice-grounds seem to be its most favored localities, the muddy soil being the substance best adapted for its means of progression. Its food seems to consist almost entirely of worms and various insects, of which it will consume a considerable quantity every day. A fine specimen used to feed upon earth-worms, of which it would devour about eighteen or twenty every two days. This individual passed the greater part of its time beneath the thick stratum of soft mud with which the bed of the basin was profusely covered. This was a very long specimen, and by an uninitiated observer would probably have been taken for an eel.

The head of the Siren is small in proportion to the size of the animal, the eye is very small, and the gill tufts are three in number on each side, and beautifully plumed. It has only one pair of legs, the hinder set being wanting, and the front pair are extremely small, and of no practical use in progression. It has only three toes on each foot. The color is dark blackish-brown, and the length of a fine specimen is about three feet.



FISHES; PISCES.



IN the FISHES, the last class of vertebrated animals, the chief and most obvious distinction lies in their adaptation to a sub-aqueous existence, and their unfitness for life upon dry land.

There are many vertebrate animals which pass the whole of their lives in the water, and would die if transferred to the land, such as the whales and the whole of the cetacean tribe, an account of which may be found in Vol. I., page 418. But these creatures are generally incapable of passing their life beneath the waters, as their lungs are formed like those of the mammalia, and they are forced to breathe atmospheric air at the surface of the waves. And though they would die if left upon land, their death would occur from hunger and inability to move about in search of food, and in almost every case a submersion of two continuous hours would drown the longest breathed whale that swims the seas.

The Fishes, on the contrary, are expressly formed for aquatic existence; and the beautiful respiratory organs, which we know by the popular term of "gills," are so constructed that they can supply sufficient oxygen for the aeration of the blood. They have not the power, as is sometimes imagined, of separating the oxygen, which, in its combination with certain proportions of hydrogen, compose the element in which they live, but are able to take advantage of the atmospheric air which is contained in the water.

Any reader who happens to possess a globe with gold-Fish can prove, and doubtlessly has proved, the truth of this assertion. It often happens that when the supply of water is insufficient, or the mouth of the vessel too small to permit the air to be absorbed by the water in sufficient volume, the Fish come gasping to the surface, and there swim with gaping mouths, sucking in the air with audible gulps. But if a little water be taken up in a cup or spoon, and dashed back from a little height, so as to cause a sharp splash, or, better still, if a syringe be employed for the same purpose, so as to drive a quantity of atmospheric air into the water, the Fish soon become contented, their anxious restlessness abates, and they quietly swim backward and forward, without displaying any more signs of uneasiness.

The reason that Fishes die when removed from the water, is not because the air is poisonous to them, as some seem to fancy, but because the delicate gill membranes become dry and collapse against each other, so that the circulation of the blood is stopped, and the oxygen of the atmosphere can no longer act upon it. It necessarily follows, that those Fish whose gills can longest retain moisture will live longest on dry land, and that those whose gills dry most rapidly will die the soonest. The herring, for example, where the delicate membranes are not sufficiently guarded from the effects of heat and evaporation, dies almost immediately it is taken out of the water; whereas the carp, a fish whose gill-covers can retain much moisture, will survive for an astonishingly long time upon dry land, and the anabas, or climbing perch, is actually able to travel from one pool to another, ascending the banks, and even traversing hot and dusty roads.

The entire shape of these creatures, subjected though it be to manifold variations, is always subservient to the great object of passing rapidly through the ponderous liquid in which they swim, so as to enable them to secure their prey or avoid their enemies. Even in creatures of such different shapes as the sharks, the eels, the salmon tribe, and the flat fish, the

capacity for speed is really wonderful, and is in all effected by simple and beautiful modifications of one mechanical principle, that of the inclined plane or screw.

In all Fishes, the power of progression lies in the wonderfully muscular tail with its appended fin, and the creature drives itself forward by repeated strokes of this organ in exactly the same manner that a sailor urges a boat through the water by the backward and forward movements of a single oar in the stern.

To show the power of this principle, I will mention that, being on one occasion left with a party of friends on board a fishing-barge in a small lake, and deserted by an ill-conditioned boatman, who refused either to put us ashore or take us to a better fishing-ground, and so went misanthropically home to his dinner, I called to mind the progression of the Fishes, and straightway became independent of the boatman. After hauling up the anchor, I inserted the butt end of the largest fishing-rod into the head of the rudder so as to form an extempore tiller, and by moving the rudder gently to and fro I was able to propel the barge in any direction and to any distance. We thus traversed the lake at our pleasure, drove the barge ashore at its further extremity, and left the boatman to find it and take it back as he could.

Even the eels and the flat Fishes, with their gracefully serpentine movements, adopt this mode of progression, though it is not so apparent as in the Fish whose bodies are less flexible, and accordingly employ more force in the tail itself.

The fins are scarcely employed at all in progression, but are usually used as balancers, and occasionally to check an onward movement. Before proceeding further, I may mention that all the fins of a Fish are distinguished by appropriate names. As they are extremely important in determining the species and even the genus of the individual, and as these members will be repeatedly mentioned in the following pages, I will briefly describe them.

Beginning at the head and following the line of the back, we come upon a fin, called from its position the "dorsal" fin. In very many species there are two such fins, called, from their relative positions, the first and the second dorsal fins. The extremity of the body is furnished with another fin, popularly called the tail, but more correctly the caudal fin. The fins which are set on that part of the body which corresponds to the shoulders are termed the "pectoral" fins; that which is found on the under surface and in front of the vent is called the abdominal fin, and that which is also on the lower surface, and between the vent and the tail, is known by the name of the "anal" fin. All these fins vary extremely in shape, size, and position.

The gill-cover, or operculum as it is technically called, is separated into four portions, and is so extensively used in determining the genus and species that a brief description must be given. The front portion, which starts immediately below the eye, is called the "præ-operculum," and immediately behind it comes the "operculum." Below the latter is another piece, termed, from its position, the "sub-operculum," and the lowest piece, which touches all the three above it, is called the "inter-operculum." Below the chin and reaching to the sub-operculum, are the slender bones, termed the "branchiostegous rays," which differ in shape and number according to the kind of Fish.

The scales with which most of the Fish are covered are very beautiful in structure, and are formed by successive laminae, increasing therefore in size according to the age of the Fish. They are attached to the skin by one edge, and they overlap each other in such a manner as to allow the creature to pass through the water with the least possible resistance. The precise mode of overlapping varies materially in different genera. Along each side of the Fish runs a series of pores, through which passes a mucous secretion formed in some glands beneath. In order to permit this secretion to reach the outer surface of the body, each scale upon the row which comes upon the pores is pierced with a little tubular aperture, which is very perceptible on the exterior, and constitutes the "lateral line." The shape and position of this line are also used in determining the precise position held by any species. In comparing the scales taken from different Fishes, it is always better to take those from the lateral line.

The heart of the Fish is very simple, consisting of two chambers only, one auricle and one ventricle. The blood is in consequence cold.

The hearing of Fishes appears in most cases to be dull, and some persons have asserted that they are totally destitute of this faculty. It is now, however, known that many species have been proved capable of hearing sounds, and that carp and other fish can be taught to come for their food at the sound of a bell or whistle. The internal structure of the ear is moderately developed, and there are some curious little bones found within the cavity, technically called otoliths.

The sense of touch seems to have its chief residence in the mouth and surrounding parts, the scaly covering rendering the surface of the body necessarily obtuse to sensation. The smell seems to be strongly developed, if it be possible to pronounce an opinion from the size and distribution of the nasal nerves. The brain is very small in these creatures, and from its shape, as well as its dimensions, denotes a low degree of intelligence.

In the anatomy of the Fishes there are many other interesting structures, which will be described when treating of the particular species in which they are best developed.

SOFT-FINNED FISHES ; CHONDROPTERYGII.

THE fishes comprised in the first order are called by the rather harshly-sounding title of Chondropterygii, a term derived from two Greek words, the former signifying cartilage and the latter a fin, and given to these creatures because their bones contain a very large amount of cartilaginous substance, and are consequently soft and flexible. The bones of the head are rather harder than those of the body and fins.

It is necessary, before entering into any description of the different species, to premise that the arrangement of the fishes is a most difficult and complicated subject, in which no two systematic naturalists seem to agree entirely. I have, therefore, followed the course which has been adopted throughout the whole of this work.

The cartilaginous fishes are again subdivided into groups, in the first of which the gills are quite free, and the members of this group are accordingly called by the name of Eleutheropómi, or free-gilled fishes. What quality in the fishes should give birth to such polysyllabic and harsh-sounding names, is not easy to say; but the fact is patent that not even in botany is the scientific terminology so repulsive as in the fishes. I shall endeavor, as far as possible, to avoid this technical language, and to throw the scientific descriptions to the end of the work, as in the two former volumes; and the reader may feel sure when his attention is struck by a long and difficult name, that it is only used in consequence of the exigencies of the occasion.

The first family, of which the common STURGEON is a good and familiar example, are at once known by the cartilaginous or bony shields with which the head and body are at intervals covered.

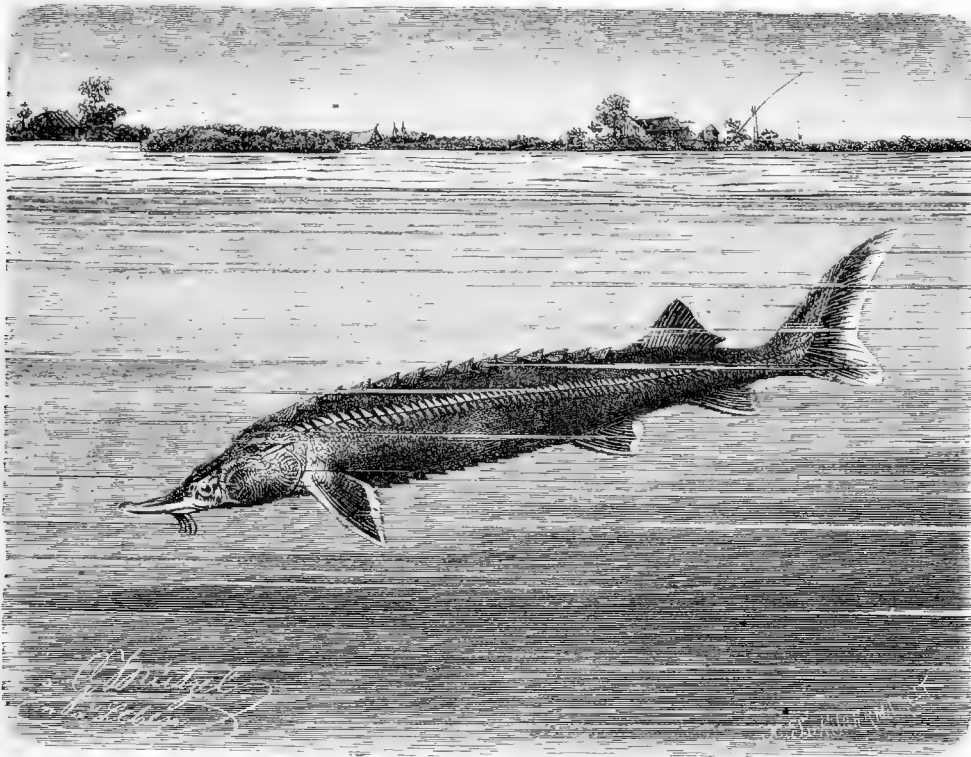
In this remarkable fish the mouth is placed well under the head, and in fact seems to be set almost in the throat, the long snout appearing to be entirely a superfluous ornament. The mouth projects downwards like a short and wide tube, much wider than long, and on looking into this tube no teeth are to be seen. Between the mouth and the extremity of the snout is a row of fleshy finger-like appendages, four in number, and apparently organs of touch.

One or two species of Sturgeon are important in commerce, as two valuable articles, namely, isinglass and caviare, are made from them. The former substance is too well known to need a description, and the mode of preparing it for use is briefly as follows: The air-bladder is removed from the fish, washed carefully in fresh water, and then hung up in the air for a day or two so as to stiffen. The outer coat or membrane is then peeled off, and the remainder is cut up into strips of greater or lesser length, technically called staples, the long staples being the most valuable. This substance affords so large a quantity of gelatinous

matter, that one part of isinglass dissolved in a hundred parts of boiling water will form a stiff jelly when cold.

Caviare is made from the roe of this fish, and as nearly three millions of eggs have been taken from a single fish, the amount of caviare that one Sturgeon can afford is rather large. It is made by removing all the membranes, and then washing the roe carefully with vinegar or white wine. It is next dried thoroughly in the air, well salted, subjected to strong pressure in order to force out all moisture caused by the wet-absorbing properties of the salt, and is lastly packed in little barrels for sale. The caviare made on the Caspian is considered the best. In Russia it forms a large item in the national consumption, probably on account of the great number of fasts observed by the Greek Church. The roes of several other fish are employed in the same manner, and in Italy, a substance called "botargo" is prepared from the roe of a species of mullet.

The common Sturgeon has sometimes, but not very often, been found in English rivers, and whenever it is captured in the Thames within the jurisdiction of the Lord Mayor, it is



STURGEON.—*Acipenser attilus*.

termed a royal fish, and becomes the property of the Crown. It is not unfrequently taken near the English shores, more especially on the eastern coast, and most persons are familiar with the occasional appearance of one of these fine fish on a fishmonger's stall. The flesh of the Sturgeon is held in some estimation; and in the olden English days, it was always reserved for the table of the king. Some very fine specimens have sometimes been caught in English rivers, the largest on record having weighed four hundred and sixty pounds. The size of this specimen may be imagined from its weight, as another individual which weighed only one hundred and ninety pounds measured eight feet in length.

The body of the Sturgeon is elongated, and slightly five-sided from the head to the tail. Along the body run five rows of flattened bony plates, each plate being marked with slight grooves in a radiating fashion, and having a pointed and partly conical spine on each plate, the points being directed towards the tail. The plates along the summit of the back are the largest.

THERE are many species of Sturgeons, and among the most remarkable are the Shovel-fish and the Spoon-bill Sturgeon, both being natives of the rivers of North America.

The SHOVEL-FISH derives its name from the curious form of its head, which is flattened, rounded, and really not unlike the implement after which it receives its popular title. The adult and young differ somewhat in their aspect. Both are of large size and show a conspicuous arrangement of the bony scales along the body.

THE SHOVEL-NOSE STURGEON (*Scaphiorhynchops platyrhynchus*). About four species inhabit the waters of Central and Eastern Asia, and the United States. One only is found in the latter region.

The term White Sturgeon is also used to designate this species. It inhabits the Mississippi Valley and the streams of the Western and Southern States. Both of the long technical terms literally mean spade-snout, and flat-snout.

THE family of Sturgeons is regarded as one very strongly marked; there being little danger of confusion as to the rights of membership. Though the Sturgeon is, in most portions of the United States, rather an unfamiliar fish, yet the characters are such, that once the species are seen they are quickly and correctly placed in a natural classification. It has no near allies, excepting those lying entombed in rocks of past geological ages. The skeleton is cartilaginous. Species are found in all north temperate portions of the globe. They all breed in fresh water; but some reside in the sea during a part of the season. Others are permanent residents in the fresh waters of the Great Lakes and rivers.

THE SHARP-NOSED STURGEON (*Acipenser sturio*). From Cape Cod to Florida this fish finds its *habitat*. It is also found in European waters. The Short-nosed Sturgeon has the same American range.

According to Jordan and Gilbert, there are two genera and twenty species of Sturgeons. There are seven species inhabiting the waters of North America. Most of the species are migratory, like the Salmon which are found in the same waters.

A variety of this species is very common in waters between Massachusetts and Florida.

THE WHITE STURGEON is native to the Columbia River. It is also called SACRAMENTO STURGEON, as it inhabits along the Pacific Coast to Monterey. It reaches a weight of from three hundred to six hundred pounds, and is used extensively for food.

THE GREEN STURGEON is reputed as unfit for food, and, indeed, it has the merited reputation of being poisonous. It is smaller in size than the preceding.

THE LAKE STURGEON, called also Ohio, Black, Stone, and Rock Sturgeon, inhabits the Mississippi River and northward to the Great Lakes. Its weight is from fifty to one hundred pounds. This is the common Fresh-water Sturgeon, which usually does not descend to the sea.

THE SHORT-NOSE STURGEON is found from Cape Cod to Florida.

THE SPOON-BILL STURGEON is, in allusion to the singular shape of the head, sometimes called the PADDLE-FISH. This creature is remarkable for several reasons. In the first place, the uncommonly elongated and flattened snout is sufficiently conspicuous to arrest the attention of even the most casual observer, and in the second place, the body is quite smooth, and wants those bony plates which generally form so characteristic an adornment of the Sturgeon. This remarkable fish is frequently found in the Ohio and Mississippi.

THE DUCK-BILLED CAT. This curiously endowed fish is represented in this country by two species, in two genera—being equally distributed in the fresh waters here and in China. They are embraced in the sub-class, Sturgeons, and in a separate order and a single family.

THE very singular family of the Chimæridæ contains a few but remarkable species.

Both these creatures are sufficiently quaint and ungainly in aspect. The NORTHERN CHIMÆRA is also known by the title of RABBIT-FISH, probably on account of its general aspect, and KING OF THE HERRINGS, because it follows the shoals of those fishes during their wonderful migrations, and makes great havoc among their numbers. The appendage to the top of the head is also looked upon by the Norwegians in the light of a kingly crown, and has contributed towards its royal title. It is known in some localities under the name of SEA CAT.

This species is mostly found in the Northern seas, and is, when living, a most beautiful creature, its body glowing with golden-brown variegations upon a white ground. The title of Gold and Silver Fish is sometimes given to the Northern Chimæra in consequence of this gorgeous coloring. The pupil of the eye is green, and the iris is white. It feeds mostly upon the smaller fish, but finds much of its subsistence among the various mollusks, crustaceans, and other inhabitants of the ocean. The flesh is not considered good, being hard and coarse.

The form of this fish is very peculiar, the body being tolerably large and rounded towards the point, and the tail tapering rapidly until it ends in an elongated thong, almost like the lash of a whip. The second dorsal fin commences immediately behind the first, and extends along the tail nearly to the extremity of its lengthened filamentary termination. The sexes may readily be distinguished from each other, both by the shape of the head and first dorsal fin, and by a pair of bony appendages close to the ventral fins. It is not a large species, seldom exceeding a yard in length.

IN the seas of the southern hemisphere, there is another species of Chimæra, called from its locality, the SOUTHERN CHIMÆRA (*Callorhynchus antarctica*) or ELEPHANT-FISH, the latter title being given to it on account of the extraordinary prolongation of the snout. The Araucanian name for this species is CHALGUA ACHAGUAL. The snout of this fish is developed into a strange cartilaginous prolongation, which is bent backwards in a hook-like form, and is thought by some persons to bear a resemblance to a common hoe.

The tail of this species does not correspond in oddity with its head, being without the long filament that gives so strange an aspect to its Northern relative. The color is satiny-white mottled with brown, and the size is about the same as that of the Northern Chimæra.

The Chimæras are so manifestly different from fishes more or less allied on each side, they are regarded as forming naturally a sub-class. They are all embraced under one order, and one family. The extraordinary appearance of these creatures quite justifies the titles given them. Two species are enumerated, one called Rat-fish, and the other Elephant-fish. The former is found in the Atlantic Ocean, from Cape Cod northward, in deep water; the other inhabits the Pacific, from Monterey northward, and is very abundant.

THE SHARKS.

THE fishes belonging to the next sub-order have their gills fixed by their outer edge to the divisions in the gill-openings at the side of the neck. This sub-order includes the Sharks and the Rays.

The first family of this large and important group is known by the name of Scyllidæ, and its members can be recognized by several distinguishing characteristics. They have spout-holes on the head, and the gill-openings are five in number on each side. Sometimes there only seems to be four openings, but on closer examination the fourth and fifth are found set closely together, the opening of the fifth appearing within that of the fourth. The teeth are sharp and pointed, and the tail is long, notched on the outer side, and is not furnished with a fin.

One of the commonest species is the LITTLE DOG-FISH, called by several other names, as is usual with a familiar species that is found in many localities. Among such names are SMALL SPOTTED DOG-FISH, LESSER SPOTTED SHARK, MORGAY, and ROBIN HUSS.

This fish is plentiful on the northern coasts of Europe, and is often thought a great nuisance by fishermen, whose bait it takes instead of the more valuable fish for which the hook was set. It generally remains near the bottom of the water, and is a voracious creature, feeding upon crustaceans and small fish. It often follows the shoals of migrating fish, and on account of that custom is called the Dog-fish.

Generally its flesh is neglected, but when properly dressed it is by no means unpalatable, and is said to be sometimes trimmed and dressed in fraudulent imitation of more valuable fish.

The skin of this and other similar species is rough and file-like, and is employed for many purposes. The handles of swords, where a firm hold is required, are sometimes bound with this substance; and joiners use it in polishing the surface of fine woods so as to bring out the grain. It is also employed instead of sand-paper upon match boxes.

The egg of this species is very curious in form and structure, and is often found on the sea-shore, flung up by the waves, especially after a storm. These objects are familiar to all observant wanderers by the sea-shore, under the name of mermaid's purses, sailor's purses, or sea purses. Their form is oblong with curved sides, and at each angle there is a long tendril-like appendage, having a strong curl, and in form not unlike the tendrils of the vine. The use of these appendages is to enable the egg to cling to the growing sea-weed at the bottom of the ocean, and is to prevent it from being washed away by the tide. After a storm, however, when the agitated waves have torn up the beds of marine wrack and other sea-weeds that usually lie in still calmness beneath their sheltering waters, and especially during the time of low tide, these objects may be found lying upon the uncovered and dripping shore, their strong but delicate tendrils entwined in almost inextricable complexity among the salt-loving vegetation of the ocean, and their tiny inmates as yet imperfect and unborn.

Water, which to these creatures contains the breath of life, gains access to the imprisoned sharkling through two slight, longitudinal apertures, one towards each end of the egg; and it is a very remarkable fact that in these waters the undeveloped young are furnished with small external gills, which are afterwards absorbed into the system—a phenomenon curiously analogous to the structure of the tadpole.

The substance of the egg-shell, if such a term can be applied to the envelope which contains the young, is of a moderately stiff, horny character, becoming harder when dry, and of a semi-transparent, yellowish hue, not very unlike, though not so clear as the yellow portions of tortoise-shell.

For the escape of the young Shark, when strong enough to make its own way in the wider world of waters, an outlet is provided in the opened end of the envelope, which opens when pushed from within, and permits the little creature to make its way out, though it effectually bars the entrance against any external foe. When it first leaves its horny home, the neophyte Shark bears with it a capsule, containing a portion of the nutrimental principle of the egg, as is seen in the chicken of the common fowl, and is enabled to exist upon this substance until it has attained the power of foraging for itself, when the small remainder of the capsule is absorbed into the abdomen.

The head of the Little Dog-fish is rather flat upon the top, there is a little spiracle or blow-hole behind each eye, and the shape of the mouth is somewhat like a horse-shoe.

The general color of the body is pale reddish on the upper parts, covered with many little spots of dark reddish-brown; below it is yellowish-white.

The length of this species is about eighteen inches.

THE ROCK DOG-FISH derives its name from the fact that it is often found on rocky coasts. From its superior size, it is also known by the name of LARGE SPOTTED DOG-FISH, and on several coasts it goes by the curt and not euphonious name of BOUNCE.

The habits of this fish are so like those of the preceding species, that they need no description.

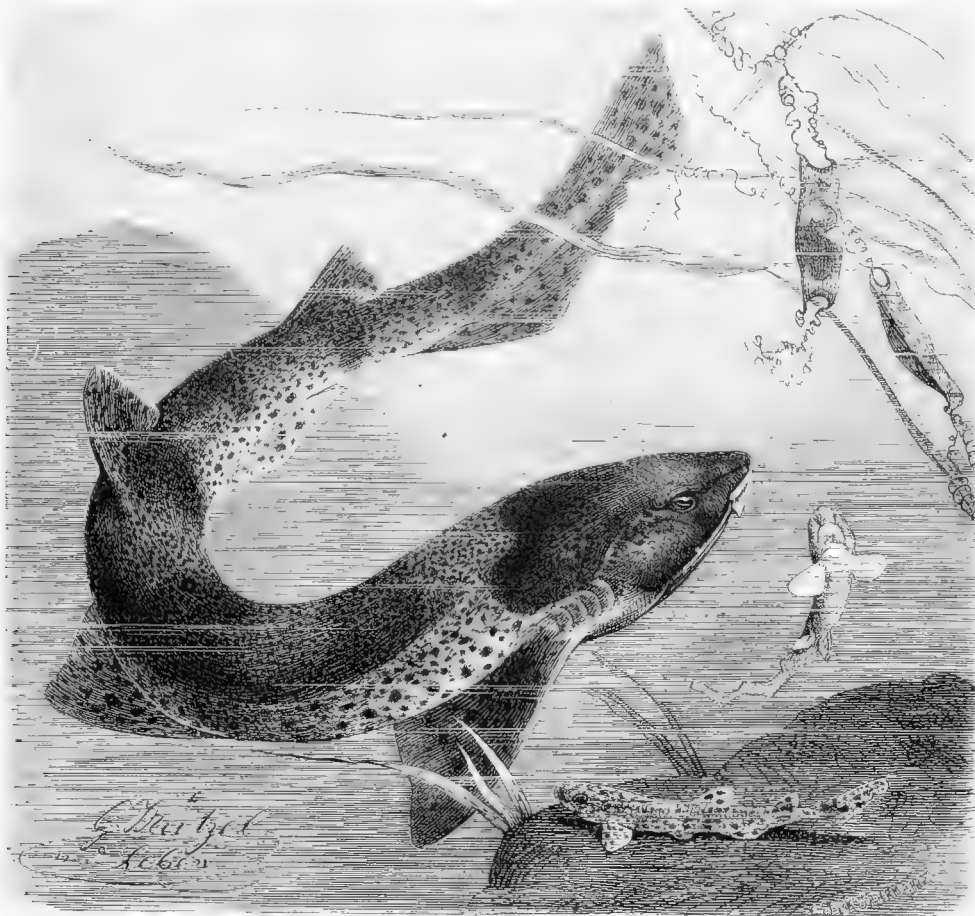
It may readily be distinguished from the little dog-fish by the large size and fewer number of the spots, as well as by the shape of the ventral fins, which in this species are nearly squared

at the end, whereas in the former they are of a diamond-like form. The color of the Rock Dog-fish is brownish-gray above, without the red tinge of the little dog-fish, and covered rather sparingly with large patches of blackish-brown. Below it is whitish. The length of a fine specimen will sometimes be nearly a yard.

ANOTHER species of Dog-fish, namely, the BLACK-MOUTHED DOG-FISH, or the EYED DOG-FISH (*Pristidurus melanostomus*), is mentioned by Mr. Yarrell among the list of European fishes. It may be at once distinguished from either of the preceding species by its large snout, and a row of small, flat, and sharp-edged prickles, arranged in saw-like fashion on the upper rim of the tail fin. The generic title *Pristidurus*, or Saw-tail, is given to the fish in allusion to this peculiarity.

Its color is light brown on the upper surface, sprinkled with spots, the smaller of which are scattered irregularly; and the larger arranged in four rows, two on each side.

Its length is between two and three feet.



ROCK DOG-FISH.—*Scyllium catulus*.

The Dog-fish family includes six or more genera. The species number fifteen,—rather small sharks, chiefly of the Atlantic. The Black Dog-fishes are represented by one species, found lately off Gloucester, Massachusetts, by the naturalists of the United States Fishery Commission. It is a native in the Greenland seas.

THE COMMON DOG-FISH, or PICKED or PIKED DOG-FISH; also called BONE-DOG, from its potent bony weapons; also SKITTLE-DOG, and HOE. Its range in the Atlantic is very wide, being very abundant on the shores of the Northern and Middle States. Its oil, from the liver, is prized, and it forms an important item of commerce among the fishermen.

A SPECIMEN of the other genus, *Centrocygnus*, was taken near Gloucester, Massachusetts. Its range extends to Portugal, on the opposite shores of the Atlantic.

THE Nurse Shark family includes two genera and four species. These Sharks are not at all the same as the so-called Nurse of the fishermen of the Northern States. It is a large, small-mouthed, harmless Shark, seen in shoals in the warm waters of the sub-tropical and tropical regions. We have seen shoals of this Shark, numbering scores, feeding in the shallow lagoons of the Tortugas reef. Their mouths are situated beneath the snout, as is the case with most Sharks; but in this species they are somewhat like those of the sturgeons, and are not armed with teeth of any considerable size; consequently, their prey consists of small stuff, as the mollusca and crustacea of the shoals. The wide-spread lagoons on the reef at Tortugas are rich feeding-grounds for this Shark. Its rather clumsy form and sluggish, harmless habits render it a tempting source of sport for the youngsters resident there. To sail with a fair wind into a drove of a hundred, more or less, and harpoon a sizeable one that would tow the boat over the reef to their hearts' content, was a privilege our boys highly appreciated, though, perhaps, savoring of the ruder class of sport.

The length of this species is from six to ten feet. Those we were accustomed to see were about seven feet on an average.

Several times we found the young of this species ensconced in some crevice of the broken coral rocks.

Under the family designated as "True Sharks" are embraced twenty or more genera, and about sixty species, found in all seas.

THE SMOOTH HOUND, or DOG SHARK (*Mustelus hinnulus*). This is the smallest of the Sharks of the American waters, and is identical with that of Venice. Another of this genus frequents the coast of California. In the same waters a kind nearly allied is

THE COMMON DOG SHARK (*Triakis semifasciatus*). It is distinguished by a row of rounded black spots along the sides of the body, alternating with the interdorsal cross bars. Another, called *T. henlei*, inhabits the same waters.

THE TIGER SHARK (*Galeocerdo tigrinus*) is the sole representative of this genus in America, being found in waters near Cape Cod. It also inhabits the Indian Ocean. It is rather large, and peculiar for the variegated appearance of coloration.

Another genus, embracing species called Smooth-toothed Sharks, is represented in American waters by THE SMOOTH-TOOTHED SHARK (*Aprionodon punctatus*).

OBLIQUE-TOOTHED SHARK (*Scoliodon terræ-novæ*), called also SHARP-NOSE, is found from Newfoundland to South America. Rather small in size.

The family of Hammer-heads embraces three genera and five species, which inhabit most seas. They are large Sharks, known at once by their most singularly-shaped heads.

SHOVEL-HEAD, or BONNET-HEAD (*Reniceps tibur*), inhabits the Atlantic southward, and extends to China.

Under the term Sharp-nosed Sharks are enumerated several large species, that live in tropical seas, of which there is one species in our waters.

THE SPOTTED-FIN SHARK (*Isogomphodon limbatus*). A stray specimen was found at Wood's Hill, Massachusetts.

THE BLUE SHARK, so called from the fine slaty-blue color of its skin, is a not unfrequent visitor of the shores of Northern Europe, and is the object of the deadliest hatred to the fishermen, who are sometimes doomed to see their fish stolen, their nets cut to pieces, and their lines hopelessly ruined by this fish, without the least power of checking its depredations.

About the month of June, according to Mr. C. observations, this Shark makes its appearance on the coasts, and has sometimes been so plentiful that nine or ten have been taken by the fishing boats in a single day. As the fishermen are hauling up their lines with the fish upon the hooks, the Blue Shark will follow the fish as it is drawn upwards, seize upon it, and hook itself for its trouble. Exasperated by the unsuspected check upon its

Animate Creation.

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W. B. CARPENTER, M.D., LL.D., writes:—"I can quite endorse the favorable opinions already given by distinguished zoologists as to the high character of the illustrations generally."

WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston, who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet, etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield; and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities. Our endeavor has been to find an author whose work would be noted for its fund of anecdote and vitality rather than for merely anatomical and scientific presentation, and we arrived at the conclusion that we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work—a work most popularly approved by speakers of the English language. It would be superfluous to say one word concerning the standard character of his book, from the pages of which old and young at the other side of the Atlantic have obtained so much instruction and rational amusement. Avoiding the lengthened dissertations and minute classifications of specialists, he presents to his readers in popular terms a complete treatise on the Animal Kingdom of all climes and countries. The one objection that could be urged against it was, that animal life in America might be treated more fully and American forms given more consideration. In order to obviate this drawback and to do full justice to the creatures of our own country, we secured the aid of Dr. J. B. HOLDER, of the American Museum of Natural History in New York, an undoubted American authority, who has adapted Wood's work to American wants and given prominence to American forms of Animal life.

The splendid work on Rodentia, by Allen, Coues, and others, will be fully consulted. The valuable work on North American Birds, by Baird, Brewer, and Ridgway, will be the guide in the treatment of birds. The late arrangement of the classification and nomenclature of North American Birds, by Mr. Ridgway, and the Committee on that subject of the Ornithologists' Union, will be utilized in full. The arrangement of Mammals will be after the latest classification by Professor Flower, of the Zoological Society of London. So that this will be the first popular Natural History worthy of the name that has made its appearance here, which gives due and full recognition to the animate world surrounding us.

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The extent of the work will be 68 parts of 28 pages, at the price of 25 cents each. The entire publication will contain 34 Oleographs and 68 Full Page Engravings on Wood, besides many hundreds of exquisite Illustrations interspersed through the text. The parts will be issued every two weeks, and are payable only as delivered. No subscriber's name will be received for less than the entire work, and anyone removing, or not regularly supplied, will please address the Publisher by mail. **No order can be cancelled after acceptance.**

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maraudings, it tries to bite the line asunder, a feat easily performed by its lancet-like teeth with their notched edges.

Sometimes, however, it takes to another stratagem, and as soon as it feels the hook, rolls itself round so rapidly on its axis, that it winds the line round its body into a mass of inextricable entanglement. So effectually is this feat achieved, that, in spite of the value of the line, the fishermen have been known to give up any attempt to unravel its knotty convolutions. This fish has another fashion of biting the line asunder without any apparent reason.

Perhaps, however, it never is so thoroughly destructive as in the pilchard season, when it follows the vast shoals of these fish to the continental shores, and devours them wholesale. Even when they are inclosed in the net, the Blue Shark is not to be baffled or deprived of its expected banquet; for, swimming along the whole length of the net, it bites at the inclosed fish, caring nothing for the meshes, and taking out large mouthfuls of mingled net and pilchards, swallows them together.

The sailors have an idea that this voracious fish is able to succor her young, when in danger, by opening her mouth and letting them swim down her throat. It is undoubtedly true, that living young have been found in the stomach of large sharks; but whether they had been swallowed as a means of protection, is by no means proved. The reader will doubtlessly remember the similar stories that have been told of the viper and other poisonous snakes.

The skull of a Shark shows the terrible teeth with which it is armed. They lie in several rows, ready to take the place of those which are broken or cast off when their work is done. From these teeth, which cut like broken glass, the natives of many savage lands make tools and weapons of war, by ingeniously fixing them into wooden handles.

The voracity and dullness of nerve belonging to the Shark is really wonderful. One of my friends was fishing after a large Shark that was following the vessel, and, after a little time, succeeded in inducing the fish to take the great hook that had been nicely baited with pork to suit his palate. Too sudden a jerk, however, having been given to the line, the hook tore its way through the side of the cheek, setting the Shark free. The wound was a terrible one, and bled profusely; but the Shark seemed to care little or nothing about it, still hovered about the bait, as if unable to resist its attractions, and after a little while was hooked a second time and hauled safely on board.

The capture of a Shark is always an event on board ship, especially if she be a sailing vessel and the wind has fallen. A hook made for the purpose is secured to a fathom or so of iron chain, the Shark being capable of biting through a rope in an instant, and in no way so particular in its diet as to need fine tackle. Indeed, as in the last-mentioned instance, the creature seems to be perfectly aware of the danger, but to be incapable of resisting the tempting morsel. The other end of the chain is firmly lashed to a stout rope, and the latter secured to the vessel, as one rush of a powerful Shark would pull half a dozen men overboard.

All things being ready, a good large piece of pork is fixed tightly on the hook, and allowed to tow overboard. The Shark, being to the full as inquisitive as the cat, comes up with true feline curiosity, and sniffs at the bait with an air of deliberate scrutiny. Sometimes, having perhaps lately partaken of a good meal, it is very coy about taking the bait, and keeps the anxious anglers above in a state of tantalized impatience for an hour or more. Generally, however, it dashes at the bait at once, and has even been known to leap from the water and hook itself before the bait had even reached the surface.

Now begins a mighty struggle, and all is eager excitement. The Shark knows no wiles, but uses all its great strength to tear away from the hook by sheer force, having apparently but slight sense of pain, and in many cases would do so were not a check put upon its efforts by a rope knotted into a bowline and dexterously slipped over its tail. Being now held by both extremities, it is shorn of its strength, like Samson without his locks, and lifted on deck by both lines. Sometimes a trident-like harpoon, technically called a "grains," the handle of which is heavily loaded with lead to make it fall with greater force, is dropped upon the struggling fish.

Being brought on deck, however, the struggles of the creature recommence with tenfold violence. Twisting with marvellous agility, snapping right and left with its murderous teeth, and dealing heavy blows with its terrible tail, it makes the deck tremble under its strokes, until some experienced sailor runs in with an axe, and, with a blow across the tail, reduces the creature to malignant impotence. The muscles of the Shark are endowed with astonishing irritability, and long after the body has been cut to pieces and parts of it cooked and eaten, the flesh will quiver if pricked with a knife-point; the separated heart will beat steadily while lying on the bare boards, and the jaws of the severed head will snap with frightful vehemence if any object be put between the teeth.

Sailors generally make high festival at the dismemberment of a Shark, and have great delight in opening the creature, for the purpose of finding out the articles which it had swallowed. For a Shark, when following a vessel, will eat anything that falls overboard. The contents of a lady's workbox, a cow's hide entire, knives, hats, boots, and all kind of miscellanea have been found in the interior of a Shark; while, on one occasion, were discovered the papers of a slaver, which had been flung overboard when the vessel was overhauled, and, by means of which papers so strangely recovered, the vessel was identified and condemned.

The color of this species is beautiful slate-blue above, and white below.

The Blue Sharks are represented in our waters by four species, being very numerous in species in other and tropical seas.

THE GREAT BLUE SHARK (*Charcharinus glaucus*) is a large form of the tropics, occasionally found in our American seas. Mr. Couch, the British naturalist, says: "This Shark is so plentiful about the month of June, that nine or ten have been taken in one day." It is a constant and serious trouble to the fishermen. This Shark is one of the kinds that are so frequently taken on ocean-going vessels.

THE DUSKY SHARK (*C. obscurus*) is a large one, reaching the length of nine or ten feet. It is very common off the American Atlantic shores.

THE SMALLER BLUE SHARK (*C. milberti*) ranges from Cape Cod to Florida, and is also found in the Mediterranean Sea. De Kay says: "This is taken frequently along our shores, and as far north as New Hampshire."

A SPECIES, *C. lamia*, was identified by Prof. Putnam from a tooth which is large enough to represent a Shark thirteen feet in length.

THE remarkable fish depicted in the accompanying illustration affords a striking instance of the wild and wondrous modifications of form assumed by certain creatures, without any ascertained purpose being gained thereby. We know by analogous reasoning that some wise and beautiful purpose is served by this astonishing variation in form; but as far as is yet known, there is nothing in the habits of this species that accounts for the necessity of this strange shape.

The shape of the body is not unlike that of the generality of Sharks, but it is upon the head that the attention is at once rivetted. As may be seen from the figure, the head is expanded laterally in a most singular manner, bearing, indeed, no small resemblance to the head of a hammer. The eyes are placed at either end of the projecting extremities, and the mouth is set quite below, its corners just coinciding with a line drawn through the two projecting lobes of the head. It is worthy of notice, that several of the commonest insects—those beautiful dragon-flies belonging to the genus *Agriion*—have heads modelled on a very similar principle, and there are some exotic insects where this singular shape is even more exaggerated, the eyes being set quite at the end of long lateral footstalks.

This species attains to a considerable size, seven or eight feet being a common measurement, and specimens of eleven or twelve feet having been known. Its flesh is said to be almost uneatable, being hard, coarse, and ill-flavored.

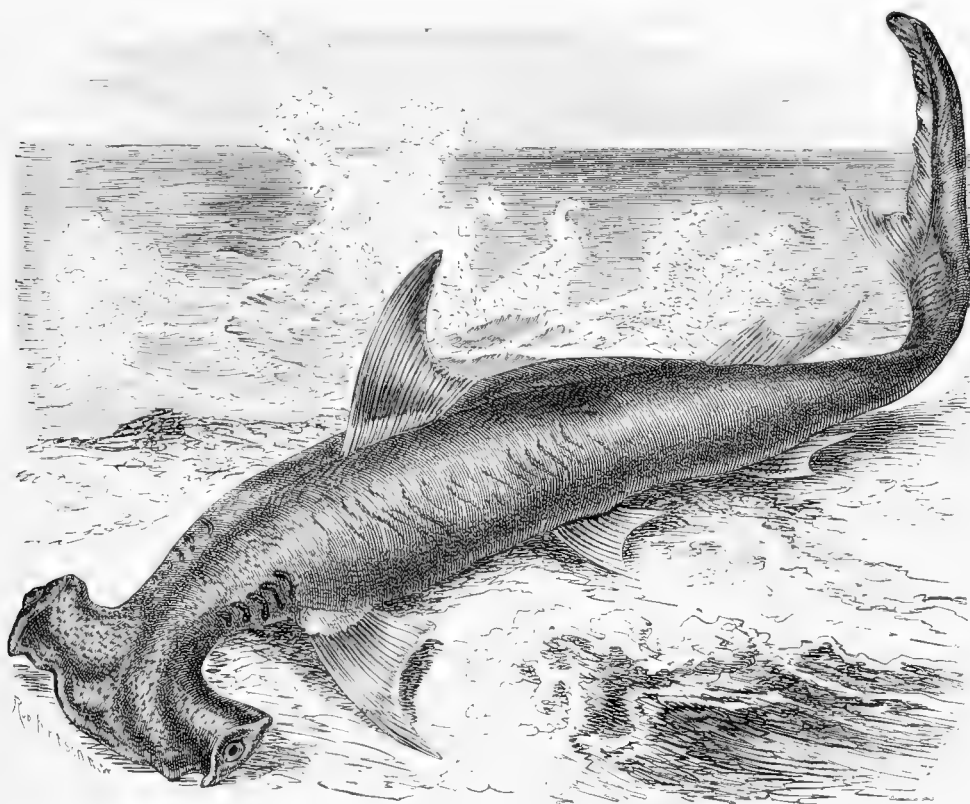
THE HAMMER-HEADED SHARK produces living young, and from the interior of a very fine specimen captured near Tenby, and measuring more than ten feet in length, were taken no less than thirty-nine young, all perfectly formed, and averaging nineteen inches in length.

Several species of Hammer-headed Sharks are known, among which the Heart-headed Shark (*Sphyrnias tiburo*), has the best developed head, and the Broad-headed Shark (*Sphyrnias laticeps*), the most so. Another species, the Tudes (*Sphyrnias tudes*), thought to inhabit the Mediterranean, and the shores of Southern America, is intermediate between the two extremes.

The general color of this species is grayish-brown above, and grayish-white below.

HAMMER-HEAD (*Sphyrna zygaena*). This is a large Shark, found in most seas. It is common on the American coast from Cape Cod southward. The width of head is about twice its length.

In Cuba this is called Cornuda. Dr. Mitchell says "the voracity of this Shark may be judged from the following occurrence at Sag Harbor, in September, 1805. Three of this species were taken in a net by Mr. Joshua Terry; the largest was eleven feet in length. On



HAMMER-HEADED SHARK.—*Sphyrnias zygaena*. (One-fifteenth natural size.)

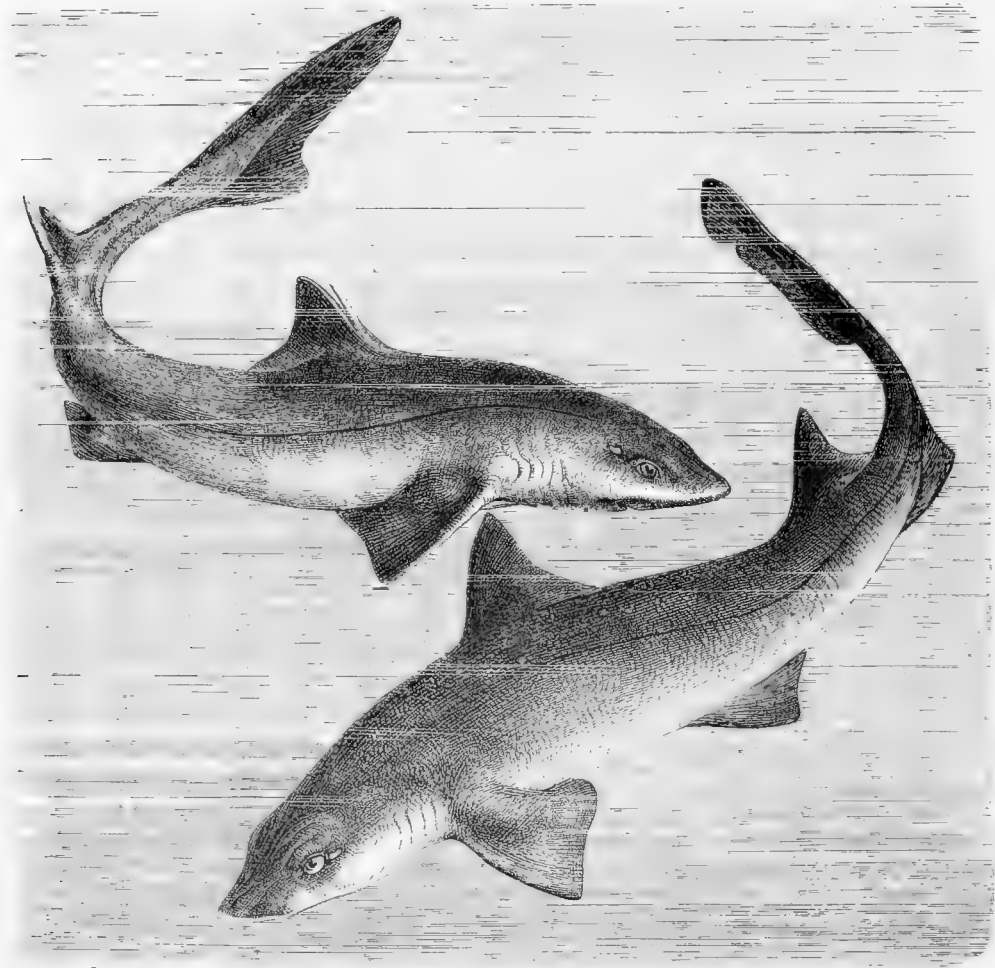
opening him many detached parts of a man were disclosed, with portions of clothing." DeKay says it is much dreaded by the Long Island fishermen, for its boldness. Some have been seen in "Hell Gate" four feet in length. The Hammer-head is equally well known on both sides of the Atlantic. Its range is from the coast of Brazil northward, but is not known to pass Cape Cod.

The extraordinary shape of this creature's head is, seemingly, a deformity; yet we are not justified in so believing—for Nature doeth all things well, and for a purpose. This Shark brings forth living young, from thirty to forty in number, all perfectly formed, and averaging nineteen inches in length.

THE destructive and voracious fish, which is indiscriminately known by the names of TOPE, PENNY DOG, or MILLER'S DOG, according to the particular coast near which it is found, is another familiar representative of the great Shark family.

The Tope is commoner towards the southern than the northern coast, but wherever it is found, it is an intolerable nuisance, behaving itself much after the example set by the blue Shark, and being, in proportion to its dimensions, quite as injurious to the fishing interest. Like the last-mentioned species, it produces living young, the number of a single family being about thirty. They are born in May and June, and mostly remain on the coasts through their first winter, not retiring into deep water till they have entered their second year.

Like the blue Shark, the Tope is fond of robbing the fishermen's hooks, and will in like manner endeavor to free itself when hooked, biting through the line, or rolling round with



PICKED DOG-FISH AND SMOOTH HOUND.—*Acanthias vulgaris* et *Mustelus vulgaris*.

such rapidity that it winds the long cord about its body into tangled knots. The upper surface of the Tope is slaty-gray, becoming lighter towards the abdomen, which is nearly white.

TOPE (*Galeorhinus galeus*). The common name of this Shark is local in the tropical countries. PENNY DOG and MILLER'S DOG are names applied to it in Europe. It is one of the species that brings its young forth alive. They are born in May, and the brood is said to be thirty in number. San Francisco is recorded as one locality it inhabits. It seems to be the only species yet known in America.

THE prettily marked and curiously toothed SMOOTH HOUND is also known under the titles of SKATE-TOOTHED SHARK and RAY-TOOTHED DOG, the two latter titles being appropriately

given it on account of its curious and beautifully formed teeth, which resemble in form the cylinders of a crushing mill, and are used for a similar purpose.

The jaws, instead of being studded with rows of sharp and knife-like teeth, are supplied with two rounded projections on which the flat-topped teeth are set closely together like the stones of a mosaic, and which are so formed that they roll over each other as the jaws are closed, producing a crushing effect of enormous power. These curious teeth are rendered needful by the food on which the Smooth Hound lives, namely, the hard-shelled crustaceans, whose armor of proof is nevertheless soon comminuted under the bony rollers.

As may be inferred from the character of its food, the Smooth Hound is not destructive to the fisheries, and may be allowed to live in harmless security. Its flesh is said to be tolerably well-flavored, and even moderately tender. It produces its young in a living state, but is not very prolific, the number at a birth rarely exceeding ten or twelve. Almost as soon as born they retire into deep water, so that, though a tolerably plentiful species, it is not seen so often as those which live in shallow waters.

The color of the Smooth Hound is pearly-gray, and above the lateral line, which in this species is very strongly marked, the body is decorated with small round white spots, very conspicuous while the creature is young, but becoming fainter when it attains maturity. The under parts are whitish-yellow.

BEFORE noticing some of the larger and more terrible species, we must not omit the PORBEAGLE, sometimes called the BEAUMARIS SHARK (*Isurus cornubicus*), a fish of a wonderfully mild aspect for a Shark, and notable for a very porpoise-like aspect. The name of Porbeagle is in fact owing to this resemblance. This species feeds on fish of various kinds, three full-grown hakes having been found in the stomach of one individual, and derives some of its subsistence from the larger mollusks. It attains a rather large size, five or six feet being a common length. Its color is uniform grayish-black above, and white below.

THE dreadful WHITE SHARK, the finny pirate of the ocean, is one of the large species that range the ocean, and in some seas are so numerous that they are the terror of sailors and natives. One individual, whose jaws are still preserved, was said to have measured thirty-seven feet in length; and when we take into consideration the many instances where the leg of a man has been bitten off through flesh and bone as easily as if it had been a carrot, and even the body of a boy or woman severed at a single bite, this great length will not seem to be exaggerated.

Many portions of this fish are used in commerce. The sailors are fond of cleaning and preparing the skull, which, when brought ashore, is sure of a ready sale, either for a public museum, or to private individuals who are struck with its strange form and terrible armature. The spine, too, is frequently taken from this fish, and when dried, it passes into the hands of walking-stick makers, who polish it neatly, fit it with a gold handle, and sell it at a very high price. One of these sticks will sometimes fetch thirty or forty dollars. There is also a large amount of oil in the Shark, which is thought rather valuable, so that in Ceylon and other places a regular trade in this commodity is carried on.

The fins are very rich in gelatine, and in China are, as is said, employed largely in the manufacture of that gelatinous soup in which the soul of a Chinese epicure delights, and of which the turtle soup is thought by Chinese judges to be a faint penumbra or distant imitation. The flesh is eaten by the natives of many Pacific islands; and in some places the liver is looked upon as a royal luxury, being hung on boards in the sun until all the contained oil has drained away, and then carefully wrapped up in leaves and reserved as a delicacy.

These islanders have a very quaint method of catching the Shark—absurdly impotent in theory, but strangely efficacious in practice. They cut a large log of wood into the rude resemblance of a canoe, tie a rope round the middle, form the end of the rope into a noose, and then set it afloat, leaving the noose to dangle in the water. Whether induced by curiosity, or by what strange impulse urged, is not very clear, but the fact is patent that before the noose has been floating very long, a Shark is sure to push its head through it, and

on backing as soon as it feels the obstruction, is caught by the tightening of the noose. The natives then go off in their canoes, chasing the bewildered Shark, who is unable to dive on account of the floating log, and who is so lustily battered about the head with the heavy clubs so admirably made by those ingenious natives, that it is soon killed and hauled ashore in triumph.

The color of the White Shark is ashen-brown above, and white below.

The Great White Shark is named in America Man-eater, and Atwood's Shark, though the latter term, applied in honor of the sea captain of Provincetown, Mass., who assisted greatly in contributing to Dr. Storer's report on the Fishes of Massachusetts, is now dropped, as the species is regarded as identical with the European. It is found in all temperate and tropical seas, and is one of the largest of Sharks, reaching a length of fifteen feet, and the weight of nearly a ton.

This Shark is especially abundant on the Florida Reef. While resident there, at Fort Jefferson, our lads of the garrison had much sport in capturing them. On one occasion, one measuring ten feet in length, and very bulky, as this species is, was hooked off shore. The boys had one of the flat pontoon boats of the engineers, otherwise they would have been taken off seaward. As it was, they had enough to do. Several soldiers went to their assistance, and rowed the party in, while the prize, hauled "short up" to the gunwale, made savage resistance. On gaining the moat of the fort planks were laid, and the monster hauled over into the confined water of the ditch. Here he remained, restlessly swimming its length of waters, steadily refusing any food. In about two months he died, seemingly exhausted.

THE Basking Sharks, or Whale-nosed, are represented in American waters by the GREAT BASKING SHARK (*Cetorhinus maximus*.) It is thought to be the largest existing Shark, being nearly forty feet in length. It is quite notable, among other things in being a resident in Arctic waters, from whence it strays as far as the latitude of Portugal, and of Virginia. It is also strange in being so enormous in bulk, and at the same time quite harmless, as it has but a small mouth and quite insignificant armament of teeth. It is called in Europe Sun-fish, Sail-fish, and Hoe-mother, from the habit of basking in the sun on the surface of the sea; from the sail-like appearance of its high dorsal fin when near the surface, and from the fact that the fishermen affect to believe it to be the Mother of the Hoe, or Piked Dog-fish, respectively.

It seems to be of a rather dull and listless character, allowing itself to be approached quite closely by a boat, without giving any signs of alarm until the bow of the boat actually touches its person.

The gill apertures of the Basking Shark are extremely long, reaching almost across the neck. The head is conical, the muzzle short, and the eyes near the snout. The skin is very rough to the touch, whether the hand be passed from head to tail or *vice versâ*, and the color is blackish-brown, glossed with a bluish tint.

Among our fishermen it is known as Bone Shark and Elephant Shark. A specimen drifted ashore at Provincetown, Mass., which afforded six barrels of oil, taken from the liver alone, which sold for \$103. The food of this Shark is probably small mollusks and crustaceans, and, according to some authors, marine algæ.

A WELL-KNOWN species, familiar under the names of THRESHER (*Alopias vulpes*), FOX SHARK, SEA FOX, SEA APE, SWINGLE-TAIL, LONG-TAIL, etc., is at once to be recognized by the peculiar form of the head and the wonderfully long upper lobe of the tail, which equals in length the body from the tip of the snout to the base of the tail. The lower lobe is quite short, and in no way conspicuous.

This fish is appropriately called the Thresher on account of its habit of using its long and flexible tail after the fashion of a quarter-staff, and dealing the most tremendous blows on or near any object that may excite its ire. Sometimes it seems to employ its tail in playing off a practical joke or frightening away dolphins or other creatures that are disporting themselves in apparent security. The following short account by Captain Crow will give a

good idea of the powers of this tremendous weapon when wielded by the iron muscles of the Thresher:—

“One morning during a calm, when near the Hebrides, all hands were called up at three A. M. to witness a battle between several of the fish called Threshers or Fox Sharks and some swordfish on the one side and an enormous whale on the other. It was in the middle of summer, and the weather being clear and the fish close to the vessel, we had a fine opportunity of witnessing the contest. As soon as the whale’s back appeared above the water, the Threshers, springing several yards into the air, descended with great violence upon the object of their rancor, and inflicted upon him the most severe slaps with their long tails, the sounds of which resembled the reports of muskets fired at a distance.

“The swordfish in their turn attacked the distressed whale, striking from below, and thus beset on all sides, and wounded, where the poor creature appeared, the water around him was dyed with blood. In this manner they continued tormenting and wounding him for many hours, until we lost sight of him, and I have no doubt that they in the end completed his destruction.” This strange alliance of two different fish against a marine mammal is a truly curious circumstance, and may have a deeper meaning than appears on the surface.

The food of the Thresher consists mostly of fish, and in the stomach of one of these creatures taken off the coast of Cornwall were found a quantity of young herrings. The color of the Thresher is dark slaty-blue above, and the same color, but mottled with white, below.

It abounds in all warm seas, and in summer is one of the most abundant kinds on our New England coast. It is also occasionally taken on the Pacific coast. The Thresher is the only representative of its family.

THE family of Sand Sharks includes one genus and three species, of which *Carcharias americanus* is the more familiar form. It is a small voracious Shark, rather common on our Atlantic shores.

The family of Porbeagles is well known through its very familiar representative, the Mackerel Shark (*Isurus glaucus*).

A species, allied of the genus *Lamna*, was lately discovered at Wood’s Holl, Mass. It is a large and fierce creature.

A large spotted species of the Whale-shark family inhabits the California waters.

The family which embraces the Port Jackson Sharks is represented in California seas by *Cestracion francesci*.

Another family in this connection is known as the Cow-shark family, having one species which ranges from Cape of Good Hope to California. It is named “Perlous,” and is of the genus *Heptangus*.

AMONG some other Sharks, the PICKED DOG-FISH deserves notice, on account of the curious weapons from which it derives its name.

In front of each dorsal fin is placed a strong and sharply pointed spine, or pike, which has caused the fish to receive its popular name in most parts of the coast. The word is a dissyllable, and pronounced Pick-ed. On some of the shores it is called the BONE DOG, and on others it is known by the name of the HOE.

These spines form aggressive weapons of a rather formidable character, the fish having the capability of directing a blow with wonderful accuracy. Mr. Couch says, that he has known the Picked Dog-fish able to pierce a finger if laid on its head, and never to miss its aim. When about to strike, it bends its body like a bow, and suddenly lashes out in the intended direction. It is a very common species, especially during the herring season, as it follows the shoals of those fish for the purpose of feeding on them. Even the tiny, quarter-grown young, not half the size of their intended prey, instinctively follow the herrings, though it is manifestly impossible that they should be able to eat them.

The Picked Dog-fish is destructive to the fishing trade, not only on account of its large appetite and the number of fish it consumes, but because it cuts the hooks away from the lines with its sharp teeth. As, moreover, it is extremely plentiful, some twenty thousand having

been captured at one haul of a seine net, the destruction which it causes can be readily imagined. Sometimes this fish assembles in large shoals, and then the fishermen avenge themselves of their injuries, by shooting their nets around them, and capturing them by boats' loads at a time. Their flesh is tolerably good, a useful oil is obtained plentifully from the liver, while the refuse portions are most valuable as manure, and are strewed in unfragrant richness over the fields, warning the nostrils at a considerable distance that the next year's crop is likely to be successful, and that a nearer approach is undesirable except to the farmer and the entomologist.

The color of the Picked Dog-fish is slaty-gray above, diversified, when young, with a few white spots, and the under parts are yellowish-white. The skin is rough if stroked from the tail to the head, and smooth when rubbed in the reverse direction. The average length of this species is about eighteen inches. It is illustrated, together with the Smooth Hound, on page 200.

THE GREENLAND, or NORTHERN SHARK (*Dalátias boreális*), must receive a brief notice, as it is frequently mentioned in accounts of whaling voyages.

This species is remarkable for the very small proportionate size of the fins, and for the manner in which the points of the teeth diverge from the centre of the jaw. It is a great foe to the whale and whalers, and is so heedless of danger when intent on satisfying its hunger, that it will follow a dead whale to the ship, mix boldly with the men who are engaged in cutting the blubber, thrust its head boldly among them, and at every bite scoop out lumps as large as a man's head.

So deeply engaged is the creature in this interesting occupation, that even if a man should slip into the water from the smooth oily skin of the whale, the Greenland Sharks take no notice of him, but continue their depredations on the whale. Even after the long whaling knife has been thrust through its body, it will dart off for the moment on feeling the wound, but will soon return to the same spot and continue its banquet. It also feeds on crustaceans and small fishes. Many specimens are nearly if not wholly blinded by a parasitic animal technically called *Lernæa elongata*, some three inches in length, which fastens upon the corner of the eye, and lives upon its fluids.

The color of this species is brown with a shade of deep blue. Its length, when full-grown, is about fourteen feet.

ANOTHER curious species of Shark, called appropriately the SPINOUS SHARK (*Echinorhæus spinosus*), is notable for the spine-topped bony tubercles which are scattered over the surface of the body. The greater number of these spinous projections are boldly hooked, in a manner not unlike the thorns of the common bramble, and the points are directed backwards; others, however, are quite straight and stand upright. The object of these curious spines is not clearly-known. They are very small in proportion to the size of the fish, and it is said that the males are more thickly studded with them than the females.

The color is dark leaden gray on the head and back as far as the first dorsal fin, the remainder being reddish-yellow with mottlings and cloudings of purple and brown. On the abdomen are irregular spots of vermilion. The chin and sides of the mouth are white. The average length of a full-grown specimen seems to be about seven or eight feet. In most, if not in all, of these creatures, the female is larger than the male, as is the case with the birds of prey.

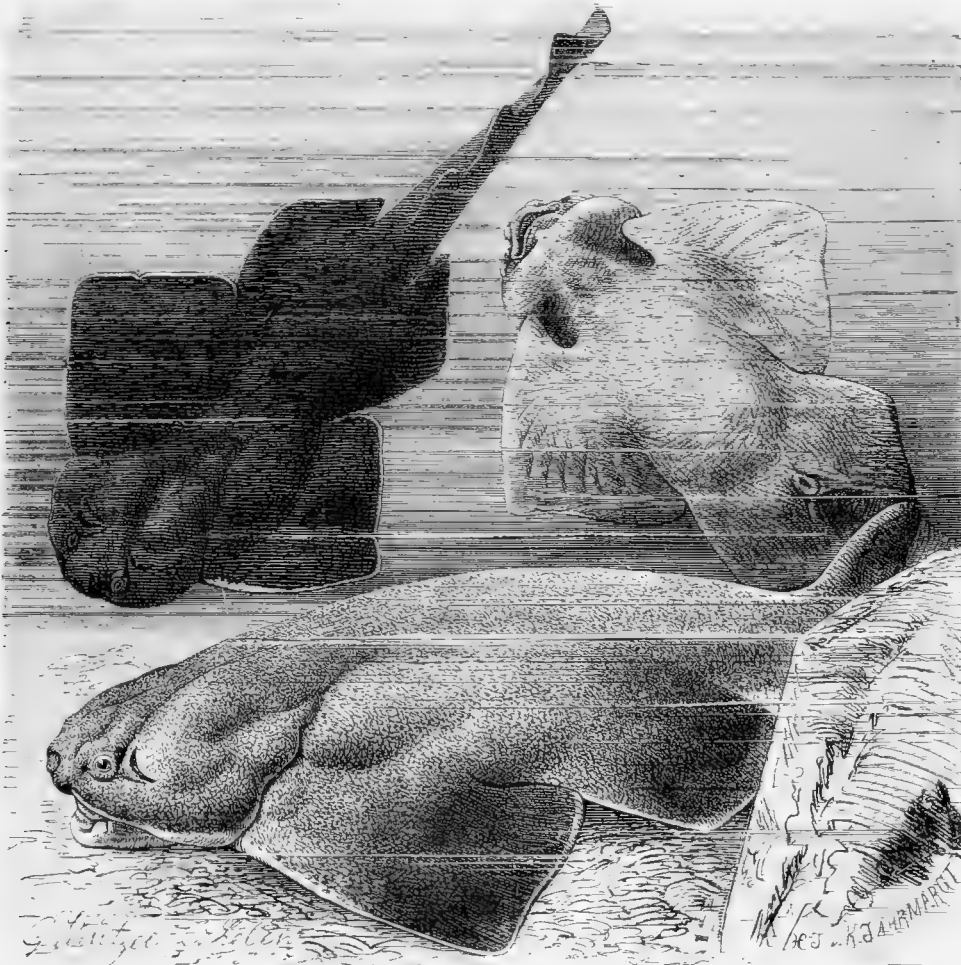
THE dark-skinned, wide-mouthed, leather-finned, and thorn-backed fish which is shown in the illustration, is popularly known throughout many parts of Europe by the name of the ANGEL-FISH, a term singularly inappropriate except on the well-known principle "lucus a non lucendo," or perchance as leaving the spectator the option of choosing the kind of angel which the creature is thought to resemble.

Sooth to say, it is as hideous a fish as is to be found in the waters, and from all accounts is as unprepossessing to the inhabitants of the sea as to those of the land, being voracious to a degree, and attaining a size that causes it to be a most formidable foe to the many fishes on

which it feeds. It is also known by the name of MONK-FISH, in allusion to the rounded head, which was thought to bear some resemblance to the shaven crown of a monk; and in some places is called the SHARK RAY because it seems to be one of the connecting links between the sharks and the rays, and has many of the characteristics of both. On some parts of the English coasts it is known as the KINGSTON.

It has many of the habits of the flat-fishes, keeping near the bottom, and even wriggling its way into the muddy sand of the sea-bed so as to conceal its entire body. As in the course of these movements it disturbs many soles, plaice, flounders, and other flat-fishes that inhabit the same localities, it snaps them up as they endeavor to escape, and devours great quantities of them, so that it is really a destructive fish upon a coast.

It is most common upon the southern shores, and has there been taken of considerable size, attaining a weight of a hundred pounds. Unfortunately, the flesh is now thought to be



ANGEL-FISH.—*Squatina vulgaris*.

too coarse for the table, though it was formerly in some estimation, so that the creature is useless to the fisherman, who can only avenge himself for his losses by killing the destructive creature, but cannot repay himself by eating or selling it. The skin, however, being rough, is of some small use in the arts, being dried and employed, like that of the dog-fish, for polishing joiner's work, and it is in some places manufactured into a sort of shagreen.

The eyes are set rather far back on the upper part of the head, and a little behind each eye is the temporal orifice, very large, in proportion to the dimensions of the fish, very long, and set transversely on the head. The wide mouth, which opens in front of the head and not below as in the sharks, is furnished with rather long and sharply-pointed teeth. The color of

the upper parts is dark chocolate-brown mottled with a darker hue, and very rough. Along the back runs a row of short, sharp spines, their points directed backwards, and the under parts are smooth and of a dull brownish-white. The length of an adult specimen is seven or eight feet.

THE RAYS.

THIS group of fishes forms a separate order, in which are seven families.

THE SAW-FISH (*Pristis antiquorum*) is a familiar form, sometimes reaching the length of fifteen feet; having a saw-like snout four or five feet in length. It is found in nearly all the warmer seas, and even in the colder regions. It is reported that this Ray swings itself side-wise with rapidity and thereby cuts down fishes by the double-edged saw, which proves a most effective weapon.

The color of the Saw-fish is dark gray above, nearly black in some individuals, the sides are ashen, and the abdomen white. It often attains a great size, measuring fifteen or eighteen feet in length, including the saw.

THE TENTACULATED SAW-FISH (*Pristiophorus cirratus*) is worthy of notice as forming a transition link between the sharks and the true Saw-fish. In this creature, the snout is lengthened and armed with spines; but these structures are of different lengths, hooked, and only attached to the skin, and not implanted in the bone, as is the case with the true Saw-fish.

IN the true Rays, or Raidæ, the fore part of the body is flattened and formed into a disc-like shape, by the conjunction of the breast fins with the snout.

Our first example of the Rays is the TORPEDO, a fish long celebrated for its power of emitting at will electrical shocks of considerable intensity. In consequence of this property, it is sometimes called the CRAMP-FISH, CRAMP RAY, ELECTRIC RAY, or NUMB-FISH.

The object of this strange power seems to be twofold, namely, to defend itself from the attacks of foes, and to benumb the swift and active fish on which it feeds, and which its slow movements would not permit it to catch in fair chase. It does not always deliver the electric shock when touched, though it is generally rather prodigal of exercising its potent though invisible arms, but will allow itself to be touched, and even handled, without inflicting a shock. But if the creature be continually annoyed, the shock is sure to come at last, and in such cases with double violence. It has been observed, moreover, that the fish depresses its eyes just before giving its shock.

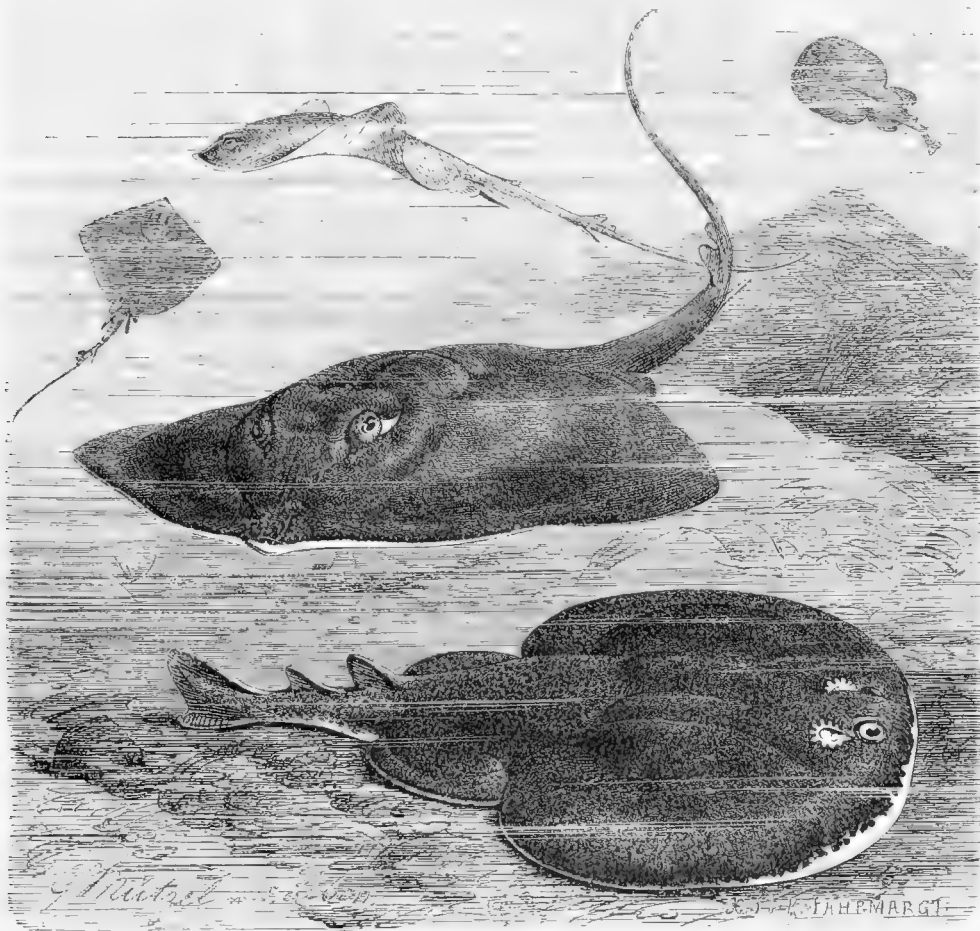
The power of the shock varies greatly in different individuals, with some being so strong as to cause the recipient to fall to the ground as if shot, and, with others, so feeble that it is hardly perceived. According to M. de Quatrefages, the fishermen are sometimes unpleasantly made aware that they have captured a Torpedo in their meshes, by the sudden shock through their arms and breast as they are hauling in their net. Anglers, too, are sometimes struck by means of the line which they are holding; and I presume that in either case the line must be wet, or it would not act as a conductor of the electrical fluid.

One of these fishes was placed in a vessel of water, and a duck was forced to swim about in the same vessel. The Torpedo soon became excited, and in a few hours the duck was dead. Fish, also, of different kinds are killed by this remarkable influence; and it is plausibly suggested by one writer, that this mode of destruction would render them liable to rapid decomposition, and would aid the organs of digestion in a creature like the Torpedo, where they are but imperfectly developed.

The shocks of this fish were once used as remedies for gout and fevers. In the first case, the patient had to lay his foot on the Torpedo, and bravely hold it in its place, despite of all the shocks sent by the angry fish through the sensitive limb of the aggressor; and in the latter case the Torpedo was used, as it were, to frighten the fever out of the system.

The patient was stripped, and the Torpedo placed successively to the joints, trunk, and extremities, so that the whole of the body and limbs were permeated, in their turn, by the electric shock.

That the stroke of the Torpedo is veritable electricity is a fact which was once much disputed, but is now conclusively proved by a host of experiments. Needles have been magnetized by it just as if the shock had been that of a galvanic battery, the electrometer showed decided proofs of the nature of the fluid that had been sent through it, and even the electric spark has been obtained from the Torpedo—very small, it is true, but still recognizably apparent. It is rather curious, that in the course of the experiments it was discovered that the upper surface of the Torpedo corresponded with the copper plate of a battery, and the lower surface with the zinc plate.



COMMON SKATE AND EYED TORPEDO.—*Raja batia* et *Torpedo oculatus*.

The structure of the electrical organ is far too complex to be fully described in this work, as it would require at least forty or fifty pages, and a large number of illustrations. I will, however, give a brief summary of the strange organ by which such wonderful results are obtained, and any of my readers who would like to examine it more in detail, will find ample information in an article on the subject by Dr. Coldstream, in the “Cyclopædia of Anatomy and Physiology.”

Briefly, then, this organ is duplex, and consists of a great number of columns, placed closely against each other, each inclosed in a very thin membrane. These columns are again built up, as it were, of flat discs, separated by a delicate membrane, which seems to contain fluid. This structure may be roughly imitated by piling a number of coins upon each other,

with a bladder between each coin and its successor—in fact, a kind of voltaic pile. The length of the columns, and consequently the number of discs, varies according to their position in the body. The columns extend quite through the creature, from the skin of the back to that of the abdomen, and are clearly visible on both sides, so that those of the middle are necessarily the longest, and those at either end become gradually shorter. In many large specimens, more than eleven hundred columns were counted, and the number of discs is on an average a hundred to the inch. It seems, from the best researches, that the growth of this organ is produced, not by the increase of each column, but by a continual addition to their number. A vast amount of blood-vessels pass through the electric organ, and it is permeated with nerves in every direction.

How the electrical effect is produced is a very deep mystery. In fact, we know scarcely aught of this marvellous power, save the knowledge that it pervades all nature, and even in its external manifestations is one of the most ethereal and most potent of the second means through which the will of the Creator guides His universe. That the same electrical principle exists in all animals is familiarly known, and also that it is far more intense in some individuals than in others of the same species. It is known that the contact of two different kinds of flesh, such as the muscle of a fish and an ox, both newly killed, will produce similar effects; and that it exists so largely in human beings, that no two individuals can place themselves on isolated stools, and join their hands, without emitting so much electricity by that slight contact, that the instrument will record its presence. But the origin of this wonderful power eludes our mental grasp like the receding waters of the mirage, and the increase of our knowledge serves but to betray the extent of our ignorance.

I cannot but think that this subtle and potent emanation, which is able to strike the victim through an intervening space of the fluid common to both aggressor and sufferer, has some affinity with the still more subtle and equally mysterious influence by which certain of the serpent race are enabled to paralyze or attract the creatures which they could not secure by actual contact. It may possibly be that the electric powers of the Torpedo, which need water or some other conducting substance for their exercise, are, after all, but a more concentrated and palpable manifestation of that force, which enables the rattlesnake to arrest an animal not in physical contact with itself, the pointed finger to lay a bird motionless on its back until released by a sudden sound or touch, and one human being to influence his fellow without the use of words, and to attract or repel him by an irresistible though invisible agency.

It is rather remarkable that even the Torpedo, gifted with such puissant arms, dealing pain and death around at will, should find at all events one foe insensible to the electric stroke, and perhaps even needing its exciting influence to preserve it in health. This is a parasitic creature, termed scientifically the Branchellion, which clings to the Torpedo and feeds upon its juices, quite indifferent to all the shocks which its victim dispenses. It generally measures from an inch to an inch and a half in length.

This fish is found in the Mediterranean, and the Indian and Pacific Oceans, and occasionally off the Cape. Happily, the Torpedo does not attain a very great size, one of the largest specimens being about four feet long, and weighing sixty or seventy pounds.

Of the Torpedo family there are three species known to American waters. The Numb-fish, or Cramp-fish, Torpedo, was formerly common off Cape Cod, Mass., ranging southward to Florida.

A specimen weighing sixty pounds was sent to Boston, where Dr. Storer examined it. It was powerful enough to give an all sufficient shock to an average man.

A species is known in California waters. The Ray family proper, embracing the forms called Skates, has four genera and about forty species. Those in American waters are: the Common Skate, Ocellated Ray, Starry Ray, Brier Ray, Barn-door Skate, Granulated Skate. On the Pacific coast are four kinds. The Skates are well known to all who go down to the sea "to fish."

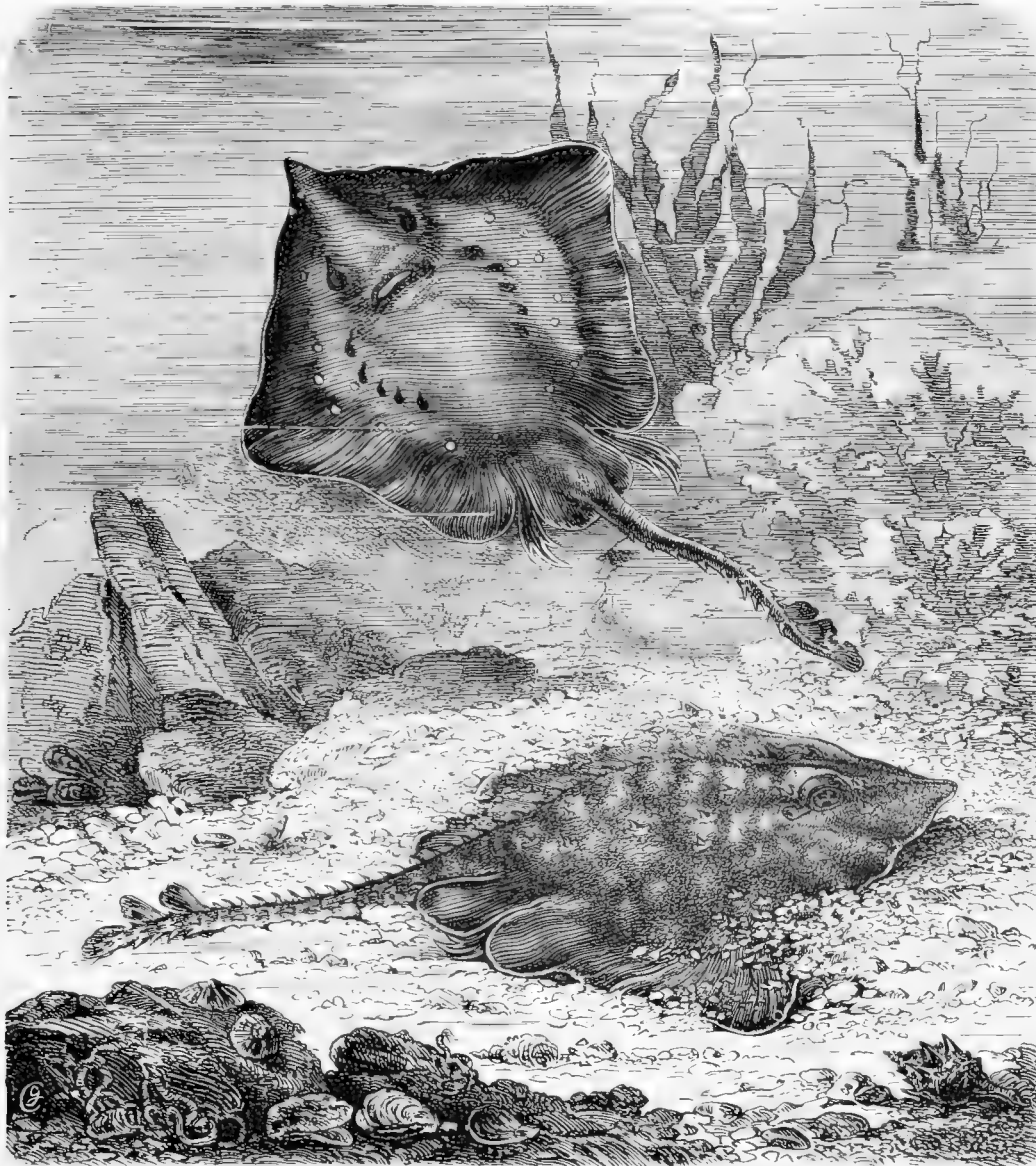
The Butterfly Ray inhabits the same waters. The young of the Skates are produced from eggs, called barrows, from their resemblance to hand barrows. Many have seen those black or

brownish oblong objects on the beaches, having four arms, which cling to seaweeds sometimes. These are the eggs. Fine examples will be seen on page 195, and in the plate near the close of this volume, entitled *Gorgonia verrucosa*; the "barrows" are seen coiling on the branches.

The Eagle Rays form another family, having three genera and twenty species.

The Cow-nose Rays are members of this family. Some of them are very handsome—really looking like large butterflies while swimming, being about a foot wide, with pure white bellies and delicate gray backs.

THE Rays are well represented by several large and curious species. One of the commonest examples is the THORNBACK SKATE OR RAY, so called from the large number



THORNBACK SKATE.—*Raja clavata*.

of thorny projections which are scattered over its back, and especially along the spine. This species is represented by the illustration.

The Thornback is one of the common Rays, and is taken plentifully on the shores of northern Europe. As is the case with many of the same genus, the flesh is considered rather good, and is eaten both when fresh and when salted for consumption during stormy weather. Autumn and winter are the best seasons for procuring this fish, as the flesh is then firm and white, while during the rest of the year it is rather liable to become flabby. Thornbacks taken in November are thought to be the best.

This species, like the rest of the Rays, feeds on crustacea, flat-fish, and mollusks, and as many of these creatures possess very hard shells, the Rays are furnished with a crushing mill of teeth, which roll on each other in such a way that even the stony shell of a crab is broken up under the pressure. It is notable that the teeth differ in the two sexes when adult. Those of the female are flat on the top, but those of the male throw out a strong angular projection, which is so arranged that the projections of one jaw exactly fit into the interstices of the other, and the roller-like arrays of teeth bear a wonderful resemblance to the well-known clod-crushing machine.

The young of this and other Skates are produced from eggs, whose form is familiar to every visitor to the sea-shore, where they go by the popular name of Skate-barrows. Their color is black, their texture leathery, thin, and tough, and their form wonderfully like a common hand-barrow, the body of the barrow being represented by the middle of the egg, and the handles by the four projections at the angles. The empty cases are continually thrown on the beach, but it is seldom that the young are found inclosed, except after a violent storm, or when obtained by means of the dredge.

This species is notable for certain thorny appendages to the skin, which are profusely sown over the back and whole upper surface, and among which stand out conspicuously a few very large tubercular spines, with broad, oval, bony bases, and curved, sharp-pointed projections. Fifteen or sixteen of these bony thorns are found on the back. Along the spine runs a single row of similiar spines, and at the commencement of the tail it is accompanied by another row on either side, making that member a very formidable instrument of offence. In point of fact, the tail is as formidable a weapon as can be met with, and the manner in which this living quarter-staff is wielded adds in no slight degree to its power. When angered, the Skate bends its body into a bow-like form, so that the tail nearly touches the snout, and then, with a sudden fling, lashes out with the tail in the direction of the offender, never failing to inflict a most painful stroke if the blow should happen to take effect.

The color of the Thorn-back Skate is brown, diversified with many spots of brownish-gray, and the under parts are pure white.

THE family of "Sea Devils" embraces the most remarkable forms of any.

THE SEA DEVIL, DEVIL-FISH, MANTA (*Manta birostris*), inhabits from the tropical waters northward to the Carolinas, reaching the length, or width, properly, of twenty feet. Dr. Mitchell records one that required the strength of three yoke of oxen to drag it. It was estimated to weigh over four tons. Singular instances have occurred of this creature becoming entangled in the anchor gear of small vessels, and actually towing them some distance before the cause of the unusual movement was discerned.

We have seen several of these monsters, feeding apparently on shoals of small fishes, in the Gulf of Mexico. As they turned in the course of their feeding, the great pectoral flaps were thrown upward out of the water, exposing a white under surface, and creating a great commotion in the sea.

THE COMMON SKATE, sometimes called the TINKER, is so well known that only a very short description is needed.

This fish is found in great plenty, and sometimes attains to a really large size, a fine specimen having been known to weigh two hundred pounds. The fishermen have a custom of calling the female Skate a Maid, and the male, in consequence of the two elongated appendages at the base of the tail, is called the Three-Tailed Skate. It is a very voracious creature, eating various kinds of fish, crustaceans, and other inhabitants of the deep.

The color of this species is grayish-brown on the upper surface, and a little reddish-brown and black-brown are found on the edges of the broad fins. Below, it is grayish-white, over which divers darker lines are drawn, and upon which are scattered a great number of bluish spots with small sharp points among them. It is illustrated on page 207, together with the Eyed Torpedo.

A FAMILY called STING RAY has seven species. Some of them are of great size. Terrible as is the armed tail of the thorn-back skate, and severe as are the wounds that can be inflicted

by it, the Sting Ray is furnished with a weapon even more to be dreaded, and capable of causing a still more serious injury.

The tail itself of this species is long, flexible, whip-like, and smooth, so that were it unaided by any additional armature, it could only inflict a sharp and stinging blow, which, however painful, would do no more damage than the cut of a horsewhip. The tail is further armed with a projecting bony spine, very sharp at the point, and furnished along both edges with sharp cutting teeth. When attacked or irritated, the Sting Ray suddenly strikes its whip-like tail around the offender in lasso fashion, and holding him tightly against the barbed spine, wields the latter with such strength and rapidity that it lacerates the flesh to a frightful and dangerous extent, in some cases even causing the death of the victim.

Along the coast, where the offensive powers of this fish are familiarly and practically known, an opinion prevails that the bony spine is supplied with poison. This notion, however, is one of the many popular errors on similar subjects, having been founded on the aggravated inflammation that sometimes follows the wounds caused by the Sting Ray. There is no poison whatever in this bone, and any such symptoms are due, not to the inherent venom of the weapon, but to the unsound constitution of the sufferer.

The reader will at once perceive the exact resemblance between the spine of the Sting Ray and the many-barbed spears used by the savage inhabitants of the Pacific islands. In fact, this spine not only furnished them with the original idea of those cruel weapons, but is constantly taken from the fish and affixed to the shaft of a lance. In their eyes, its great merit—and one which they imitate in their manufactured weapons—is that when the spear is struck into the body of a foe, the jagged blade is sure to snap asunder at the point where it enters the body, leaving several barbs fixed in the wound without any handle by which they may be withdrawn.

It is found that in the Sting Ray, a second spine exists below the first, which is provided in order to supply the place of the first in case it should be broken off or dragged out.

The Sting Ray is in some places called the FIRE FLAIRE, probably on account of the very red color of the flesh when cut open. This fish is not approved for the table, being rank and disagreeable in flavor.

The color of the Sting Ray is grayish-yellow above, taking a slaty-blue tint towards the middle of the body, and spotted with brown when the creature is young. Below, it is white. The eyes are golden color, the temporal orifice behind each eye is extremely large, and the tail is very thick and muscular at the base. The spine is set about one-third of its length from the base. The mouth and teeth are small.

The Sting Ray of our waters is the same as that of Europe. It ranges from Cape Cod to Florida. In various places it is called Whip Ray, Clam-cracker, and Sting-a-ree, or Whip-sting Ray. A large form is common off Long Island, with tail of five feet in length.

IN some respects, such as the long tail and double-barbed spine with which it is armed, the EAGLE RAY (*Myliobatis aquila*) bears some resemblance to the preceding species, but must be distinguished from that fish by the projecting head, the bluntness of the snout, the very great length and comparative tenuity of the tail, the shortness of the spine, and the diminutive size of the temporal apertures. In some places this fish is called the Whip Ray, in allusion to the extreme length of the slender tail.

The flesh of the Eagle Ray is not eaten, being hard, rank, and disagreeable, but the liver is thought to be eatable, and a large quantity of good oil is obtained from it. It sometimes attains to a very large size, weighing as much as eight hundred pounds. Its color is dark brown above, deepening towards the edges, and grayish-white below.

The Eagle Ray is a Mediterranean species, found occasionally in English waters. Its great wing-like sides give it a resemblance to a bird. Its long tail and double barbed spine at its base give it a most singular and vicious aspect.

BEFORE quitting these fish entirely, a short notice must be given of several interesting species, of which figures cannot be inserted for want of space.

The first is the HORNED RAY (*Cephaloptera johnii*), sometimes called, from its huge dimensions, horned head, dark body, and lowering aspect, the SEA DEVIL. There are, however, several species which are popularly called by the latter title.

This enormous creature is found in the Mediterranean and the warmer seas in general, and has been taken in the nets together with the tunny. The flesh is not eaten except by the very poor, but the supply of oil from the liver is abundant and valuable. There seem to be hardly any bounds to the size which this creature will attain. M. Le Vaillant saw three of these huge fish sporting round the ship in lat. 10° 15' N. long. 35° W. and, after some persuasion, induced the crew to attempt their capture. They secured the smallest of the three, and when it was brought on board, it was found to measure twenty-eight feet in width, twenty feet in length, to weigh a full ton, and to have a mouth large enough to swallow a man.

This gigantic Ray feeds almost wholly on fishes and mollusks. On account of their horned heads, the Italian fishermen call the old ones cows and the young calves. A strong attachment seems to exist between the male and female, for it has more than once happened that when one fish has been harpooned or otherwise captured, its mate has hung about the boat until it shared the same fate with its deceased partner; and in one instance, where the female had been caught in a tunny net, the male was seen wandering about the net for several days, and at last was found dead in the same partition where his mate had been captured. So, in common justice, the name of Sea Devil ought not to be applied to so loving and faithful a creature.

The color of the Horned Ray is very dark black-blue above, and gray-white beneath. The jaws and mouth are proportionately greater than is generally the case with these fishes. The tail is long, thin, and smooth for the first quarter of its length, after which it is furnished with tubercles. At its base there is a sharp, flattened spine, armed, like that of the preceding species, with a double row of barbs.

THERE are several other Rays, among which may be briefly mentioned the LONG-NOSED SKATE (*Raia salviani*), remarkable for the great length of the snout; the FLIPPER SKATE (*Raia intermedia*), notable for the olive-green color of the upper surface, and the numerous white spots with which it is covered; the BORDERED RAY (*Raia marginata*), which may be known by the dark edge to the side fins, or wings as they are generally called, and the three rows of sharp spines on the tail; and lastly, the HOMELYN RAY (*Raia miraletus*), which may be distinguished by the large size of the eyes and temporal orifices, and the bold dark spots on the sides.

SPINE-FINNED FISHES; ACANTHOPTERYGII.

WE now arrive at the vast order of the SPINE-FINNED FISHES, known scientifically as the ACANTHOPTERYGII. In all these fishes, the skeleton is entirely bony, and part of the rays of the dorsal, anal, and ventral fins are formed into spines, in some species very short, and in others of extraordinary length.

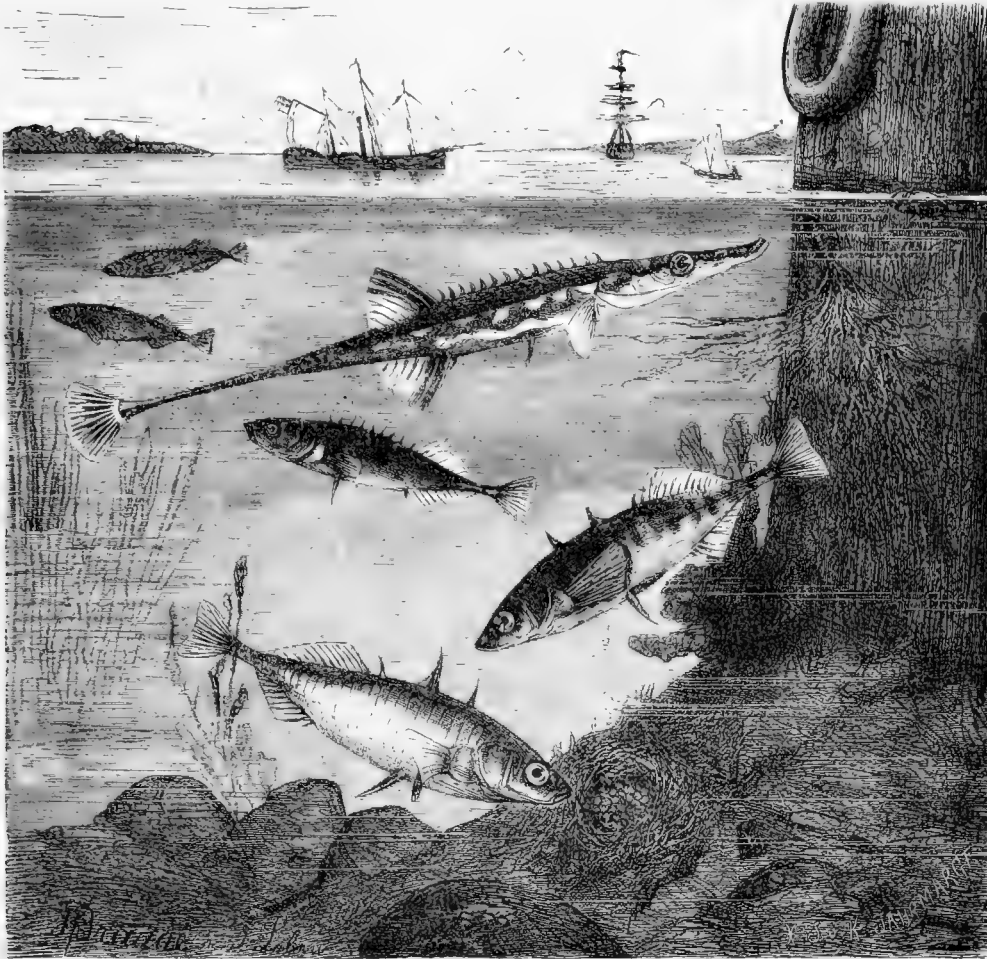
Without devoting more time or space to the purely scientific and anatomical characteristics, which will be separately described at the end of the volume, we will proceed at once to the various species of this vast and important order. I may here mention, that, whenever possible, I have selected examples of the various common genera, employing only those foreign species that are needful to fill up the links of the chain, or that are worthy of notice from some remarkable points in their form or their habits.

THE family of Sticklebacks comprises eight genera, and about twenty species of small, active, and exceedingly pugnacious fishes. They are very destructive to spawn and fry of other fishes. It is scarcely to be conceived how damaging these little creatures are, and how greatly detrimental they are to the increase of all the fishes among which they live.

Most of them build nests quite elaborately—which the male defends with great spirit. They inhabit the fresh waters and arms of the sea in Northern Europe and America.

THE NINE-SPINED STICKLEBACK (*Gasterosteus pungitius*) is a form equally known in the northern parts of Europe and America, found in both fresh and salt water. Eight other species are known in American waters. The following account of European species discloses the habits of nest-building, and other habits that apply equally to American forms.

THE THREE-SPINED STICKLEBACK, a very common fish, is also known under the names of TITTLEBAT, PRICKLEFISH, and SHARPLIN.



THREE-SPINED STICKLEBACK AND FIFTEEN-SPINED STICKLEBACK, WITH NEST.—*Gasterosteus aculeatus* and *Gasterosteus spinachia*. (Natural Size.)

It is a most bold and lively little fish, hardly knowing fear, pugnacious to an absurd degree, and remarkably interesting in its habits. Even more voracious than the perch, it renders great service to mankind in keeping within due bounds the many aquatic and terrestrial insects, which, although performing their indispensable duties in the world, are so extremely prolific, that they would render the country uninhabitable were they allowed to increase without some check.

So voracious and fearless indeed is this little creature that it always forms the earliest game of the juvenile angler, who need not trouble himself in the least about the temper of his hooks, the fineness of his tackle, or the delicate balance of his float. Any one can catch a Stickleback without rod, float, or even hook. All that is needful is to repair to the nearest streamlet, armed with a yard or two of thread and a walking-stick. Thin twine will answer very well instead of the thread, and even the stick is not absolutely needed. Having proceeded thus

equipped to the bank of the stream, a worm may be picked out of the ground, tied by the middle to the thread, and thrown quite at random into the water.

The Sticklebacks will not be in the least frightened by the splash, but rather rejoice in it as calling their attention to food. In a moment the worm will be the centre of a contending mass of little fishes, rolling over and over, struggling to the utmost of their power, and entirely hiding the worm from sight. Now let the angler quickly lift the bait out of the water, swing it on shore, and he will almost certainly find that he has captured two Sticklebacks, one hanging to each end of the worm, and retaining its hold so perseveringly that it can hardly be induced to relinquish its gripe. This process may be repeated at pleasure, and as the Sticklebacks never seem to learn wisdom, a large store may soon be accumulated. This is a good way of stocking an aquarium, as the strongest and liveliest fish are sure to be caught first.

I have caught them by hundreds in a common butterfly-net, by the simple stratagem of lowering the net into the water, dangling the worm over the ring, and by degrees lowering the worm and raising the net until I had the whole flock within the meshes.

Should the reader be disposed to place his newly-captured specimens in an aquarium, he must make up his mind that they will fight desperately at first, and until they have satisfactorily settled the championship of the tank, their intercourse will be of the most aggressive character. Never were such creatures to fight as the Sticklebacks, for they will even go out of their way to attack anything which they think may possibly offend them, and they have no more hesitation in charging at a human being than at one of their own species. I have known one of these belligerent fish make repeated dashes at my walking-stick, knocking his nose so hard against his inanimate antagonist, that he inflicted a perceptible jar upon it, and in spite of the blows which his nose must have suffered, returning to the combat time after time with undiminished spirit.

These combats are, however, most common about the breeding season, when every adult Stickleback challenges every other of his own sex, and they do little but fight from morning to evening. They are as jealous as they are courageous, and will not allow another fish to pass within a certain distance of their home without darting out and offering battle.

Any one may see these spirited little combats by quietly watching the inhabitants of a clear streamlet on a summer day. The two antagonists dart at each other with spears in rest, snap at each other's gills or head, and retain their grasp with the tenacity of a bull-dog. They whirl round and round in the water, they drop, feint, attack, and retreat, with astonishing quickness, until one confesses itself beaten, and makes off for shelter, the conqueror snapping at its tail, and inflicting a parting bite.

Then is the time to see the triumphant little creature in all the glory of his radiant apparel; for with his conquest he assumes the victor's crown; his back glows with shining green, his sides and head are glorious with gold and scarlet, and his belly is silvery-white. It is a little creature certainly, but even among the brilliant inhabitants of the southern seas, a more gorgeously colored fish can hardly be found. If the conqueror Stickleback could only be enlarged to the size of a full-grown perch or roach, it would excite the greatest admiration. It is curious, that the vanquished antagonist loses in brilliance as much as the conqueror has gained; he sneaks off ignominiously after his defeat, and hides himself, dull and sombre, until the time comes when he, too, may conquer in fight, and proudly wear the gold and scarlet insignia of victory.

These struggles are not only for mastery, but are in so far praiseworthy, that they are waged in defence of home and family.

The Stickleback is one of the very few fish who build houses for their young, as a defence against the many foes which are ever lying in wait for the destruction of the eggs or the newly-hatched young. These nests are built of various vegetable substances, and their structure is admirably described in the following passage extracted from an educational magazine:—

“In a large dock for shipping, thousands of Prickle-fish were bred some years ago, and I have often amused myself for hours by observing them. While multitudes have been enjoying

themselves near the shore in the warm sunshine, others have been busily engaged making their nests, if a nest it can be called. It consisted of the very minutest pieces of straw or sticks, the exact color of the ground at the bottom of the water on which it was laid, so that it was next to an impossibility for any one to discover the nest, unless they saw the fish at work, or observed the eggs.

“The nest is somewhat larger than a twenty-five-cent piece, and has a top or cover, with a hole in the centre, about the size of a very small nut, in which are deposited the eggs or spawn. This opening is frequently concealed by drawing small fragments over it, but this is not always the case. Many times have I taken up the nest, and thrown the eggs to the multitude around, which they instantly devoured with the greatest voracity. These eggs are about the size of poppy seeds, and of a bright yellow color; but I have at times seen them almost black, which, I suppose, is an indication that they are approaching to life.

“In making the nest, I observed that the fish used an unusual degree of force when conveying the material to its destination. When the fish was about an inch from the nest, it suddenly darted at the spot, and left the tiny fragment in its place, after which it would be engaged for half a minute in adjusting it. The nest, when taken up, did not separate, but hung together like a piece of wool.”

This interesting little account is doubly valuable, as not being the work of a professed naturalist, but of an observant lover of nature, who saw some curious phenomena, and recorded them in simple and unpretending language. The fifteen-spined Stickleback, a marine species, also makes a nest, though hardly of so careful a construction.

The Three-spined Stickleback is very fond of inhabiting the mouths of rivers where they empty themselves into the sea, the brackish water appearing to suit its constitution. It can therefore be easily acclimatized to new conditions, and a specimen that has been taken from an inland stream can soon be brought to inhabiting the water of a marine aquarium, though such water is usually, in consequence of evaporation, more salt than that of the sea.

As a general fact, the flesh of the Stickleback is despised as an article of food, and in my opinion wrongly so. I have often partaken of these little fish fried, or even baked, and think them decidedly palatable—delicate, crisp, and well-flavored, with the slightest possible dash of bitter that gives a unique piquancy to the dish. At all events, the young of the Stickleback and the minnow frequently do duty as whitebait, and the guests never discover the deception. Yet there is hardly any place in Europe where people, except the starving poor, will condescend to eat this delicate and nutritious little fish, which can be scooped by thousands out of any streamlet, and does not require more trouble in cooking than the red herring. The only use that at present seems to be made of this fish is to spread it over the ground as manure, an office which it certainly fulfils admirably, but might, in all probability, be better employed in feeding man than manuring his fields. An oil is sometimes expressed from them, and the refuse carted off to the fields, but the value of the oil seems hardly to repay the trouble of procuring it.

Mr. Yarrell mentions a considerable number of Sticklebacks; but Dr. Günther, in his elaborate catalogue of Acanthopterygian fishes, comprises several species together, as only varieties and not different species. For example, the QUARTER-ARMED STICKLEBACK (*Gasterosteus gymnurus*), or SMOOTH-TAILED STICKLEBACK, known by its four or five scaly plates above the pectoral fin; the HALF-ARMED STICKLEBACK (*Gasterosteus semiarmatus*), where the plates extend throughout half the length of the body; the HALF-MAILED STICKLEBACK (*Gasterosteus semiloricatus*), where they extend still farther; and the NEW YORK STICKLEBACK (*Gasterosteus noveboracensis*), are all considered as being only varieties of the species which has just been denoted.

THE TEN-SPINED STICKLEBACK is nearly, if not quite, as plentiful as the three-spined species, and is perhaps the smallest of our river-fish.

It may be readily distinguished by the nine or ten spines upon the back, all in front of the dorsal fin, and by the absence of plates upon the sides. All the Sticklebacks are voracious

little creatures, and I am told by an angler friend that they destroy quantities of the spawn of other fish, and seize upon the young as soon as they are hatched. He also informs me that they are extremely capricious in their choice of locality. For example, at the head of a mill-stream they may be found by thousands, while at the tail of the same stream not a single Stickleback can be found. There are parts of rivers where they are so plentiful that the fisher is entirely baffled in his sport by these little creatures eating his bait before it sinks to its full depth, while the middle of the stream might be quite free from them.

The Ten-spined Stickleback does not like salt water, and cannot be acclimatized to the marine aquarium like its three-spined relative. All the Sticklebacks are remarkable for the comparative nakedness of the skin, which for the most part bears no scales, as in the generality of fish, and in the Ten-spined species is wholly naked. The place of the scales is supplied by certain bony or scaly plates upon the side, and it is the nakedness of the skin which permits the colors of these little fish to glow with such bright and changeful hues.

The color of this species is green upon the back, and on the abdomen and sides silvery-white spotted minutely with black. The fins are very slightly tinged with yellow. The length of the Ten-spined Stickleback is variable, but rarely exceeds two inches.

The FIFTEEN-SPINED STICKLEBACK, SEA-ADDER, or BISMORE, is wholly a marine species, and is nearly as common as its companion on the picture on page 213.

It is remarkably elongated in proportion to its width, and this formation, together with its armature of sharp, tooth-like spines, has gained it the name of Sea-Adder. It is a voracious creature, feeding on all sorts of marine animals, mollusks, worms, eggs, and fry, and minute crustaceans. Mr. Yarrell advises the collector of marine crustaceans to examine carefully the stomachs of the shore-frequenting fishes, and especially of this species, as he will be likely to discover some curious species of those animals, too active or too small to lodge in his net, but unable to avoid the quick eye and ready jaws of the Stickleback. The same writer mentions that on one occasion, when a Fifteen-spined Stickleback had been caught with a net and placed in water together with a small eel, three inches in length, the voracious creature seized on the eel in a very short time, and contrived to swallow it. The eel, however, was too long to be wholly accommodated in the stomach of the Stickleback, and after a while was disgorged, only partly digested.

As in the case of the frog, the color of the Stickleback varies with singular rapidity, being dull or bright according to the mental emotions of the individual.

WE now arrive at another family of fishes, in which the body is rather compressed—*i. e.*, flattened sideways—the eyes are large, and the mouth oblique. It is scientifically known by the name of Berycidæ, and all its members are inhabitants of the tropical and temperate seas.

Our first example of this family is the JAPANESE SINGLE-THORN.

In all the fishes of this genus, the scales are rather large, very strong, and so closely compacted together, that they form a strong, mailed covering to the body. The name of Monocentris, or Single-thorn, is derived from the curious modification of the ventral fins, which are devoid of membrane, and are reduced to a single, very strong, and rather lengthened spine, and a few very short rays. In the place of the dorsal fin are four or five thick spines, and the shield-like scales of the body are rough, projecting, and keeled.

The Japanese Single-thorn is an inhabitant, as its name imports, of the seas of Japan, and is almost, if not quite, the only species of its genus. It is chiefly remarkable for the size of its head, the strong, thorn-like spines, and the mailed suit of hard and projecting scales. It is of a tolerably uniform color, its whole body being silvery-white, and its length is about six or seven inches.

THE large-eyed and deep-bodied fish, HOPLOSTETHUS, or Armed-breast, derives its name from the strong and sharp spines which are placed on the scapular bone and the angle of the preoperculum. Like the last-mentioned species, it seems to be the only member of its genus.

This fish is found in the Mediterranean, and is not uncommon on the coast of Madeira.

It is remarkable not only for the offensive weapons with which it is armed, but for the large, full eye, the saw-like series of notches on the abdomen, and the beautiful rosy hue of its scales. The dorsal fin of this fish is single, but is composed of two distinct portions, the one being supported by strong, spinous rays, and the other by soft and flexible rays. The muzzle is very short, rounded, and does not protrude; the tail is deeply forked, and the serrated portion of the abdomen consists of eleven, twelve, or thirteen scales. The body is very deep, in proportion to its length.

BEFORE proceeding to the next family, we must casually notice two large genera belonging to this family. Of the first genus the MURDJAN PERCH (*Myripristis murdjan*) is a good example.

This handsome fish is found off the coasts of India and in the Red Sea, and can be easily recognized by its beautiful coloring, its large scales, short muzzle, and prominent chin. The general color of this splendid fish is bright rose-pink, beautifully mottled by a rich violet edge to each scale. The soft portions of the dorsal, ventral, and anal fins are boldly margined with white, and the front rays have a cross band of violet-brown. The tail fin is edged with white, and a longitudinal stripe of violet-brown traverses each lobe. About fourteen or fifteen species of this genus are known.

OF the next genus, the SCARLET PERCH (*Holocentrum rubrum*) is rather a striking example.

This fine fish inhabits the Asiatic seas, and there are specimens in the museums from the Red Sea, Amboyna, Louisiade Archipelago, the Philippines, Japan, and China. On the operculum are two strong spines, the upper being the larger. The color of this fish is shining red, diversified with eight bands of grayish-white. The outer edges of the tail fin are black, and there is a patch of the same color on the ventral fins. This genus contains many very handsome species, and in almost every case the prevailing colors are red and violet.

PERCH, MULLET, BRAIZE.

WE now come to the large and important family of the Perches, which comprises many of the handsomest and most valuable fishes. The members of this family are found in all parts of the globe.

THE COMMON PERCH is well known as one of the handsomest river-fish, and, on account of its boldness and the voracious manner in which it takes the bait, and the active strength with which it struggles against its captor, is a great favorite with many anglers.

Moreover, when captured, and placed in an aquarium, it very soon learns to distinguish the hand that feeds it, and will come to the surface and take food from the fingers. It has a fashion of seizing its food with a rather sharp jerk, and then snatches it away with such violence, that, when it takes the hook, it will drag a stout cork float several inches below the surface, and, by the force of its own stroke, will mostly hook itself, without any exertion on the part of the angler. Bold-biting, however, as is its reputation, there are some seasons of the year when it is almost impossible to catch a Perch, and even the shy and gently-nibbling roach is an easier prey.

The flesh of the Perch is white, firm, well-flavored, and is thought to be both delicate and nutritious.

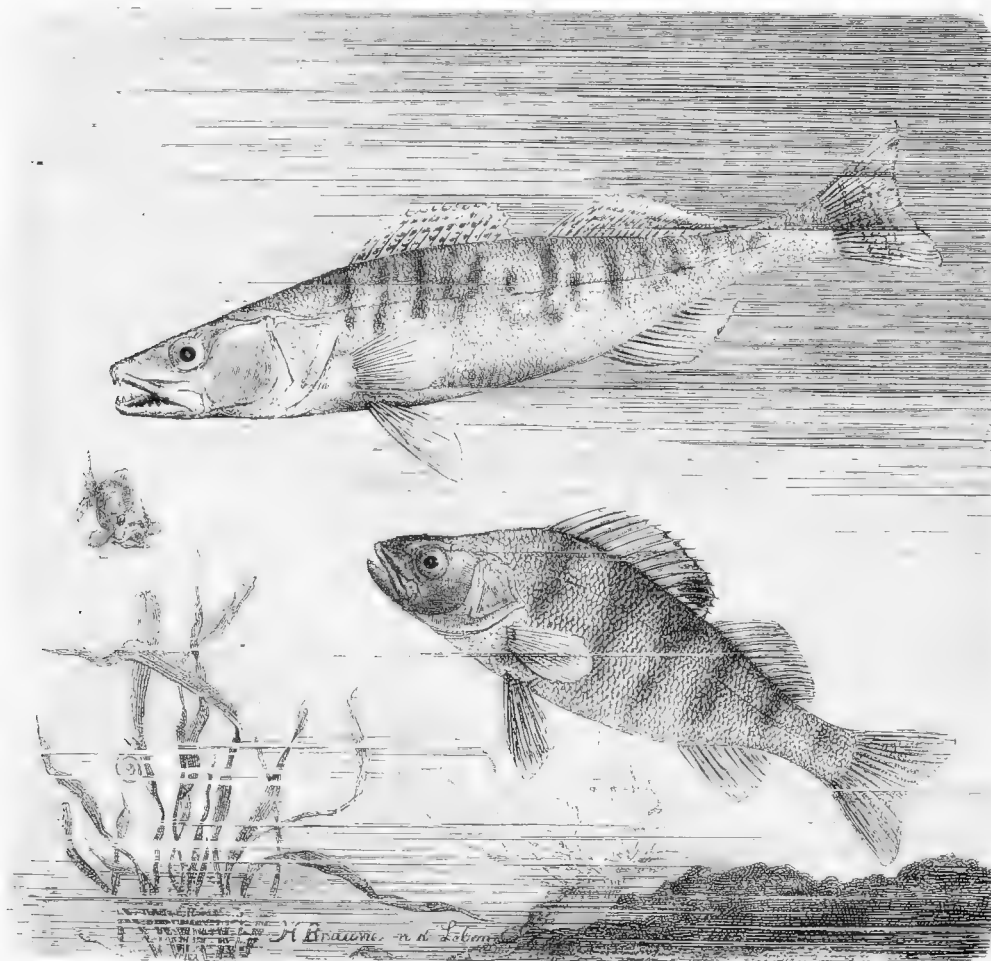
The Perch is not a large fish; from two to three pounds being considered rather a heavy weight. Individuals, however, of much greater dimensions have been, though rarely, captured.

The color of the Perch is rich greenish-brown above, passing gradually into golden-white below. Upon the sides is a row of dark transverse bands, generally from five to seven in number. The first dorsal fin is brown, with a little black between two or three of the first

and last rays; the second dorsal and the pectoral are pale brown, and the tail and other fins are bright red.

THE fine fish so well known under the name of BASS, or SEA-DACE, or SEA-PERCH, is common on many coasts, and is considered by anglers as affording good sport.

It seems, from the accounts of practical sportsmen, to bite with readiness at a bait, but to be a difficult fish to secure, on account of its tender mouth, its ingenious stratagems, and its great strength. When hooked, it leaps, plunges, and swims with such force and swiftness, that the captor is forced to exercise the greatest skill in preventing it from breaking away. One of its favorite ruses is to double back under the boat, in hopes of cutting the



GIANT PERCH AND COMMON PERCH.—*Lucioperca sandra* et *Perca fluviatilis*.

line against the keel, or gaining a fixed point by which it may be able to drag the hook from its mouth.

Even when fairly tired out, and drawn to the edge of the boat, it is by no means secured, for its scales are so hard that a very sharp blow of the gaff is needed to fix the hook in its side, and its gills and fins are so formidably armed, that it cannot be grasped with impunity. The spines of the dorsal fin, in particular, are strong and sharp as packing-needles, and the various portions of the operculum are edged with projecting teeth that cut like lancets. Many are the wounds that have been inflicted by the sudden twist and wriggle of the Bass, when grasped in a careless manner. When lifted into the boat, the hook is not to be taken from the mouth without some risk.

It is a voracious fish, and derives its name of "lupus," or wolf, in consequence of its insatiate appetite. It feeds upon other fish and various inhabitants of the sea. Mr. Couch states that it is very fond of wood-lice, and is bold enough to venture among rocks in a tem-

pest for the sake of snapping up these creatures, as they are washed by the waves and beaten by the winds from their places of concealment among the stones.

The flesh of the Basse is very excellent, and is thought to be in best condition when the fish is small, measuring about eighteen inches in length. The color of this fish is dark dusky blue on the back, and silvery white on the abdomen ; the fins are brown.

THE pretty little RUFFE (*Acerina cernua*) is common in many rivers, where it is sometimes known under the name of POPE, the reason for the latter title not being very clear.

In general appearance the Ruffe bears some resemblance to the perch, the shape of its body and the thorny fins being not unlike those of that handsome fish. It may, however, be immediately distinguished from the perch by its spotted fins, and the absence of the dark band over the sides. Moreover, the dorsal fin is single. It is a tolerably bold biter, and takes a hook readily when baited with a little bright-red worm.

The color of the Ruffe is light olive-brown above, and silver-white on the abdomen ; the flanks are yellowish-brown. The back, dorsal fin, and tail, are covered with little brown spots, set so closely in the tail as to resemble bars, and upon the gill-covers there is a little pearly-green. The length of this fish seldom exceeds six or seven inches.

One of the two creatures figured in the engraving on page 218 is the GIANT PERCH. It is a remarkably fine fish, which is found in many of the rivers and lakes of Germany and Eastern Europe.

This handsome species derives its name of *Lucioperca*, or Pike-Perch, from the resemblance which it bears to both these fishes, having the lengthened body of the one and the spine-armed fins of the other. It has, however, nothing to do with the pike, and is closely allied to its companion on the engraving, the perch, belonging, indeed, to the same family. The teeth are rather large, and are thought to resemble those of the pike in length and sharpness.

The color of the Giant Perch is greenish-olive above, banded with brown. Below, it is white. It is a very fine fish, attaining, when full-grown, to a length of three or four feet. There are several species belonging to the same genus.

A very handsome fish, that is popularly but erroneously called the AMERICAN PIKE, has derived its name from the elongated and somewhat pike-like form of its body. The teeth, however, are even, and bear no resemblance to those of the real pike.

The flesh of this fish is thought to be good for the table, and as the dimensions to which the creature attains are often considerable, it is really one of the valuable inhabitants of the American waters. It is one of the sea-loving species, and is mostly found on the Atlantic shores of tropical America. Many specimens now in the museums were taken in the West Indies, others off the coast of Guiana, some from Bahia, and others from Surinam. The general color of the American Pike is silvery-white, tinged on the back with green, and becoming a pure, shining white on the abdomen. The dorsal fins are two in number, the first being shortish, and having eight very strong and sharp spines. The second spine of the anal fin is very long and sharp, and the præoperculum is armed with two sharply-toothed edges.

The PIKE, or PIKE-PERCHES, so called in America, are equally a European form. They are large carnivorous fishes, living in fresh waters. Two strongly marked species are on each hemisphere.

The WALL-EYED PIKE (*Stidostedium vitreum*), DORY, GLASS-EYE, YELLOW PIKE, BLUE PIKE, and JACK SALMON, are names common to this species. It is found in the Great Lakes, and the Upper Mississippi, and some of the Atlantic streams far north ; is an abundant and valuable food fish, reaching nearly three feet in length, and a weight of twenty pounds. Another species, called SANGER, SAND-PIKE, GRAY PIKE, and HORN-FISH, is smaller, and is found in similar regions.

The family *Percidæ*, the Percenes, in which this fish belongs, embraces twenty-two genera, and from ninety to one hundred species. They are inhabitants of fresh waters of cool regions, most of them being American, and nearly all belonging to the fauna of the United States. A great majority belong to the Darters, all of which are American. They are among the most

singular and interesting of our fishes. Their colors are generally brilliant; in some of the genera are some of the most brilliantly colored of any known fishes. The sexual differences are very great in some species, the females being more sombre in color and more speckled or barred than the males. Most prefer clear running water, where they lie concealed under stones, darting from under with great velocity when hungry. They all can turn the head from side to side, and lie with the head turned on one side at times, the body supported on the expanded ventrals. The Ammocrypts are fond of lying concealed under the sand, the eyes only exposed. They are carnivorous, feeding greatly on larvæ of *Diptera*. All are small in size, being at most eight inches in length. The group *Microperca* are the smallest spiny-rayed fishes known, being only about one and a half inch. The general aspects of this numerous family are here indicated. The species would require volumes to describe. They are interesting and beautiful, but of no account commercially, and scarcely large enough for food.

The well-known BLACK BASS of America (*Centropristis atrarius*) inhabits the rivers and lakes of North America.

This fine fish is a really valuable species, on account of its large dimensions and the excellence of its flesh, and the attention of scientific men has lately been turned towards its preservation. In the Patent Reports upon some Black Bass that were transferred to Waramang Lake, Connecticut, some years previous, it is said that they multiplied very rapidly, grew at the average rate of one pound per annum, and ordinarily attained a weight of five pounds or a little more. They are very hardy, and can be taken from one locality to another if placed in a tub of water covered with a wet canvas. So rapid, indeed, is its increase, that although less than a hundred were originally placed in the lake, they have probably increased to several millions in a space of seven years.

It is a marvellously bold-biting fish, and affords good sport to all anglers, whether they only fish for the sake of the amusement, using a fly or other delicate bait, or whether they merely seek to take their prey as a matter of business, and employ small fish as a bait, or the obstruction "spoon," whose treacherous glitter the Black Bass is seldom able to withstand. It is an active and powerful fish, and when hooked struggles so long and so fiercely, that it tests all the angler's skill before it can be safely landed.

The color of the Black Bass is brown, washed with golden-green, and mottled with dark spots on the centre of each scale, darker on the back, and becoming nearly white on the abdomen. When newly caught, the body is traversed with several dark bands. It is a very fine fish, specimens having been known to weigh nearly twenty pounds.

BLACK SEA BASS (*Serranus atrarius*). This fish ranges from Cape Cod to Florida. It is called Black Perch in Massachusetts; Black Bass and Black Fish in New Jersey.

The STRIPED BASS (*Roccus lineatus*) is one of the most notable of our sea fishes—one of the largest and finest of our game fishes, reaching four feet in length. Dr. Storer records one that weighed eighty-four pounds. We have taken small ones off Nahant rocks by angling, while fishing for Tautog. It is found in our markets nearly all the year.

CLOSELY allied to these fish is an enormous genus, containing about one hundred and forty known species, from which the OUATALIBI, or RUDDY SERRANUS (*Serranus ouatalibi*), is selected as an example.

This beautiful fish inhabits the warm Caribbean Sea, and is plentiful upon the West Indian coasts. Its color is bright red, and the head, body, and sometimes the dorsal fin, are profusely powdered with small blue spots, edged with black. Just by the joint of the lower jaw there is a pair of largish black spots, and on the back of the tail, immediately behind the dorsal fin, is another black spot. Of its habits nothing interesting is told.

THE STONE BASS is an inhabitant of the European seas. It is otherwise known as COUCH'S POLYPRION, in honor of the eminent naturalist who first made it known as an own species, and as JEW-FISH and WRECK-FISH—the last title being given to it on account of its habit of frequenting drifting timbers, apparently for the purpose of feeding upon the

various marine creatures that swarm about such localities. In Madeira it is called *CHERNE*, when full grown, and *CHEMNOTTE* when young.

Barnacle-laden timber seems to have great attractions for the Stone Bass, and it is mentioned by Mr. Yarrell that a becalmed vessel was surrounded for a fortnight with these fish, probably on account of the trailing barnacles with which her planking was covered. Their presence was most valuable, as they were caught in great numbers, and the men fed almost wholly upon them for twelve or fourteen days.

From examination of the stomach, the Stone Bass seems to feed mostly on small fish of various kinds, sardines having been found in its interior in large quantities. Mollusks also form part of its food. It lives mostly in the deeper waters, preferring a rocky bottom, and generally remaining deeply immersed, unless attracted to the surface by the presence of its food.

When following floating timbers, it is a remarkably bold fish. Mr. Couch remarks thus upon its habits: "When a piece of timber, covered with barnacles, is brought by the currents from the more southern regions which these fishes inhabit, considerable numbers of them sometimes accompany it. In the alacrity of their exertions, they pass over the wreck in pursuit of each other, and sometimes for a short space are left dry on the top, until a succeeding wave bears them off again. From the circumstance of their being usually found near floating wood covered with barnacles, it might be supposed that this shell-fish forms their food; but this does not appear to be the case, since, in many that were opened, nothing was found but small fishes. Perhaps the young fishes follow the floating wood for the sake of the insects that accompany it, and thus draw the Stone Bass after them."

The color of the Stone Bass is dark purple-brown above, and silvery-white below. The fin-membranes are brown, and the tail is tipped with white. When young, it is mottled with darker and lighter brown. The lower jaw is larger than the upper, and over the operculum runs horizontally a bold, bony ridge, ending in a sharp point directed backwards. There is also a row of short, sharp spines over the eye, and the first ray of the ventral fins and the first three rays of the anal fin are furnished with strong, thorny spines, so that the fish is armed at all points, and when struggling violently is likely to inflict rather severe wounds on the hand that grasps it incautiously.

THE great and important family of the Labridæ, or Lip-fishes, so called in allusion to the thick and fleshy lip with which their mouths are furnished, are spread over the greater portion of the globe, few coasts being without several representatives of the group.

These fishes are not only remarkable for the full fleshiness of their evidently sensitive lips, but for the endless variety of rich and vivid tints with which their bodies are decorated; hues pure as the bright patterns of cathedral windows, and often arranged with a symmetrical regularity of outline and a daring harmony of contrasting colors that, when seen on the healthy and living fish, appear as if flung on its scales direct from the kaleidoscope. Of the three primary colors, red seems to retain its purity of tone more perfectly than either the blue or the yellow, the former usually being mingled with yellow, and forming greens of varying qualities, while the latter frequently takes a slight tinge of red, and becomes warm orange. These tints are extremely variable, ranging through every tone of the secondary colors, and even in different individuals of the same species the color is so uncertain that no dependence can be placed upon it as a means of determining the particular species.

The Labridæ are most lovely creatures, but it is in the tropical and warmer seas of the world that they are to be seen in their full brilliancy. No artist can transfer to paper the radiant hues that glow on these favored members of the finny race, and no pen can do justice to their wondrous splendor, as they dart through the crystalline water like living meteors, or leisurely traverse the forests of moving algæ, balancing themselves among the submarine foliage like humming-birds of the sea.

THE CHECKERED SWINE-FISH is one of the singular species which are so frequent in the hotter seas, and which exhibit a surface at once colored with the brightest hues, and decorated

with a pattern as geometrically regular as if drawn by the aid of rule and compass. This fish is found on the coasts of Ceylon. Its color is bright green on the back, gradually changing to golden-yellow towards the abdomen. The checkered marks on the body are purple and gray, and the stripes and spots on the head are rich, glowing orange. In allusion to the wicker-like markings and the brilliant colors of the fish, the natives call it by the name of *Hembili Girawah*; the former word signifying the little basket in which betel is carried, and the latter a parrot.

Though edible, this fish is not regularly captured for the markets. It generally frequents the rocky portions of the coast. It never attains any great dimensions, none seeming to measure more than fifteen inches in length.

THE curious fish, *SLY EPIBULUS*, has derived its popular and scientific titles from the crafty manner in which it obtains its food.

In this fish, the mouth and jaws exhibit a very remarkable modification of structure, which enables the creature to protrude its mouth with great rapidity, and to such a degree, that when pushed forward to its greatest extent it is even longer than the head. Aided by this apparatus, the *Sly Epibulus* captures its prey as follows: It feeds mostly upon small fishes, and instead of alarming them by charging among their ranks, and so giving itself a tedious and possibly an unsuccessful chase, it quietly withdraws itself to some sheltered spot, and waits, still and motionless as the watchful kingfisher, and no less dangerous to the smaller members of the finny tribe. No sooner does an unwary fish pass near the cunning enemy, deceived by its apparent harmlessness, than the movable mouth is suddenly projected with the rapidity of a serpent's stroke, and the victim is seized and swallowed in a moment.

THE TILE-FISH (*Lopholatilus chamaeleonticeps*, *Goode and Bean*) is a newly-discovered food-fish, the value of which is thought to be very considerable as an addition to our list of food-fishes. It is abundant in deep water off Massachusetts Bay; it is a fine large fish and highly colored, and belongs to family *Latilidae*.

FROM the many species of the genus *Labrus*, the *BALLAN WRASSE* has been selected. This fish, otherwise known by the popular names of *ANCIENT WRASSE*, or *OLD WIFE*, is one of those species which is mostly found haunting the rocky portions of the shore.

It is not in any great estimation as an article of food, the flesh being too soft, and not possessing any particularly good flavor. It generally frequents the deep rocky gullies, where the water is tolerably tranquil, except when the waves are beaten into foam by a storm. Here it may be seen swimming about in the clear element, concealing itself among masses of seaweed, and ever and anon darting forth to secure some tempting morsel, such as a passing crab or prawn.

Mr. Couch remarks concerning this species, that "it takes a bait freely, and fishermen remark that when they first fish in a place, they take but few, and those of a large size; but on trying the same spot a few days after, they catch a greater number, and those smaller; from whence they conclude that the large fish assume the dominion of a district, and keep the younger at a distance."

The Wrasse deposits its spawn in spring or towards the beginning of summer, and, as is usual with most fishes, assumes its brightest apparel previous to performing that duty. There is much uncertainty about the coloring of the *Ballan Wrasse*, but in general the color is red above and on the sides, variegated with oval spots of rich bluish-green; the fins are green, sparsely spotted with red, and the abdomen is pale orange. It does not attain to any great size, seldom having been known to exceed sixteen or eighteen inches in length, and two or three pounds in weight.

OF the family *Labridæ*, the *Cunners* are important as food-fishes. The *CHOGSETT OR CUNNER* (*Otenolabrus adspersa*) is, perhaps, the most familiar sea-fish on our New England coast. During the summer months it is the principal source of angling sport. It is a singular fact

that in Boston this fish is called Cunner, and by no other name, while in Lynn Salem, and Nahant, adjoining towns, it is universally known as Nipper and Chogsett, the latter the aboriginal term. It is sometimes called Perch or Sea Perch.

From the first settlement of the country this fish has been esteemed, and parties have been accustomed to visit the shore yearly to enjoy a day's nipping, and feast on fried Nippers and haddock chowder. The Nipper is taken by hook from the rocks, and affords much sport, as it is very "gamey."

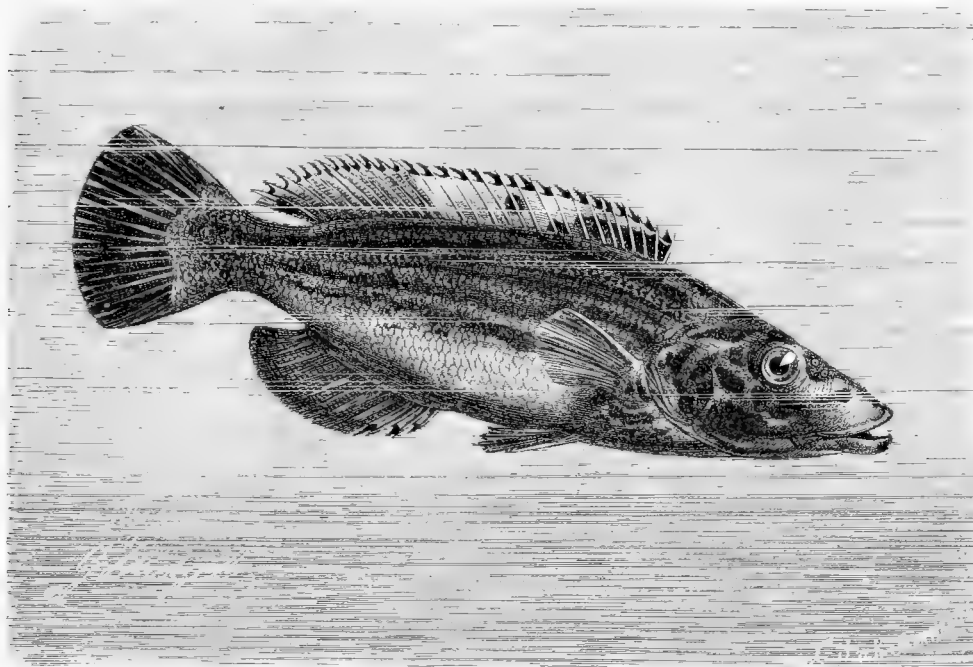
Like many other fishes, this is better and larger as the water is colder; therefore, in Portland harbor the Nipper is much larger and proves an excellent food-fish.

THE TAUTOG (*Tautoga onitis*) is of this family. It much resembles the Cunner, but is quite black. In New England it is called Black-fish by some. Its range is from Maine to South Carolina. No ocean fish is more "gamey" than this. With small live-crab bait it affords sharp sport with the rod. This fish abounds in the vicinity of Long Island. But a few years since it was not known north of Cape Cod, but is now quite abundant.

Dr. Smith, in his "Fishes of Massachusetts," an early work, says: "Within the recollection of a gentleman now living (1833), the Tautog was unknown in Boston harbor." Its weight reaches twelve pounds, though it averages but about half that. The blossoming of the dogwood (*Cornus florida*) early in April, or the chestnut-trees, is understood to denote the time of baiting Black-fish:

"When chestnut leaves are big as thumb-nail,
Then bite Black-fish without fail;
But when chestnut leaves are long as a span,
Then, catch Black-fish if you can!"

This is an old verse recorded in Mitchell's interesting book.
This fish is related to the Wrasse of Europe.



THREE-SPOTTED WRASSE.—*Labrus trimaculatus*.

SEVERAL other species of the same genus are known, such as the GREEN STREAKED-WRASSE, or GREEN-FISH (*Labrus donovani*), a rather rare but very beautifully colored fish, almost wholly green and slightly streaked. Some naturalists think that this is only the young of the preceding species. The most curiously decorated species is, however, the THREE-SPOTTED WRASSE (*Labrus trimaculatus*). This fish is decorated with a rich ruddy orange

over the greater part of its body, becoming slightly paler on the sides, and changing to golden-yellow on the abdomen, with the slightest possible dash of red. On the upper part of the back, and occupying portions of the dorsal fish, are three large spots of deep rich purple, between which are placed four similarly shaped spots of pale rose. These spots, however, are rather variable in number.

THE RED GROUPER (*Epinephelus morio*) is an important food-fish, forming much of the fish cargoes gathered by the fishermen on the Florida coast for the Havana market.

IN the course of the preceding pages our notice has been drawn to many remarkable forms of fishes, some terrible in their fearful armatures of spines and teeth, some repulsive from their slimy exterior and coldly malignant aspect, and others almost bordering on the grotesque from the odd and eccentric manner in which various parts of their structure are modified. The TESSELATED PARROT-FISH of the Ceylonese seas, though not strikingly unique in its external appearance, as many of the species already described, is, when closely examined, one of the most wonderfully colored fish in the world. The whole body is covered with a beautifully drawn pattern of elongated hexagons, as perfect and regular as those of a honeycomb.

The colors of this remarkable fish are as follow: The general hue of the Tesselated Parrot-fish is azure-blue, covered with a hexagonal network of golden-yellow. The oddly shaped head is bright yellow, streaked and spotted with blue. The dorsal and anal fins are brown edged with green, and the pectorals and ventrals are brown with the front rays green. The tail fin is wholly green. The natives call this fish by the name of Laboo Girawah, the former term being the name of a certain gourd or pumpkin which is marked in a somewhat similar fashion.

The species belonging to this genus are very numerous, and have received their rather appropriate title of Parrot-fishes from the rich beauty of their colors and the peculiar form of their jaws, which are very strong, covered with great numbers of mosaic-like teeth, and curved in a manner that greatly resembles the beak of a parrot. As the fish wears out the teeth rapidly while crushing the corallines and other hard substances on which it feeds, a provision is made for insuring a continual supply of new teeth to replace those which are worn away and rendered useless. The young teeth are perpetually being developed towards the base of the jaws, and by a beautiful yet simple adaptation of existing parts, which cannot be made intelligible without the use of diagrams, advance in orderly succession towards the front, and take their places with unflinching certainty in the densely compacted mosaic-work which arms the jaws.

BEFORE leaving this family we must briefly examine another very large genus, here represented by the BANDED MULLET (*Apogon fasciatus*).

This fish is found off the Fejee Islands, upon the coast of Mozambique, and in the Australian and Moluccan seas. The genus to which it belongs comprises about sixty species, all inhabiting the warmer waters, and some entering the mouths of rivers. They are most plentiful in the Indian and Australian seas, but are never seen in the colder waters of the northern and southern regions. The scales of these fish are large, and fall off almost at a touch. The gill-cover is rather formidably armed, the operculum bearing spines, and the præoperculum having a double-notched ridge.

The coloring of the Banded Mullet is bold and striking. The general tint of the body is a glowing rose and a series of broad dark bands are drawn along the body, four or five on each side, and one on the back. At the base of the tail fin is a large round black spot, and a black band runs across the root of the second dorsal and anal fins.

THE next family, termed the Pristipomidæ, after the typical genus, forms a large and somewhat important group of fishes. They are all carnivorous, *i.e.*, they feed upon fish in preference to other diet; they have no molar or cutting teeth, and all inhabit the waters of the

warm and temperate regions of the globe. The greater number of the species are marine, but a few are found in the rivers.

As an example of the typical genus, we will take the ΚΑΚΑΑΝ (*Pristipoma hasta*), a species found in the "Red Sea, along the east coast of Africa, through all the Indian seas to the northern shores of Australia."

In this prettily marked species, the dorsal fins are separated by a notch, rather variable in depth, and the fourth dorsal spine is much elongated, being indeed equal to half the length of the head. The second spine of the anal fin is also long and sharp. The coloring of the Kakaan is seldom precisely the same in any two individuals, but the body is always covered with a great number of brown spots, arranged with some degree of regularity. Sometimes these spots fall into horizontal lines, so as to look at a little distance like a series of brown bars drawn along the body, while in other specimens the spots are gathered into vertical bands. There are also several series of circular brown spots on both the dorsal fins.

THE CAPEUNA, or FOUR-STREAKED RED-THROAT, is a remarkably pretty fish, and a good example of the genus to which it belongs.

The generic title of *Hæmulon* is given to these fishes on account of the bright ruddy color of that part of the lower jaw which is concealed when the jaws are shut. The French call this genus *Rougegueule*. The profile of their rather elongated head is thought to bear some resemblance to that of a pig. The Capeuna is most beautifully colored, as will be seen when the description is compared with the figure. The spines of the dorsal fins are tolerably firm, but cannot be termed strong or formidable, and the same may be said of the lengthened second spine of the anal fin. The eye is large and full, and the tail is deeply forked. A rich brown band runs along the whole of the body just above the dorsal line, and a corresponding band is drawn immediately below it. Between the upper band and the spinous portion of the dorsal fin, a short brown streak is drawn, looking as if dashed hastily with one sweep of a brush, and a still shorter stripe of the same color runs along each side of the head just above the eye. From the eyes are drawn two wider stripes of rich golden-yellow, which pass beneath the lateral line, and run to a considerable distance, the lower streak being continued as far as the tail fin, and the upper reaching to the middle of the soft portion of the dorsal fin, where it turns slightly upwards.

ONE of those remarkably colored species for which the warmer seas are so famous, and whose vivid coloring and striking forms put to shame the comparatively sober inhabitants of the northern waters, is the BODIAN, or CUVIER'S BODIAN, as it is generally called.

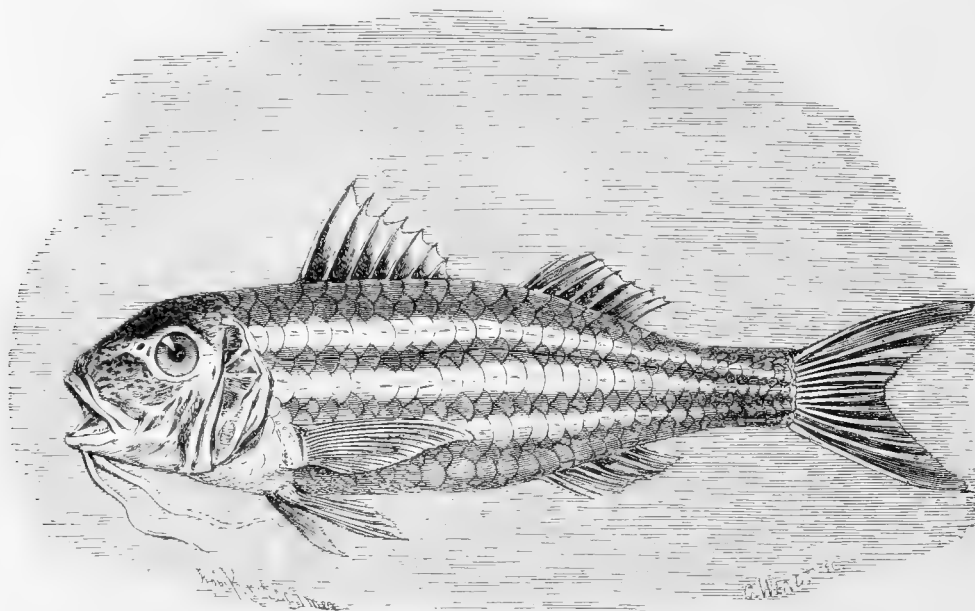
What connection there may be between colors and caloric is one of the unsolved enigmas of creation, and though it is most evident that such a connection exists, its principles and even its results are at present shrouded in mystery.

The tints which decorate the finny inhabitants of these tepid waters are brilliant beyond all power of description, and the most glowing colors of the artist, though painted on a ground of burnished gold, fail to convey more than a dim idea of the wondrous chromatic effects produced by the living creatures. Even the patterns in which these colors are arranged are as unexpected as they are effective, and the art student would gain no slight knowledge of that most difficult science of color, were he to visit the tropical seas, and study the fishes as they swim calmly in the crystalline water, amid the forests of waving seaweeds or branching corals.

The harmony of the tints is not less remarkable than their brilliancy, for the brightest and most glowing colors are flung boldly together in kaleidoscopic profusion, and, in defiance of all the conventional rules by which artists like to govern themselves and others, are so exquisitely harmonious that not a tint could be altered or removed without destroying the entire chromatic effect. Examples of some of these fish will be given in the course of the succeeding pages, and the reader will see that, even when laboring in this instance under the disadvantage of substituting plain black and white for their natural colors, they must be truly the humming-birds of the ocean.

The Cuvier's Bodian is a species spread over the greater part of the Indian seas, and caught, though it appears but rarely, on the coasts of Ceylon, being most frequently captured on the southern shores and upon rocky ground. The Cingalese name is Deweeboraloowah. In color it is a remarkably handsome fish, though not of such pure primary tints as others which will presently be mentioned. The color of this fish is yellowish-brown on the back, changing gradually to reddish-gray on the sides, and fading to simple gray on the abdomen. The head, tail, and fins are bright golden-yellow, and the bars and patches of darker color are deep chocolate-brown. Its average length is from eighteen to twenty inches.

THE next family, the Mullidæ, finds a well-known representative in the common SURMULLET, sometimes called the STRIPED RED MULLET, on account of the yellow longitudinal stripes that are drawn along the body.



SURMULLET.—*Mullus surmuletus*.

This fish is celebrated for the excellence of its flesh, and in the time of the ancients was one of the most costly luxuries that the wealthy epicure could place upon his table, from two hundred to three hundred dollars being paid for a fish weighing six or seven pounds. These dimensions are but rarely reached, and never, as it is believed, on cold shores. The liver is held to be the best part of this fish, but the whole of its flesh is firm, white, and delicately flavored. Its value in the market is extremely variable, owing to its migratory habits, being at one time caught by hundreds in the trawl or mackerel nets, while at other times there is not a single individual to be found. There seems, however, to be one definite rule in its migrations, namely, that it approaches the shore in the summer time, and in the winter retires into deep water, whence it can only be taken in the trawl net.

ANOTHER species of this genus is the PLAIN RED MULLET (*Mullus barbatus*).

In general habits it closely resembles the preceding species, but may be distinguished from that fish by the almost vertical line of the head, which rises abruptly from the muzzle to the eyes, and by the different coloring. In the Plain Red Mullet the back is light pink, the sides and part of the abdomen dark red, and there is a single yellow streak below the lateral line.

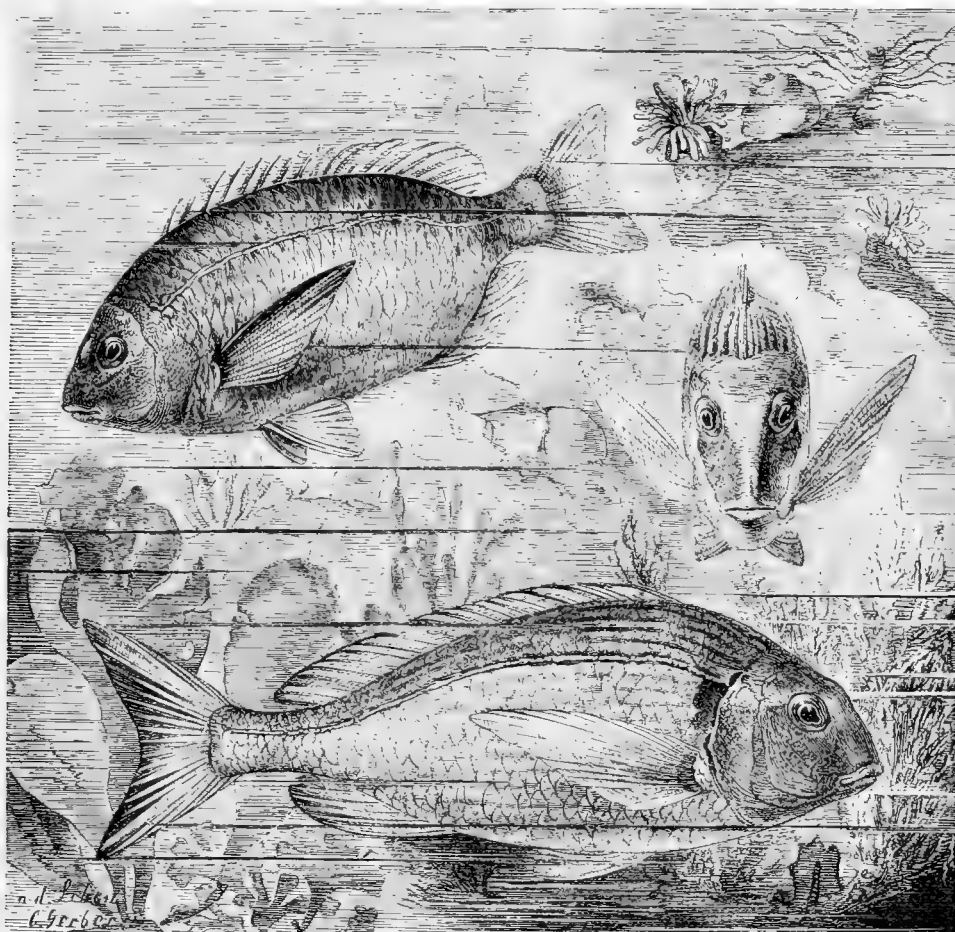
A RATHER extensive genus belonging to the present family cannot be passed over without some notice, as it contains many fish which are remarkable for their form and coloring, if not for their habits or utilities.

The THREE-BANDED MULLET is a native of the Indian and Polynesian Seas, and has been taken off the coasts of China, Amboyna, Celebes, Ceylon, and India.

THE family *Mullidæ* is represented in American waters by five genera, containing thirty-five species. They are called collectively Surmullets, and inhabit all tropical seas; some species straying northward. The Goat-fishes belong to this family.

THE family of the *Sparidæ* is represented by the BRAIZE, otherwise known as the BECKER, PANDORA, and KING OF THE SEA-BREAM.

This is a common fish in the Mediterranean.



BRAIZE AND YOUNG GILT HEAD.—*Pagrus vulgaris* et *Chrysophrys aurata*.

The family *Sparidæ* is a very large one, embracing four hundred and fifty species, in fifty-five genera; abounding in temperate and tropical seas. The Snappers (*Lutjanus*) include several very notable table fishes. The Gray Snapper and the Red Snapper are important. The latter, *L. blackfordii*, is a late introduction in our markets. It is named in honor of the notable dealer in fish at Fulton Market, who adds to an exceptional reputation as a business man a scientific spirit which is highly commendable. The Hog-fish, or Sailors' Choice (*Pomadasys*), is a food-fish of some note, found along the Atlantic from New York southward. The various species of Grunts are classified here. The Scup, Scuppung, or Porgee (*Diplodus*) is an abundant and valuable food-fish. The Sheepshead (*Diplodus probatocephalus*) is regarded as equal if not the superior of any of our fishes as a table luxury. It is abundant from Cape Cod to Texas; though it is not so common north of Virginia, where it is prized very highly. Its flesh is compared to the English turbot. Its name is derived from the appearance of the mouth, which resembles that of a sheep. Its weight is occasionally sixteen pounds. It is

wary and timid, and is very difficult to take with a hook ; though they are captured in numbers by the seine.

THE well-known COMMON SEA-BREAM (*Pagellus centrodontus*) is a handsome fish, notable for its large round eyes, and the reddish-gray hue of its body. It is sometimes called the GILT-HEAD, because part of the head looks as if it were silvered, and when young, it goes by the name of CHAD. The general color is reddish with a tinge of gray, becoming light on the sides, and fading into white below. A few very faint bands are drawn along the sides.

As allusion has been made to the term GILT-HEAD as one of the popular names of the sea-bream, it is as well to mention that the title rightly belongs to a closely allied species, *Chryso-phrys aurata*, a fish that properly inhabits the Mediterranean.

This fish derives its name from a semilunar golden spot over the eye. At the upper part of the edge of the operculum there is a violet patch. The back is blue, fading delicately into silver-gray, and the sides are longitudinally banded with golden streaks. The fins are grayish-blue, and at the bases of the dorsal and anal fins the scales are so raised at each side, that the fin looks as if it were set in a groove. This arrangement is seen in many of the fish belonging to this family. It is represented through the lower figure in the illustration on page 227.

SCALY-FINNED FISHES ; SQUAMIPINNES.

WE now arrive at a large family, containing a series of fishes remarkable for their extraordinary shape, their bold and eccentric coloring, and their curious habits. In Dr. Günther's elaborate arrangement of the Acanthopterygian fishes, this family is called by the name of Squamipinnes, or scaly-finned fishes, because "the vertical fins are more or less densely covered with small scales ;" the spinous portions sometimes not scaly. They are nearly all carnivorous fishes, and for the most part are exclusively inhabitants of the tropical seas or rivers. Their bodies are very much compressed and extremely deep in proportion to their length, and the mouth is usually small and placed in front of the snout.

CHÆTODONTINA.

THE large family of *Chatodontidae*—the Chetodonts—so called from the Greek, meaning bristle-tooth, embraces one hundred and seventy species, in about five genera. They are carnivorous fishes ; most of them belonging to the genera *Pomacanthus* and *Chatodon*. They are remarkable for their extraordinary shape, bold and eccentric coloring, and curious habits. One special characteristic is that the body is deep, often extremely so, and very thin or compressed, comparatively. The mouth is usually very small and placed in front of the snout.

The ANGEL-FISH (*Pomacanthus ciliaris*), called also ISABELITA in the West Indies, is found on our southern coast, and is quite abundant in the waters of the Florida Reef. It is one of the most beautiful of fishes, and has been eagerly sought for aquaria. Mr. Barnum, who first put in operation a sea-water aquarium, sent some assistants to the Florida Reef in the winter of 1859-60. The editor of this edition was then resident of Fort Jefferson, Tortugas, where the party ultimately arrived. In order to fit up Mr. Barnum's aquarium in New York City with the beautiful fishes and marine objects that are so abundant in the waters of the Florida Reef, we, who felt much interest in desiring our northern people to enjoy some of the beauties of the coral reefs, gave them all assistance. We encircled a lot of old roots that were lying in shallow water, the most favorable places for finding the Angel-fishes and many rare forms. When the seines were ready to haul, the roots were turned over, and the fishes and other

forms being temporarily disturbed were quickly captured. The party had secured the services of a fishing-crew and their smack. The latter had the usual "well," which is used to keep the "fare" of fish alive within while waiting a market. Into this well the fishes, etc., were placed. The sea-water playing in and out through the bottom was comparatively pure. After securing many specimens of great value, as many as could safely be bestowed, the smack set sail for the colder waters of the north. Here in the Florida Straits the sea is, even in winter, warmer than that around the northern coast in summer. Some of the choicest specimens and duplicates were judiciously placed in glass globes, and kept in the cabin. The almost inevitable thing happened—the cold water killed everything before the party had reached Hatteras. The specimens in the globes were saved, and the "only Angel-fish ever exhibited in northern waters" was continued a long time a pleasing object to the many visitors of the aquarium, and a nearly sole consolation for the loss of the entire cargo of living tropical fishes. One of the most beautiful of the objects saved was a peculiar form of Sea-Anemone, which we had captive in our own aquarium, and which we added to the New York collection. This lived a long time, and was a constant source of admiration. It will be described in the proper place at the end of this volume.

THE WANDERING CHÆTODON is an example of a very large genus, comprising about seventy species, all of which are striking from their shape and color. Some of them are almost circular or disc-like in the general contour of their figure, and the arrangement of the markings is very conspicuous. The muzzle is moderate in length, and the scales are rather large in proportion to the dimensions of the body.

The Wandering Chætodon is a native of the waters extending from the Red Sea to Polynesia, and is one of the common fishes of the Ceylonese coasts.

The colors of this fish are very beautiful, and are arranged after a very curious fashion. The ground color of the body is golden-yellow, on which a number of purplish-brown lines are drawn. Some which start from the upper edge of the gill-cover are drawn obliquely towards the centre of the dorsal fin, and from the last of these lines a number of streaks issue nearly at right angles, take a slight sweep downwards, and then converge towards the tail. From the upper part of the head a broad black band descends to the angle of the interoperculum, and envelops the eye in its progress. The dorsal fin has a narrow black edge, and a black band extends along the soft portion of the same fin, crosses the tail, and is continued on the anal fin, which has a black and white edge. Two bold black bands are drawn across the tail. It is not a large species, rarely exceeding one foot in length.

A MOST remarkable species is called, from the form of its mouth, the BEAKED CHÆTODON.

The curiously elongated muzzle is employed by this fish in a rather unexpected manner, being used as a gun or bow, a drop of water taking the place of the arrow or bullet. Perhaps the closest analogy is with the celebrated "sumpitan," or blow-gun, of the Macoushi Indians, a tube through which an arrow is driven by the force of the breath. The Beaked Chætodon feeds largely on flies and other insects, but is not forced to depend, as is the case with nearly every other fish, on the accidental fall of its prey into the water. If it sees a fly or other insect resting on a twig or grass-blade that overhangs the water, the Chætodon approaches very quietly, the greater part of its body submerged, and its nose just showing itself above the surface, the point directed towards the victim. Suddenly, it shoots a drop of water at the fly with such accuracy of aim, that the unsuspecting insect is knocked off its perch, and is snapped up by the fish as soon as it touches the surface of the water.

This habit it continues even in captivity, and is in consequence in great estimation as a household pet by the Japanese. They keep the fish in a large bowl of water, and amuse themselves by holding towards it a fly upon the end of a slender rod, and seeing the finny archer strike its prey into the water. Another fish, which will be described in the following pages, possesses the same faculty, but is not so remarkable for its eccentric form and the bold beauty of its tints.

The Beaked Chætodon inhabits the Indian and Polynesian seas, and has been taken off the west coast of Australia, where it is usually found in or near the mouths of rivers. Over the head and body of this species are drawn five brownish cross-bands edged with darker brown and white, and in the middle of the soft dorsal fin there is a rather large circular black spot edged with white.

Several other species of this genus are recognized, one of which, the LONG-BEAKED CHÆTODON (*Chelmo longirostris*), is truly remarkable for the exceeding development of the snout, which considerably exceeds half the length of the head. This species is also notable for a large triangular patch of jetty-black, which covers the upper surface of the head, the neck, and the side of the head as far as the lower edge of the eye. There is also a circular spot of the same hue on the anal fin. This species is a native of Amboyna.

A VERY remarkable fish adds to the singular shape of all the group the peculiarly elongated dorsal spine from which it has received its name of LONG-SPINED CHÆTODON, or CHARIOTEER. It also well exhibits the scale-covered fins, a structure which is indicative of the large family to which it belongs. Both scientific names are of Greek origin, the former signifying a charioteer, the long slender spine representing the whip; and the latter signifies "single-horned," in allusion to the same peculiarity.

The fourth dorsal spine of this species is enormously elongated and whip-like; its use not being as yet ascertained or even conjectured with any show of reason. Over each eye is a conical projection, not easily distinguished, on account of the deep black hue with which it is colored, and a similar protuberance arises on that part of the fish which is by courtesy termed the nape of the neck. Three very broad black bands are drawn across the body; their edges are sharply defined, as if a painter had drawn them with black varnish. The foremost band commences at the first dorsal spine, and sweeps over the neck, upper part of the head, snout, and chin, the eye being imbedded, as it were, in the black ground, and shining with great vividness on account of the contrast. The second band passes from the fifth to the seventh dorsal spines to the abdomen, being rather narrow at the top and widening as it passes downwards below, but not comprising the pectoral fin. The third band starts a little below the central streak, and is drawn rather obliquely over the body, through the hinder portion of the anal fin.

THE members of the curious genus to which the SEMILUNAR HOLOCANTHUS belongs are remarkable for a very strong, sharp-pointed, thorny spine with which the præoperculum is armed. These curious fish are found in almost all tropical seas.

Nearly forty species of this genus are now known, all of which possess some remarkable peculiarity in coloring. There is, for example, the RINGED HOLOCANTHUS (*Holocanthus annularis*), where the shoulder is decorated with a blue ring, and the body is marked with six or seven arched blue stripes, all radiating from the base of the pectoral fin. The SPOTTED HOLOCANTHUS (*Holocanthus maculosus*) has a number of black, semilunar spots on the fore part of the body; the CILLATED HOLOCANTHUS (*Holocanthus ciliaris*) is marked with an azure ring on the nape of the neck, and a number of blue spots and streaks about the head; the EMPEROR HOLOCANTHUS (*Holocanthus imperator*) has a number of blue lines upon the head, chest, and anal fin, a large black spot on the shoulder, and the body decorated with many wavy, orange-colored streaks; and lastly, the ARCHED HOLOCANTHUS (*Holocanthus arcuatus*), though not so brightly clad, is quite as striking a species as any that has been mentioned, simply on account of the single arched stripe that is drawn along the body, from the eye to the end of the dorsal fin, taking a slight upward curve like a bent bow.

It is said of one of the species, LAMARCK'S HOLOCANTHUS (*Holocanthus lamarckii*), that the attachment between the sexes is very strongly developed, and that, if one individual be captured, its mate will haunt the fatal spot, and even fling itself ashore or into the net, in the eagerness of its search.



ARCHER FISH.

OTHER SCALE-FINNED FISHES.

OF another group or sub-family of the scale-finned fishes the ARCHER FISH is a good example. It is depicted on the accompanying full-page illustration.

This curious species is a native of the East Indian and Polynesian seas, and possesses the power of shooting water at its prey with even more force than the beaked chætodon. So powerful, indeed, is the projectile force, and so marvellously accurate is the aim, that it will strike a fly with certainty at a distance of three or even four feet. In general appearance, there is little to attract attention about this fish, the only remarkable point in its form being the greatly elongated lower jaw, which may possibly aid it in directing the liquid missile, on which it partially depends for its subsistence as does a hunter on the accuracy of his rifle. The general color of the Archer Fish is greenish, and the short, wide bands across the back are dark brown with a shade of green. Two species of this genus are known.

As an example of the next family, the Cirrhitidæ, we take the BANDED CHILODACTYLE. The family to which this fish belongs is a very small one, containing only eight genera, none of which comprise many species. Altogether, this family is not larger than many single genera. The members of which it is composed are all exotic species, inhabiting the "seas of the tropical regions and the southern temperate parts of the Pacific."

Perplexing as is the task of ascertaining the habitation of migrating birds, the difficulty of fixing the range of fishes is far less easy to overcome, as the transition from the tropical to the temperate, and from them to the colder seas, is so extremely gentle, that a fish of errant disposition, or one that has been caught in a long-lasting storm might be, and has been often, driven into strange waters which it does not know, and from which it can find no retreat.

THE large and important family of the Triglidæ, or Gurnards, is represented by several European fishes. This family contains a great number of species, many of which are most remarkable, not only for their beautiful colors, which alone are sufficient to attract attention, but also for the strange and wild shape, and large development of the fins. They are carnivorous fish, mostly inhabiting the seas, a very few species being able to exist in fresh water. They are not swift or strong swimmers, and therefore remain, for the most part, in deep water. Some, however, are able, by means of their largely developed pectoral fins, to raise themselves into the air, and for a brief space to sustain themselves in the thinner element. The mouth is mostly large; and in some cases the gape is so wide, and the head and jaws so strangely shaped, that the general aspect is most repulsive.

On account of its fiery color and ungainly aspect, the RED SCORPION-FISH has long been supposed to possess qualities as dangerous as its appearance is repulsive, and has been termed the SEA SCORPION and SEA DEVIL, from the supposed venom of its spines and frowardness of its temper. It is, however, a harmless fish enough, not capable of inflicting such severe injuries as several species that have already been described. When captured, it certainly plunges and struggles violently, in its endeavors to escape, and if handled incautiously it will probably inflict some painful injuries with its bony spears. This result, however, is attributable to the carelessness of the captor and to the natural desire for liberty, and not to any malevolent propensities innate in its being.

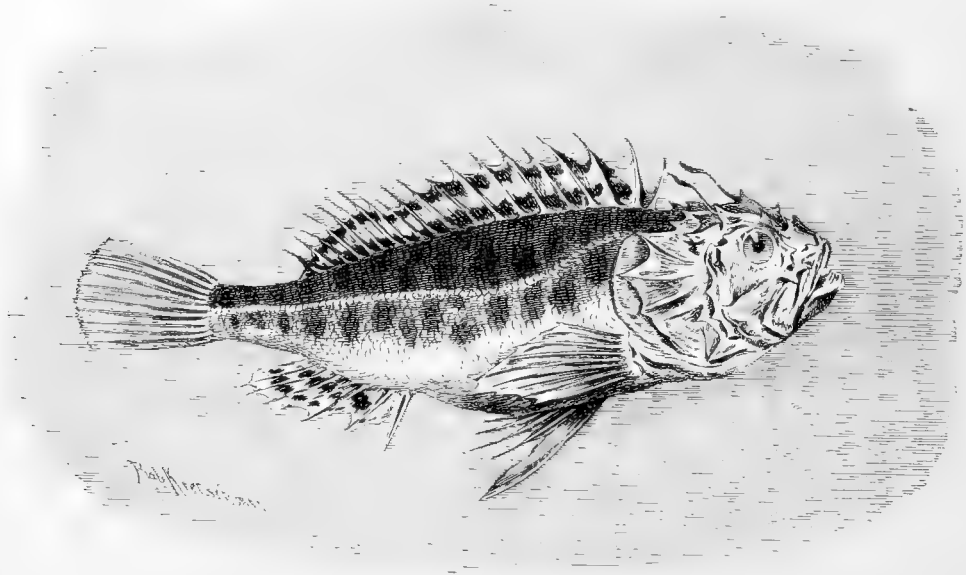
Another species, the SPOTTED SCORPION-FISH (*Scorpæna porcus*), represented in the fine engraving on next page, has similar habits. Both these fish are extremely voracious, as may be inferred from their wide mouth and general aspect, feeding on the smaller fish and similar creatures. They have a habit of lying in ambush, under overhanging tufts of sea-weed, and thence issuing in chase of any unfortunate little fish that may happen to pass near the fatal spot. All the fish of this genus are remarkable for their large head, with its armature of spines and odd skinny flaps, and the curious naked groove that runs along its summit. The pectoral fins are always large and rounded, and the body is mostly decorated with sundry skinny appendages. Examples of this genus are found in all the

tropical seas, extending as far north as the Mediterranean, and to the Atlantic shores of Northern America.

The general color is brownish-red, marbled with dark brown and dotted with black. In some individuals the dots are arranged in lines around the dark marblings.

The extraordinary creature which is known by the name of RED FIRE-FISH, and to the natives of Ceylon by the title of GINI-MAHA, inhabits the greater part of the tropical seas, from Eastern Africa, through the Indian seas, to Australia.

This fish is remarkable for the singular development of the dorsal and pectoral fins, the latter being of such vast proportionate size, that they were formerly supposed to act like the



SPOTTED SCORPION-FISH.—*Scorpaena porcus*.

corresponding organs in the flying fish, and to raise the creature out of the water into the air. Such, however, is not the case; for the rays which carry the connecting membrane are not supported by a corresponding strength of bone as in the true flying fishes, and are far too weak to serve that purpose. Indeed, the object of this remarkable development is one of the many mysteries with which the inquiring zoologist is surrounded, and which make his task so exhaustlessly fascinating.

The structure of the entire skeleton is very interesting to comparative anatomists, but is too complicated, and requires too many technical terms to be described in these pages.

The Red Fire-fish is common off the Ceylonese coast, and is said to be rather valuable as an article of food, its flesh being very white, firm, and nutritious. The native fishermen hold this species in some dread, thinking that it can inflict an incurable wound with the sharp spines which arm its person and stand out so boldly in every direction. This idea, however, is without any foundation; for, although the thorny spines may prick the hand deeply and painfully, they carry no poison, and inflict no venomous hurt.

ONE or two notable fishes require a cursory notice.

The SEA LOCUST (*Apistos israelitorum*) is a native of the Red Sea, and is remarkable as being the only flying-fish of those strange waters. It is particularly plentiful on that part of the coast near which the Israelites were forced to wander for a space of forty years, and on that account has received its specific title. Ehrenberg has noticed that it is very abundant near Tor, and that several specimens fell into his boat almost every time that the sea was agitated. He further throws out a suggestion, that the quails to which allusion is made in the

sacred volume are really the Sea Locusts, but this conjecture seems to be entirely gratuitous, and is unsupported by facts.

ANOTHER curious fish is the SEEPAARD of the Dutch (*Agriopus torvus*), a native of the seas around the Cape of Good Hope.

It is a rather powerfully armed species, on account of the strong, sharp, and recurved spines of the dorsal fin, but its head is not supplied with the thorny projections that render the preceding fish so perilous to handle. The dorsal fin of the Seepaard is single, and the spinous portion is greatly developed, rising in a bold curve over the shoulders and back like the crest of an ancient helmet, and being continued almost as far as the tail. Very little is known of this fish, though it is far from uncommon, and is eaten by the Dutch colonists of the Cape.

Its color is brown, mostly marbled with black, and the skin is smooth.

THE strange and quaintly decorated fish, called YELLOW SCORPÆNA, is an inhabitant of the American coast, being found on the Atlantic shores of Northern America.

This odd-looking species frequents the same localities as the cod, and is often taken at the same time as that fish. The skin of the Yellow Scorpæna is devoid of scales, and the ventral and pectoral fins are enveloped in thick skin. The head is depressed, naked, and is covered with a series of loose, skinny appendages, that flap and wave about in the water without any apparent purpose. It is also armed with a number of rather sharp spines. There are two dorsal fins, the first being so deeply scooped that at one time the fish was described as possessing three dorsals. The first four spines of the dorsal fin are very long, and the membrane is deeply scooped between the fourth and fifth spines. The general color of this fish is yellow, tinged more or less with red, and in some specimens marbled with brown. The length of a very fine specimen is about two feet, but the ordinary average is from fourteen to eighteen inches.

THE FILAMENTOUS GURNARD affords another example of this apparent capriciousness of grotesque formation. It is found on the coasts of the Isle of France. It appears to feed mostly upon crustaceans and mollusks, and the bony remnants of certain cuttle-fish have been found in its stomach. Its color is grayish-brown, marbled with a deeper hue of the same tint, and covered with minute spots of white.

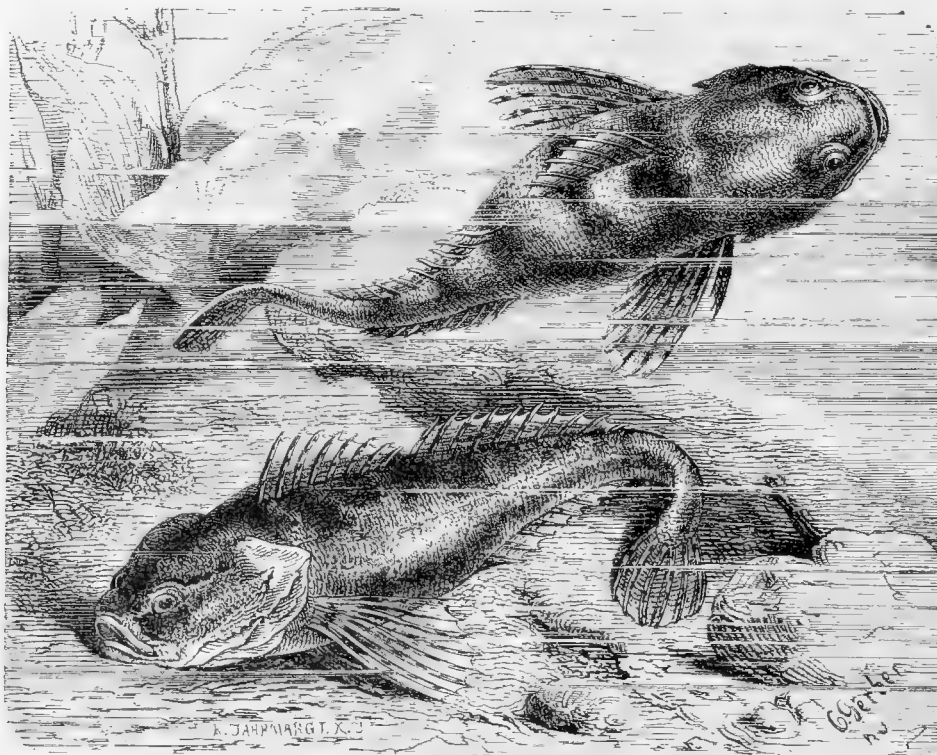
There is another species of this genus which is colored in a rather bold and pleasing manner. This is the SPOTTED PELOR (*Pelor maculatum*), which derives its name from the manner in which the black hue of the skin is variegated with white. In this species there are three large white patches on the back, and three more on the dorsal fin. Some circular white spots are scattered on the head, and a white ring encircles the eyes. The pectoral fins are decorated with a bold white band, and the tail fin is marked with two white bands alternating with the same number of black stripes.

THE odd-looking fish which is known by the name of the THREE-LOBED BLEPSIAS, is one of those species to which the ancient naturalists had affixed certain names without any apparent motive for so doing. There is no particular meaning in the word, and the sum of information obtainable from lexicons is, that it signifies a certain fish.

The members of this genus are found on the coasts of Kamschatka, and some fine specimens were obtained from the New Orcas Islands, in the Gulf of Georgia. This species is not very common, but may easily be known from its congener, the TWO-LOBED BLEPSIAS (*Blepsias bilobus*), by the peculiar manner in which the spiny portion of the dorsal fin is notched so as to form the whole fin into three distinct lobes. In the second species this structure is not seen. In both, the soft portion of the dorsal fin is greatly developed, and the body and fins are boldly marked with dark streaks upon a lighter surface. The body is entirely covered with prickles.

FAMILY *Triglidae*—the Gurnards. This group has about forty species, included in five genera. They are singular-looking fishes, resembling the *Cottidae*, their allies. The Sea Robins are among them, and the curious Flying Gurnards.

THE SCULPINS—family *Cottidae*. The genera are very numerous, being forty in number, and the species about one hundred and fifty. They are mostly confined to the rock pools and shores of northern regions. Many are found in fresh waters. Most are of small size and singular aspect, and none are valued as food. The Sea Ravens are included in this family. Several species called Sculpin are familiar to the fishermen and anglers of our northern coast; more particularly the tyro, who allows his line to lie loosely, and the bait to drag over the sea-weeds near bottom, where lurk these exceedingly odd-looking creatures.



BULL-HEAD.—*Cottus gobio*. (Natural size.)

WE now come to a very familiar and not very prepossessing fish—the well-known BULL-HEAD, or MILLER'S THUMB, sometimes called by the name of TOMMY LOGGE.

This large-headed and odd-looking fish is very common in European brooks and streams, where it is generally found under loose stones, and affords great sport to the juvenile fisherman.

The name of Miller's Thumb is derived from the peculiarly wide and flattened head, which is thought to bear some resemblance to the object whence its name is taken. A miller judges of the quality of the meal by rubbing it with his thumb over his fingers as it is shot from the spout, and by the continual use of this custom, the thumb becomes gradually widened and flattened at its extremity. The name of Bull-head also alludes to the same width and flatness of the skull. It is but a small fish, averaging four, and seldom exceeding five inches in length.

SEVERAL other species of this genus inhabit Europe. There is the SHORT-SPINED COTTUS, or SEA SCORPION (*Cottus scorpius*), which, as its name denotes, is one of the marine species. It is a very common fish, being found plentifully under heavy sea-weeds and stones, in the pools that are left above low-water mark by the retreating tide. The name of Scorpion is

given to it on account of the sharp spines with which its head is armed, no less than eight sharp and four rather blunt prickles being found on the head. The rays of the dorsal and pectoral fins are also sharply pointed, so that it must be cautiously handled by those who wish to escape wounded fingers. This is a much prettier species than the preceding fish, its body being rich purple-brown, mottled with a warm red hue, and in the adult male there are some stripes of red on the pectoral fins, and the abdomen is brightly decorated with some snowy-white circular spots on glowing scarlet. Its extreme length seldom exceeds eight inches.

ANOTHER and much more formidable species is the well-known FATHER LASHER, LONG-SPINED COTTUS, or LUCKY PROACH (*Cottus bubalis*). In color this species is very like the sea scorpion, but it may be readily distinguished from that fish by the array of long and sharply-pointed spines with which its head is armed. It is a rather large species, measuring ten inches in length. It is common on European coasts, and like the preceding species, may be taken in the rock pools at low water.

THE FOUR-HORNED COTTUS (*Cottus quadricornis*) may be easily known by the four bony protuberances on the crown of the head. There are four spines on the præoperculum. Its general color is brown above, and grayish-white below, the sides being yellow. The lateral line is marked with rough points.

THE generic name of *Platycephalus*, which is appropriately given to this and the other fish placed in the same group, is of Greek origin, and signifies Broad-head.

The head is of great width, but also of very considerable flatness. It is even wider in proportion than that of the bull-head, but is narrower towards the snout and not so rounded. The body is also flattened in front, but assumes a more cylindrical form towards the tail.

THE ARMED PLATYCEPHALUS is remarkable for the great length of the lower spine which proceeds from the præoperculum, and which reaches almost to the edge of the elongated operculum. It is also very wide and strong, being, indeed, about four times as large as the spine immediately above it. There are three little spines in front of the eye. Its color is brown, mottled and spotted on the fins with deeper and lighter shades of the same color.

WE now come to the typical genus of this family, which is represented by several well-known species.

THE SAPPHIRINE GURNARD, so called from the fine, deep blue which tints the inner surface of the pectoral fins, is of tolerably common occurrence.

This seems to be the most valuable of nine species, being, like all the others, excellent for the table, but exceeding them considerably in size. The name of *Hirundo*, or swallow, has been given to this fish on account of the great size of the pectoral fins, which are almost as proportionately large to the dimensions of the fish as the wings of the swallow to the bird. Putting aside the great development of these members and their rich blue color, the Sapphirine Gurnard may be distinguished from the other species by the extreme smoothness of the lateral line, which may be rubbed with the finger in either direction without exhibiting the spiny roughness which is found in other Gurnards. In consequence of this structure, the fishermen sometimes call the fish the Smoothside Gurnard.

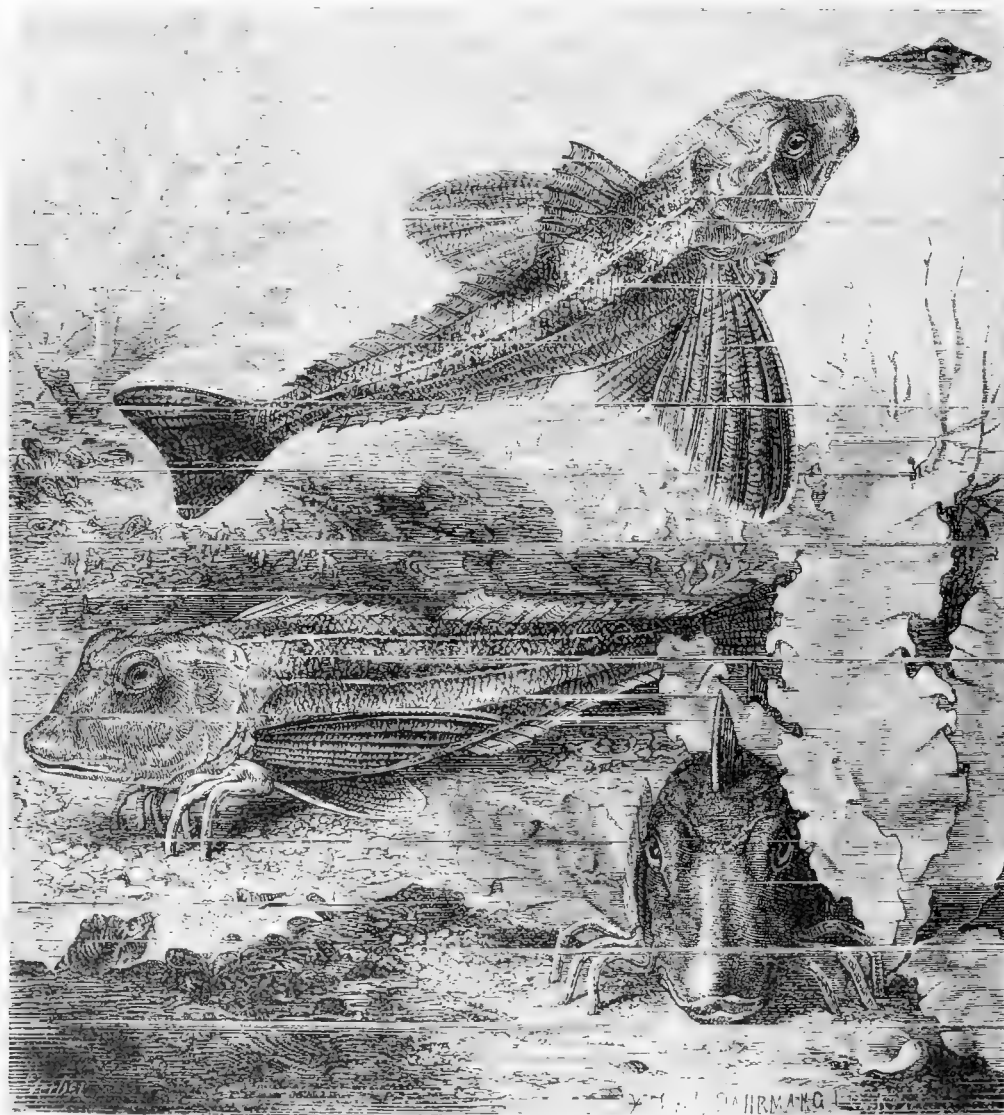
All the scales of this species are very small. The large head is armed with spines, some springing from just before the eye, and others from the operculum and the shoulder.

Of several other species of Gurnard, may be mentioned the CUCKOO GURNARD (*Trigla pini*), sometimes called the RED GURNARD from the color of its body. This is a very common species, and when young may be found in the rock pools at low water, measuring only a few inches in length, but perfectly exhibiting the characters of its genus. The specific title of "pini," or belonging to the pine-tree, is given to the Cuckoo Gurnard on account of the peculiar aspect of the lateral line, which is crossed with numerous short, straight, narrow, and elevated lines, which have been compared by some writers to the needle-shaped leaves of the pine. The name of Cuckoo Gurnard is given to it, because when it is first taken out of the water it emits a sound which bears a distant resemblance to the cuckoo's cry. The curious soft rays which project from the base of the pectoral fin in this and other Gurnards are

evidently organs of touch, being plentifully supplied with nerves and movable at the will of the owner.

The color of this fish is bright rosy-red above, and silvery-white on the sides and abdomen. These colors soon fade after the fish has been removed from the water.

THE GRAY GURNARD (*Trigla gurnardus*) is also tolerably common, and is readily to be known by its short pectoral fins and the greenish-brown body, spotted with white above the lateral line. On account of the peculiar sound which it utters, it is popularly known in Scotland by the name of CROONER, and in Ireland it is called the NOWD.



SAPPHIRINE GURNARD.—*Trigla hirundo*. (One-fifth natural size.)

ANOTHER curious and remarkable species, the SHINING OR LONG-FINNED GURNARD (*Trigla obscura*), is at once known by the great length of the second spine of the dorsal fin, which is nearly double the length of the other spines, and projects boldly with a slight curve towards the tail. It is a handsomely colored fish, the head and upper part of the body being vermilion-red, and the abdomen white, tinged with red. The flanks are shining silvery-white, and have given cause for the name of Shining Gurnard. The fins are all bright red, with the exception of the pectorals, which are deep blue.

THE LYRIE, OR ARMED BULL-HEAD, is known by a great variety of names, such as POGGE, SEA POACHER, and NOBLE.

It is a curious-looking fish, with its bony armor-plates and shielded head. It is most commonly taken near the mouths of rivers, though it is sometimes captured far out at sea. Its flesh is firm and good, but its small size and bony shields render it scarcely serviceable for the table. It feeds mostly on aquatic animals.

The body of the Lyrie is covered by eight rows of bony plates, strongly reminding the observer of the sturgeon, and the head, gill-cover, and shoulders are strongly armed with spines.

The general color of the Lyrie is brown above, crossed with several broad bands of dark brown, and the abdomen is white, with a trifling tinge of brown.

In the remarkable genus which now comes before our notice, the body is covered with bony plates, like ancient armor, and the front part of the head is formed into a deeply cleft fork on account of the development of certain bones of the skull.

The ORIENTAL GURNARD is found in the Japanese seas, and is a good example of the genus to which it belongs, the bony plates being very large, and the forked processes of the head well developed. Between the ventral fins, each bony plate is just three times as long as it is broad. The preoperculum is furnished with a strong spine, crossed by a projecting ridge from its angle.

A very curious species belonging to this genus is known by the name of MAILED GURNARD (*Peristethus cataphractum*).

In this fish, the bony plates between the ventral fins are twice as long as they are broad. It mostly prefers rather deep water over rocky ground, but approaches the shallows for the purpose of spawning. Its food consists of the softer crustaceans, medusæ, and similar creatures. It is a swift swimmer, but seems to be rather reckless, as it not unfrequently strikes its forked snout against the stones, and breaks off one or both points. The flesh of the Mailed Gurnard is tolerably good, but requires some care in cooking, besides costing some little trouble in freeing it from the hard, bony plates in which the body is so securely enveloped. In order to clear away these defences, the fish must be soaked in warm water, and the scales stripped off from the tail upward. In some places, such as the coasts of Spain, it is held in considerable estimation, and is especially sought by fishermen. Its color is like that of the Red Gurnard. Nearly all the rays of the first dorsal fin are extremely elongated, and, together with the mailed body, the armed head, and the double snout, give to the fish a most singular aspect. The total length of the Mailed Gurnard is about two feet.

THE Flying Gurnards are extraordinary and beautiful fishes, remarkable not only for the very great development of the pectoral fins, their muscles and attachments, but for the unexpected use to which those members are occasionally subservient.

These fishes, together with one or two other species, hereafter to be described, possess the power of darting from the water into the air, and by the mingled force of the impetus with which they spring from the surface, and the widely spread wing-like fins, to sustain themselves for a short space in the thinner element, and usurp for a time the privileges of the winged beings whose trackless path is through the air.

The object of exercising these strange powers seems to be, not the pleasure of the fish, but the hope of escaping from the jaws of some voracious monster of the deep, whose sub-aquatic speed is greater than that of the intended victim, but whose limited powers are incapable of raising it into the air. Foremost among these persecutors is the coryphene, often called the dolphin by sailors, and which is the so-called "dolphin" whose colors glow with such changeful beauty during its death-pangs.

Little, however, do the powers of flight avail the unfortunate fish, for winged foes, known by the name of albatross, frigate-bird, and similar titles, are hovering above in waiting for their prey, and no sooner does the Gurnard launch itself fairly into the air, and so escape the open jaws of the pursuer coryphene, than the albatross swoops down with extended wings, snatches up the fish in its beak, and without altering the bold and graceful curve in which it has made

the swoop, sweeps up again into its airy height, where it wheels on steady wing awaiting another victim.

Between the hungry coryphene below and the voracious albatross above, the poor Flying Gurnard leads no very happy life, and its intermediate existence, persecuted on either side, has been often employed as a type of those unfortunate persons who are ashamed of the more lowly society in which they were born, and aspire to ascend to an elevated condition for which they are not fitted by nature.

While passing through the air, the Flying Gurnard is able slightly to change its direction, but cannot prolong its flight, by flapping its finny wings. In fact, its elevation into the air may be readily imitated by throwing an oyster-shell in a horizontal direction, taking care to throw it in such a manner that the concavity is downwards and the convexity upwards. The flight is closely analogous to that of the flying squirrels, rats, and mice among mammalia, and of the flying dragon among reptiles.

The COMMON FLYING GURNARD, represented in the accompanying full-page illustration, is brown above, passing into a beautiful rose-color below. The fins are black, variegated with blue spots, and on the tail fin the spots run together so as to resemble continuous bands. Its length varies from ten to fifteen inches. It is a native of the Mediterranean and warmer parts of the Atlantic, and in many parts of those seas is very common.

The second species, the INDIAN FLYING GURNARD, is found throughout the Indian Ocean and Archipelago, and on account of its habits, its singular and striking form, and its lovely coloring, has always attracted the attention of voyagers, even though they have possessed no skill in natural history.

This beautiful fish is notable for the two long detached filaments that are planted between the head and the dorsal fin, the first being extremely elongated and the second much shorter. The first spine of the dorsal fin is solitary, and at first sight looks like another isolated filament. In all the members of this genus, the præoperculum is armed with long, sharp, and powerful spines, the scales of the body are strongly keeled, and there is no appearance of a lateral line. Four species of Flying Gurnards are known, the two which have been selected affording excellent types of their general form. In the Indian Flying Gurnard, the pectorals are covered with brown spots, and dotted rather profusely with bluish white.

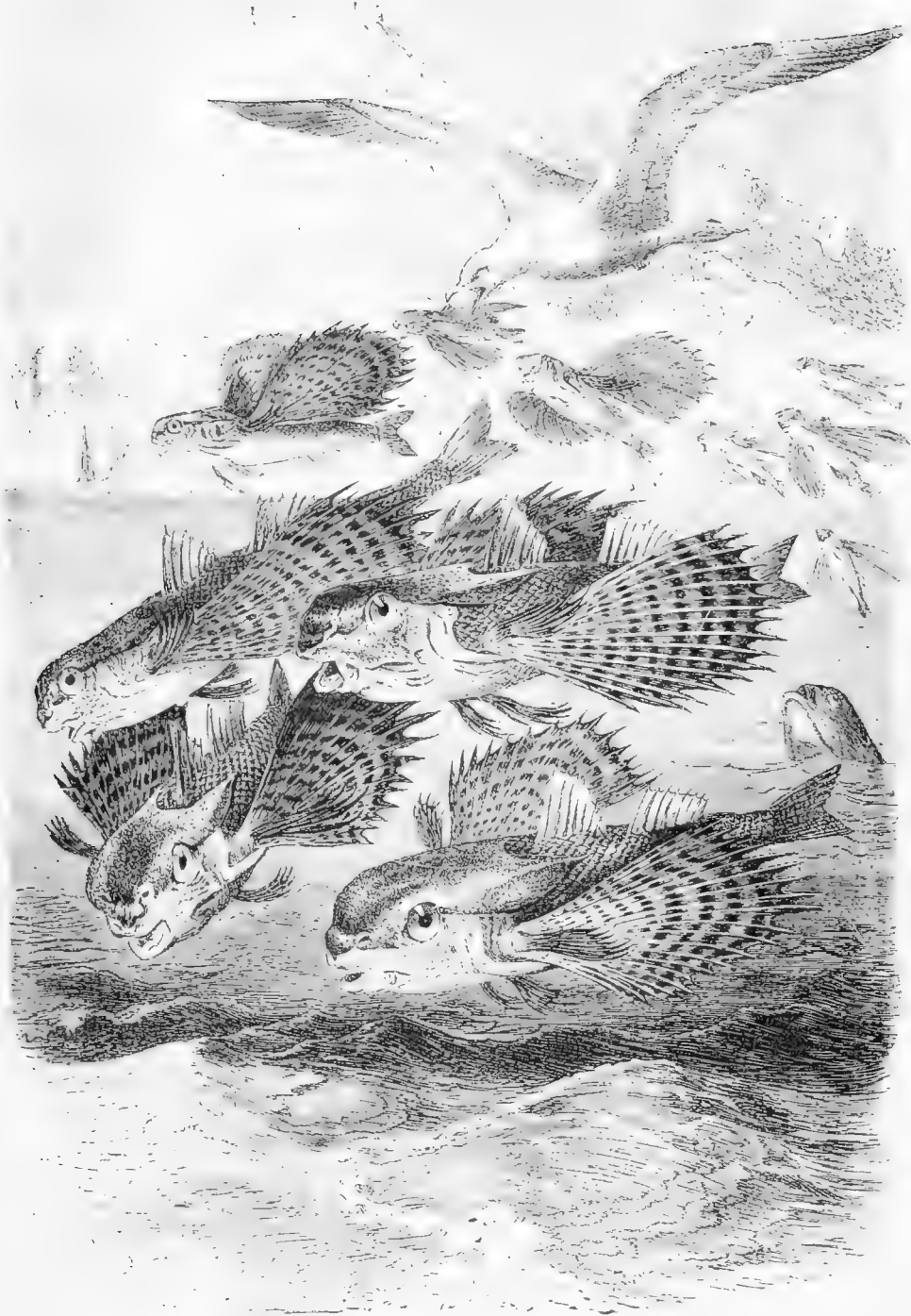
WE now arrive at a moderately large family of fishes, called, from the typical genus, Trachinidæ. In these creatures the body is long and rather flattened, the gill-covers are wide, and the teeth are arranged in bands.

OUR first example of these fishes is the very remarkable MEDITERRANEAN URANOSCOPIUS, a word which requires some little explanation before examining the form and habits of the species. The generic title is derived from two Greek words, literally signifying sky-gazer, and is given to the fish on account of the peculiar position of the eyes, which are set so singularly on the upper part of the head, that they look upwards instead of sideways, as is the usual custom among the finny inhabitants of the waters. It is illustrated on next page.

This species lives mostly at the bottom of deep seas, and is said to angle for the smaller fish, on which it feeds, by agitating a slender filamentary appendage of its mouth in such a manner as to resemble a worm, and to pounce on the deluded victims when they hurry to the spot in hopes of a meal. Though a fish of rather repulsive aspect, its flesh is tolerably good, and is eaten in many parts of Europe and along the shores of the Mediterranean.

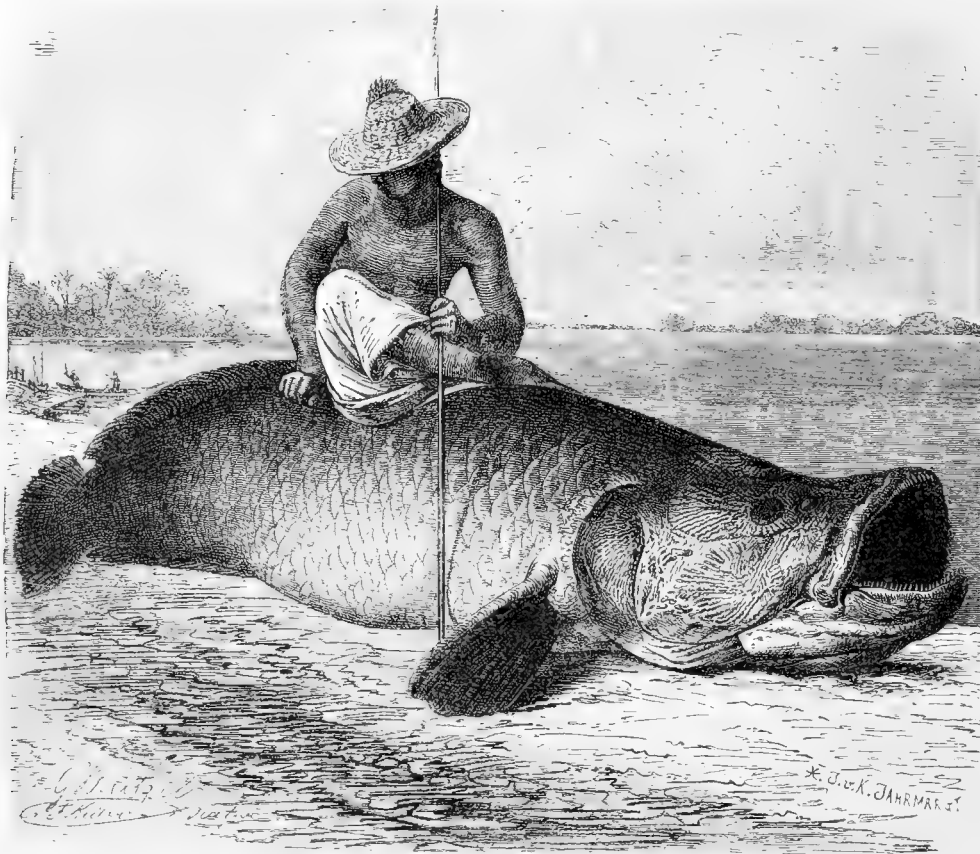
Its head is very large and broad, and is partially covered with bony plates, and the opening of the mouth is nearly vertical. The slender filament which has already been mentioned is set before and below the tongue, and the shoulders and gill-covers are armed with an array of strong sharp spines.

THE STAR-GAZERS, or family *Uranoscopidæ*, are divided among seven genera, and twenty species are known. They are carnivorous fishes, of singular appearance, living on the sea-bottoms in most warm regions. The great protruding eyes are placed upon the surface of the face, and near each other, that they may be observant when buried, as they are much of the



FLYING GURNARD.

THE ARAPAIMA (*Sadis gigas*), also called PIRARUCU, is one of the most remarkable fishes known, as to size especially. Specimens have been caught measuring fifteen feet in length, and of 410 pounds weight. In our illustration the gigantic fish is shown one-twentieth of its



ARAPAIMA.—*Sadis gigas*.

natural size. The body is entirely covered by large scales. The remarkable colors add to its singularity, as large fishes are usually plainly decorated. This fish has the tail so small, it appears to have been shorn of a large part. The color of the body and base of fins is a mixture of bluish and crimson lake, with a terminal bar of blue along the fins and tail. It is abundant in the Amazon, where it is prized as an edible.

ANOTHER family, the *Sciænidae*, now come before us. The members of this family are clothed with ctenoid, or toothed scales; the mouth is set in front of the snout, the teeth are arranged in bands, and the gill-covers are either unarmed or furnished with feeble spines.

The first example of this family is the BELTED HORSEMAN, a striking and boldly marked species.

This fish is found upon the Atlantic coasts of tropical America, and is, perhaps, the most striking of the limited genus to which it belongs. The body is oblong, and the nape of the neck is very high, its elevated line being continued by the first dorsal fin, which is short, high, and pointed, its height being just equal to the depth of the body. The second dorsal fin is long, rather low, and is covered with very thin scales. The tail fin is covered in like manner. The scales of the body are of moderate size.

Its general color is grayish yellow, diversified with three broad brown belts, edged with whitish gray.

Another species of the same genus, the SPOTTED HORSEMAN (*Eques punctatus*), is nearly, though not quite as remarkable a fish, and is notable for the bluish-white spots which decorate the dorsal, ventral, and anal fins. The general color of this fish is brown, with two vertical

bands running over the side of the head, and some curved bands passing along the body from the back to the tail. This fish is found in the Caribbean seas.

CLOSELY allied to these creatures is a rather remarkable fish, called scientifically *Pogonias chromis*, and more popularly known by the name of BEARDED DRUM-FISH.

This title is given to the fish on account of the peculiar sounds produced by the fish, which are thought to bear some resemblance to the beating of a drum. The sound is apparently produced both while the fish is immersed and after its removal from the water, and probably on account of the sound-conducting powers of the water, the hearer finds great difficulty in referring the strange noises to any particular spot. These fish do not seem to thrive well in fresh water, as the drumming was invariably found to cease as soon as the boat in which the observers were sitting had left the sea-coast and entered a river. It is a native of the North American coasts, and is known to extend as far south as Florida.

ANOTHER noisy fish is well known under the title of MAIGRE, the strange sounds produced by this species having been heard from a depth of one hundred and twenty feet.

In one instance, perhaps in many others, the novel accomplishment has led to the destruction of its possessors, the fishermen having been directed by the sounds to the whereabouts of the utterers, and inclosed them in their nets. The flesh of the Maigre is thought to be peculiarly excellent, the head and shoulders being held in the greatest estimation.

It is a rather large fish, seldom measuring less than a yard in length, and often attaining nearly double those dimensions, and is in consequence extremely valuable to the fisherman. Although at one time it might be captured with tolerable frequency on the coast of France, and now and then on more northern European shores, it is now very scarce, having shifted its localities, and being found most plentifully on the southern shores of the Mediterranean. There it seems to be hatched and to remain until it attains nearly adult age, when it crosses to the northern side of that sea, and is there found to be of considerable dimensions.

THE BLACK CORVINA of the Mediterranean (*Corvina nigra*) is allied to the maigre, and is scarcely less celebrated than that fish for the excellence of its flesh.

This fish is not exclusively a marine species, but frequents salt lakes and ponds, and, though it hovers about the mouths of large rivers, probably for the purpose of feeding on the many animal and vegetable substances which are borne by their currents into the sea, does not appear to ascend their streams. In general appearance it is not unlike the maigre, and is often sold in the markets under that name.

THE SQUETEAGUE, or WEAK-FISH of North America (*Cynoscion regale*) is another of the noisy fishes, producing dull sounds like those of a drum. It is plentiful about New York, and is captured in large quantities for the table. The name of Weak-fish is attributable to two causes, the one that when hooked it makes but a feeble resistance, and the other that its flesh is popularly supposed to be weakening to those who habitually live upon it. It is a useful species, for it not only affords delicate food, but its swimming-bladder can be made into isinglass which is said to be in no way inferior to that of the sturgeon. On account of its spotted skin, the French of New Orleans call it by the name of Trout.

It is a member of the family *Sciænidæ*, the Croakers, which number one hundred and twenty-five species, included in twenty-five genera. The species are all carnivorous; and most reach a large size.

A genus embraces what are called Fresh-water Drums.

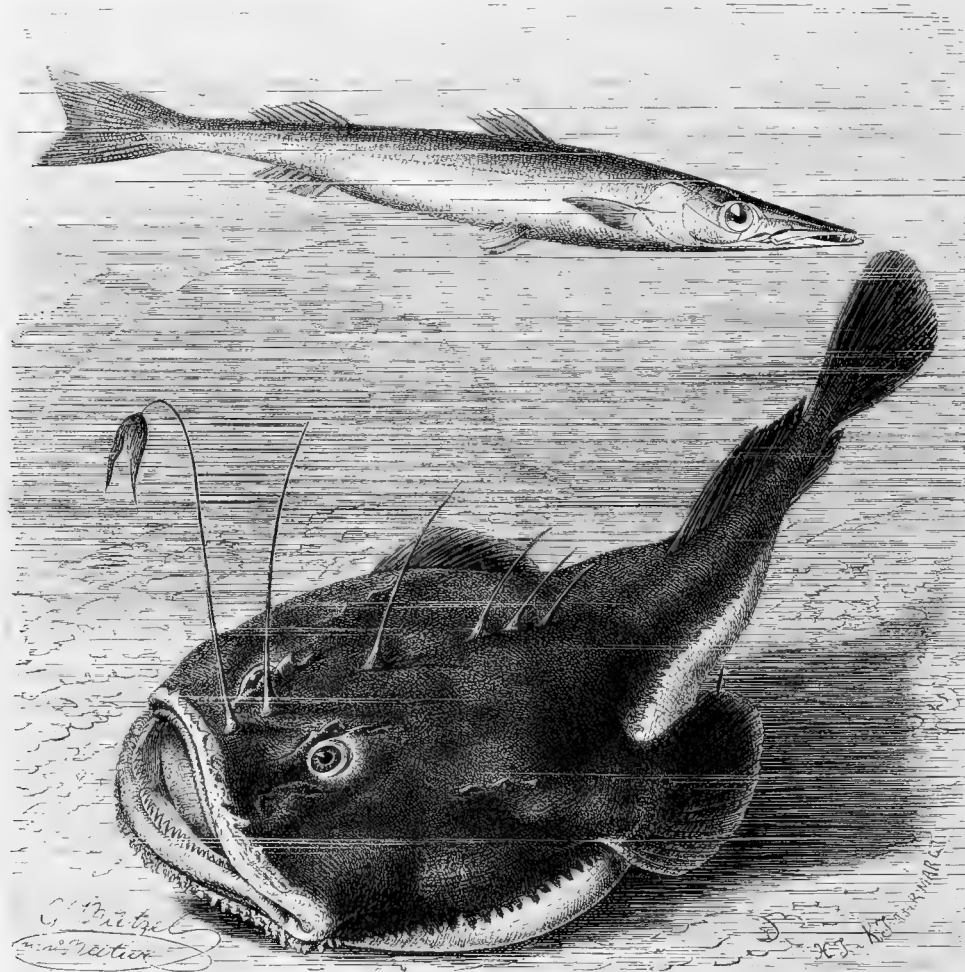
The BIG DRUM (*Pogonias chromis*) inhabits from Cape Cod to Florida. A peculiar drumming sound is heard from it. Some fine ones, three feet in length, were kept in Mr. Coup's Aquarium, and proved of great interest to visitors.

LAFAYETTE FISH (*Stromateus triacanthus*). This is a species which made its appearance, as was supposed, for the first time, in great numbers in the Long Island Sound and adjacent waters, at the time Lafayette made his last visit to the country, in 1824. Its habit is to reap-

pear in large shoals after long intervals, and though then known to science, it was new to the public. It is called Goody at Cape May, and Chub and Roach in Virginia.

THE KING-FISH (*Menticirrus nebulosus*) is a large silvery fish, much esteemed in Key West and other Southern cities as a table fish. It resembles the mackerel or blue-fish in its flesh.

This fish affords much occupation to the fishermen of the Florida Keys; the Havana market being supplied therefrom. It is found as far north as Cape Cod. It is called in some quarters Bermuda Whiting. Its excellence as a food-fish induced the early settlers to name it King-fish in token of its superiority. Barb is another name for it.



BECUNA.—*Sphyræna vulgaris*. FISHING FROG.—*Lophius piscatorius*.

ONE example of the Sphyrænidæ, the family next in order, is the BECUNA, a rather large and tolerably ferocious fish, inhabiting the Mediterranean and many parts of the Atlantic Ocean.

This long-bodied, deep-mouthed, and sharp-toothed fish bears some resemblance to the pike both in general appearance and in habits, and is hardly less voracious than the veritable pike of our own country. It is said that from the scales of the Becuna are washed those minute crystalline spiculæ, which are so useful in the preparation of artificial pearls, and which, when mixed and prepared for commerce, are termed *essence d'orient*. Some parts of the air-bladder are also used in the manufacture of this substance. The flesh of the Becuna is well flavored and is often brought to table; being capable of being dressed in a fresh state and after salting.

On the back, the color of this fish is leaden-blue with a wash of green, and on the abdomen

it is white. The sides are in many specimens marked with dark cross-bars of the same green color as the back. When young it is spotted with brown.

THE BARRACOURAS, family *Sphyrænidæ*, consist of one genus and about fifteen species. They are voracious, pike-like fishes, inhabiting nearly all temperate and tropical seas. A species is found on the Pacific coast, which proves a valuable food-fish, measuring about three feet.

These fishes resemble strongly the pickerels or pikes, and their habits are certainly much the same. We have often seen the fishermen on the Florida Reef strike some great specimen of the Barracoura—the *S. picuda*, we think, which abounds there. The fisherman stands in his “dingy” and sculls with his back to the sun, just outside the shallow waters of the reef. The Barracoura is curious about the oar-blade, and follows it. The sun is in *his* eye. A well-directed aim transfixes the victim.

WE now arrive at a small family of fishes, termed Trichiuridæ, or Hair-tailed fishes, in consequence of the delicate filamentary finlets which decorate the tail in some species. In all these fishes, the body is long and compressed, almost like a riband, and indeed is not at all unlike those flat “snakes” that are sold in the toy shops, and which dart in all directions when held by the tail.

The first example of these curious creatures is the SCABBARD-FISH, so called because in shape it bears some resemblance to the sheath of a sword.

On account of its shape and bright silvery whiteness, it is a most striking inhabitant of the ocean, and when writhing its way through the translucent water, in elegant undulations, it looks like a broad riband of burnished silver winding through the waves. This shining brilliancy is caused by a thin epidermis, which covers the body in place of scales, and which can be easily rubbed off by the fingers, to which it adheres, transmitting to them a portion of the metallic whiteness which it imparts to its proper owner.

In spite of the exquisite beauty of this fish, it is captured for the sake of its flesh, which is highly esteemed, and is generally sought in the months of April and May when it approaches the coasts. The drag-net is the usual instrument of capture. It seems to be a solitary fish, and lives at a considerable depth. The rapid undulations of the body are capable of propelling the creature through the water with great velocity, but, from all appearances, it is not able to make much way against a rapid tide, or to overcome the dashing waves raised by a tempestuous wind. Along its back runs a single dorsal fin, and the ventral fins are only represented by a pair of scales, a structure which has gained for the fish the generic name of *Lepidopus*, or Scale-fin.

ANOTHER fish that much resembles the preceding species is sometimes, but very rarely seen. This is the SILVERY HAIR-TAIL (*Trichiurus lepturus*), a species that may easily be distinguished from the scabbard-fish by the shape of the tail, which has no fin at its extremity, but tapers into a long and gradually diminishing point. This species is common in many parts of the Atlantic Ocean, and by the Spanish inhabitants of Cuba it is termed the Sabre-fish.

Another species, the SAVALA (*Trichiurus savala*), is found in the East Indian seas, and is sufficiently plentiful to form a recognized article of diet, and to be sold in the markets. The Savala bears salting well, and is much used for consumption when the inclemency of the weather will not permit fishing-boats to put to sea. When fresh, however, it does not suit the taste of Europeans, though in Malabar the salted fish is esteemed both by the native inhabitants and the European colonists.

BEFORE leaving this small but curious family, the ATUN (*Thyrsites atun*) deserves a passing notice.

This elegant and useful fish is found on the coasts of Southern Africa and part of Australia, and is much valued for the flakey whiteness and pleasant flavor of its flesh, which bears some resemblance to that of the cod, but is even superior in delicacy. It feeds mostly upon

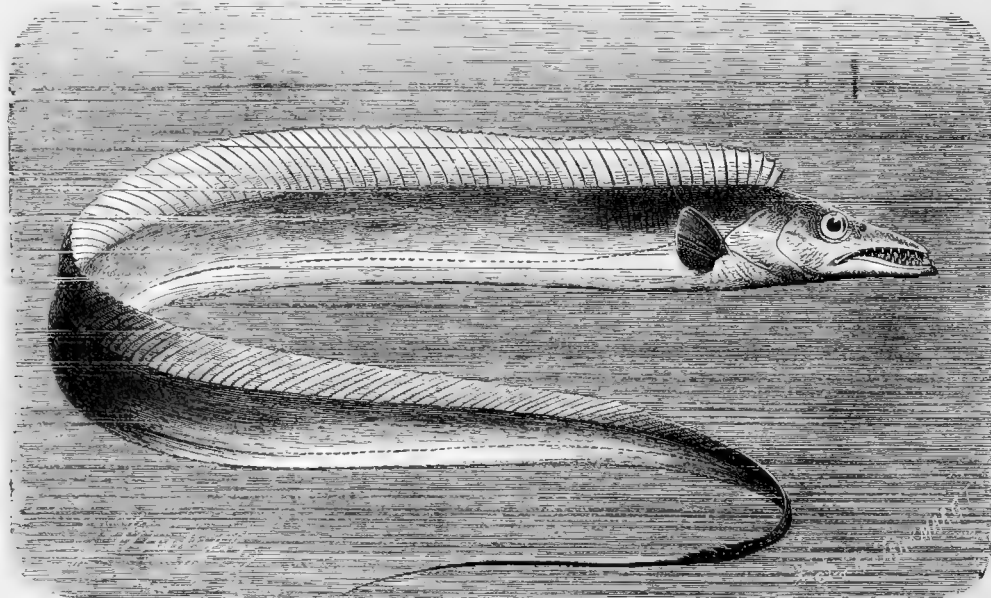
the cuttle-fish, the calamary being its favorite prey. So voracious is this creature that it is readily caught by making a sham calamary out of lead and leather, dressing it with projecting hooks, and flinging it into the sea. The fishermen throw this bait to some distance, and then draw it rapidly through the water, when the Atun takes it for the real calamary darting along after its usual fashion, dashes at it and is immediately hooked. In default of this bait, a strip of red cloth stuck on a hook is often a sufficient lure for this voracious fish.

THE MACKERELS, family *Scombridae*, include seventeen genera and about seventy species of highly brilliant and metallic-tinted fishes, found in the high seas. Many of them are cosmopolitan, and all have a wide range.

The COMMON MACKEREL (*Scomber scombrus*), the well-known food-fish, is abundant along the whole coast of North America, occasionally straying to the Pacific ocean.

The notable SPANISH MACKEREL is a common article in our New York market. It is not frequently seen above that.

The Bonito is another ally, of considerable repute as a food-fish,—occasional on our coast.



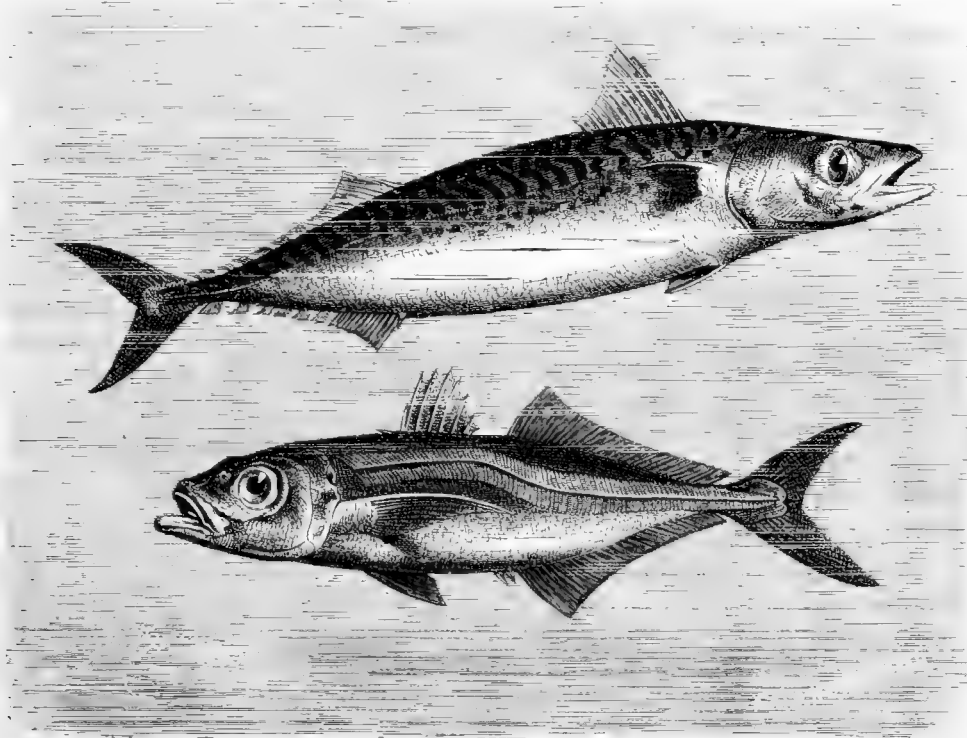
SILVERY HAIR-TAIL.—*Trichiurus lepturus*.

The Tunnies of this family are wonderful for their size. The COMMON TUNNY, or HORSE MACKEREL, is a notable creature, reaching the length of ten feet, and weighing a half ton. It makes its appearance in the summer months, sometimes being taken in the seines. Though large in the anterior half, its terminal portion has all the beauty of the shape of the Mackerel. The small of the body and the sharply-defined crescent tail render it a graceful fish. It is one of the well-known ancient fishes, being abundant in the Mediterranean Sea from the earliest time. A single specimen has yielded twenty gallons of oil. So much like the Mackerel is its flesh, it is captured for the market, and its flesh sold as third-rate mackerel.

The LITTLE TUNNY, or ALBICORE, is an active, graceful fish, running in schools of a hundred or more. We have seen them leaping out of water, and gambolling around Egg Rock, at Nahant, Massachusetts.

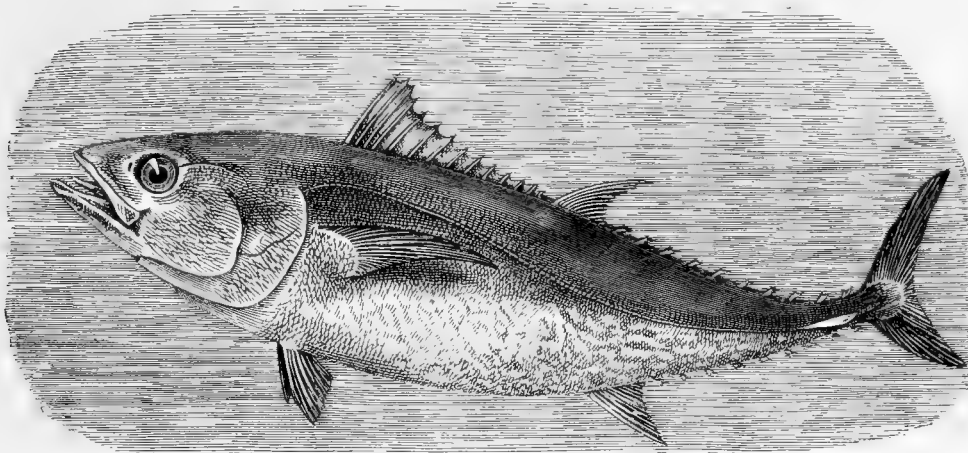
The Mackerel is well known for the exceeding beauty of its colors and the peculiar flavor of its flesh. This is one of the species that are forced by the irresistible impulse of instinct to migrate in vast shoals at certain times of the year, directing their course towards the shores, and as a general rule frequenting the same or neighboring localities from year to year. The time of their advent is rather variable, and in consequence the price of this fish varies with the scarcity or abundance.

The flesh of the Mackerel is very excellent, and it possesses a rather powerful and unique flavor that has caused fennel to be looked upon as a necessary corrective in the sauce with which the fish is served. Unfortunately, it must be eaten while quite fresh, as it becomes



MACKEREL.—*Scomber scombrus*. HORSE MACKEREL.—*Trachurus saurus*.

unfit for consumption in a very short time after being taken out of the water; and in consequence of this property, the London costermongers are permitted to hawk it about the streets on Sundays, much to the discomfort of peaceable householders who long for repose and do not want Mackerel.



TUNNY.—*Orcynus thynnus*.

THE TUNNY does not visit the European coasts in sufficient numbers to be of any commercial importance; but on the shores of the Mediterranean, where it is found in very great abundance, it forms one of the chief sources of wealth of the sea-side population.

In May and June, the Tunnies move in vast shoals along the shores, seeking for suitable spots wherein to deposit their spawn. As soon as they are seen on the move, notice is given

by a sentinel, who is constantly watching from some lofty eminence, and the whole population is at once astir, preparing nets for the capture, and salt and tubs for the curing of the expected fish. There are two modes of catching the Tunny, one by the seine-net and the other by the "madrague." The mode of using the seine is identical with that which has already been described when treating of the mackerel, but the madrague is much more complicated in its structure and management.

The general shape of the Tunny is like that of the Mackerel, but in size it is vastly superior, generally averaging four feet in length and sometimes attaining the dimensions of six or seven feet.

Of an allied species, the PACIFIC ALBACORE (*Orcynus alalonga*), Mr. F. D. Bennett writes as follows, in his well-known "Whaling Voyage." "Ships, when cruising slowly in the Pacific Ocean, are usually attended by myriads of this fish, for many successive months. A few days' rapid sailing is nevertheless sufficient to get rid of them, however numerous they may be; for they seldom pay more than very transient visits to vessels making a quick passage. When a ship is sailing with a fresh breeze, they swim pertinaciously by her side and take the hook greedily; but should she be lying motionless or becalmed, they go off to some distance in search of prey, and cannot be prevailed upon to take the most tempting bait that the sailor can devise."

The BONITO (*Sarda mediterranea*) is a very pretty and common species that is found in the Mediterranean and many parts of the Atlantic.

This is a smaller species than the albacore, not exceeding two feet and a half in length. The flesh of this fish is eaten both fresh and when pickled, but in a fresh state is not held in very high estimation. At some seasons, it appears to contract an unwholesome quality, which is injurious to certain constitutions, causing rather a painful rash to break out on the face and body, though others can eat it with impunity. The flesh is very red in color, and looks very like butcher's meat.

Like the albacore, the Bonito is a determined foe of that much persecuted creature, the flying-fish, and is often taken by means of a hook dressed with feathers so as to resemble its natural prey. It is a truly beautiful species, deserving fully the popular name of Bonito, which may be freely translated as Little Beauty. The back is deep indigo-blue, mottled with a lighter shade of the same hue, and when young a number of dark streaks are drawn across the back. The abdomen is silvery-white, and the cheeks and gill-covers are of the same brilliant hue.

BONITO (*Sarda chiliensis*), SKIP-JACK, and TUNA, so called, and the *S. mediterranea* are food-fishes of something the same quality as the mackerel. They are especially "sea-going" species.

Another species, the STRIPED BONITO (*Auxis rochei*), inhabits the same localities, and is nearly as plentiful as the preceding fish. It may readily be known from the plain Bonito by the four dark lines which extend along each side of the abdomen and end at the tail.

THE prettily-marked PILOT-FISH is frequently seen off the American coasts, but seems to be rather shy, and is not very often captured.

This little fish has long been supposed to act the part of the shark's provider, and to perform in the ocean the same actions that were once attributed to the jackal on land. Many modern writers, however, deny the truth of the statement, by saying that the Pilot-fish only follows the shark for the sake of the scraps that the larger fish is likely to leave, and that it would probably be snapped up by the shark but for its watchfulness and agility.

As is usual in such a disputation, the evidence is very conflicting, and many accounts have been published tending to throw discredit on the one side or the other, according to the particular circumstances under which the observations were made. One well-known naturalist, for example, mentions an instance where a shark was directed towards a baited hook by two Pilot-fish that accompanied him; but, on the other hand, another accomplished observer narrates an interesting anecdote of a shark being continually warned of a baited hook by his little friends, who struck their noses against his snout whenever he turned towards the bait.

At last, however, he dashed at the tempting morsel and was captured, to the sorrow of the Pilot-fishes, who swam about for some time in search of their friend, and then darted down into the depths of the sea.

BLUE-FISH (*Pomatomus saltator*), called in some quarters GREEN-FISH and SKIP-JACK. This is valued generally as one of the choicest of ocean fishes, being much the same as the mackerel as a food-fish, but rather preferred. In the first quarter of this century, Blue-fishes were unknown in New England above Cape Cod. About 1850, single individuals were taken at Nahant, and for several years a few were taken, and valued very highly. Soon we heard of their abundance to such an extent that they were hauled on to the land as manure, on the coast above Cape Cod. With a good breeze and trolling lines, this fish affords much sport. Its range is remarkable; it is found in the Mediterranean and Indian Ocean, and near New Holland. Blue-fish are very destructive to the mackerel fishery. They are voracious and make havoc in the shoals of those fishes.

THE POMPAÑO (*Trachynotus carolinus*) is a much prized fish of the Southern waters, ranking ahead of all others. It is put down in salt for the market, and is always in great request. In South Carolina it is called CREVALLI. Its range is from Cape Cod to Florida.

SPANISH MACKEREL (*Scomberomorus maculatus*). A "sea-going" fish, but frequently exposed for sale in New York markets.

EVERY one has heard of the SUCKING-FISH, and there are few who are not acquainted with the wild and fabulous tales narrated of its powers.

This little fish was reported to adhere to the bottom of ships, and to arrest their progress as suddenly and firmly as if they had struck upon a rock. The winds might blow, the sails might fill, and the masts creak, but the unseen fish below could hold the vessel by its single force, and confine her to the same spot as if at anchor. It is wonderful how fully this fable was received, and how many years were needed to root the belief out of prejudiced minds. Both scientific names refer to this so-called property, *echeñéis* signifying "shipholder," and *rémore* meaning delay.

That the Sucking-fish is able to adhere strongly to smooth surfaces is a well-known fact, the process being accomplished by means of the curious shield or disc upon the upper surface of the head and shoulders. This disc is composed of a number of flat, bony laminæ, arranged parallel to each other in a manner resembling the common wooden window-blind, and capable of being raised or depressed at will. It is found by anatomical investigation, that these laminæ are formed by modifications of the spinous dorsal fin, the number of laminæ corresponding to that of the spines. They are moved by a series of muscles set obliquely; and when the fish presses the soft edge of the disc against any smooth object and then depresses the laminæ, a vacuum is formed, causing the fish to adhere tightly to the spot upon which the disc is placed.

When the creature has once fixed itself, it cannot be detached without much difficulty; and the only method of removing it, without tearing the body or disc, is to slide it forwards in a direction corresponding with the set of the laminæ. In the opposite direction it cannot be moved; and the fish, therefore, when adhering to a moving body, takes care to fix itself in such a manner that it cannot be washed off by the water through which it is drawn. Even after death, or when the disc is separated from the body, this curious organ can be applied to any smooth object, and will hold with tolerable firmness. In order to accommodate the disc, the upper part of the skull is flattened and rather widened.

The Sucking-fish will attach itself to many moving objects, and has been found adhering to the plankings of ships and boats, to turtles, to whales, and to fishes of various kinds. Even the albacore, which eats the Sucking-fish whenever it can catch it, is occasionally honored by its adhesion, and in the British seas a specimen has been captured while sticking to a cod-fish. The shark, however, is its favorite companion; and it often happens that one of

these voracious creatures is attended by quite a little train of Sucking-fishes. What object is fulfilled by this capability of adhesion, is a problem as yet unsolved. The Remora is perfectly organized and capable of procuring food for itself, and, though not a swift swimmer, is able to proceed through the water with tolerable rapidity. Its mouth is moderately large; and that the creature has no difficulty in seeking a subsistence is proved by the fact that its stomach usually contains remnants of small crustacea and mollusks.

The color of this species is dusky brown, darker on the back than on the abdomen. The fins are darker than the body, and are of a dense leathery consistence. The length of this fish seldom exceeds eight inches.

There are about ten species of Sucking-fishes known, of which the SHIELDED SUCKING-FISH (*Echeneis scutáta*) is perhaps the most remarkable. This species may be at once recognized by the very great size of the disc, and its length being nearly one-half that of the body. At the hinder portion of the disc the laminae are wanting, and its surface is smooth. This species attains to considerable dimensions, sometimes to nearly two feet in length.

The family of Remoras (*Echeneididae*) is made up of the species of two genera, found in all seas, all having a long range. The COMMON REMORA is found attached to large sharks in the warmer waters, from the Atlantic to the Pacific. Another species is found north as far as Massachusetts. We have seen several Remoras drop from the Blue Shark, of the Gulf of Mexico, when taken from the water.

THE well-known JOHN DORY, so dear to epicures, is frequently seen in the fishmongers' shops, where its peculiar shape seldom fails of attracting attention even from those who are not likely to purchase it, or even to have seen it on the table.

The name of John Dory is thought to be a corruption of the French name *jaune dorée*, a title given to the fish on account of the gilded yellow which decorates its body. It was called Zeus by the ancients, because they considered it to be the king of eatable fish; and the name of Faber, or blacksmith, has probably been earned by the smoky tints which cloud its back. The dark and conspicuous spots on the side are thought in many places to be imprinted on the fish as a memorial of the honor conferred upon its ancestor in times past, when St. Peter took the tribute-money from the mouth of the Dory, and left the print of his finger and thumb as a perpetual remembrance of the event. Some persons, however, contend that the marks are due, not to St. Peter, but to St. Christopher; and the Greeks, who hold to the latter tradition, call the fish Christophoron.

The Dorics (family *Zenidae*) inhabit the warmer seas. Five genera and about ten species are known. One species only is recorded as familiar to our coasts, the *Z. ocellatus*, though it is oceanic, approaching our shores near Cape Cod.

WE now come to a most beautiful and interesting fish, the CORYPHENE, so often erroneously spoken of as the dolphin.

This splendid fish is found in many of the warmer seas, inhabiting the Mediterranean Sea, and the Indian, Pacific, and Atlantic Oceans. The reader has, in all probability, heard the old story respecting the lovely and changeful colors of the dying dolphin, and is quite aware that in the shining black and gray skin of the true dolphin no such changes take place. There is, however, more truth than usual in this tale; for the dolphin in question is really the Coryphene, whose colors are always most brilliant, and glow with changeful beauty during the death struggle. A similar phenomenon occurs in several other fishes, of which the common red mullet is a familiar example.

The Dolphins (family *Coryphænidæ*) are embraced in one genus and six or eight species. They are very large fishes, inhabiting the high seas in warm regions, well known through their representative which is so often seen by the ship's sides in the warm waters of the tropics. The term *Coryphænas* would be more appropriate for these fishes instead of the Dolphin. The latter was applied by the ancients to the small whale-like creature which resembles our porpoise. The beautiful form so frequently used in sculpture was borrowed from the cetacean, although it is true that the Coryphene also has the graceful protuberance

on the head which characterizes the Dolphin of the ancients. Ancient authors do not give much attention to the Coryphene; hence, to the cetacean rightfully belongs the place in art. Poets have celebrated the beauties of Coryphene. The colors are beyond description, and the changeable hues are surprisingly beautiful. As seen from the side of a vessel, as the Coryphene playfully accompanies it, the gleam of golden and silvery lights, changing now and again to rich metallic tints—emerald, sapphire, and many gorgeous colors—it is a never-failing source of wonder and enjoyment. Two species are seen near our shores in the warmer seasons, though they are essentially pelagic.

A VERY remarkable fish is allied rather closely to the preceding species, in spite of the great difference in form, and by some writers was placed in the same genus as that fish.

The EYED PTERACLIS is a good example of the curious genus to which it belongs, and which can always be recognized by the extreme depth of the dorsal and anal fins, and their delicate tenuity of structure. The dorsal fin is, moreover, remarkable for the bold sweep of its extent, passing in an unbroken curve from the forehead to the tail. Owing to the development of the anal fin, the two ventrals are placed very far forward, and are seen under the throat. The members of this genus are spread over the Indian Ocean, the Sea of Marmora, and some of the American coasts.

The Eyed Pteraclis is found on the Mozambique coast. It is a very beautiful fish, the general color being shining white, as if made of polished silver, with a wash of gold upon the pectoral and tail fins, and a deepish tint of blue-gray upon the others. On the dorsal fin there is a round spot of dark blue. It seems to be a small species. About four members of this genus are known to naturalists.

These fishes form a small family called *Bramidae*, the Bramoids, included in four genera and about ten species. *Pteraclis carolina*, a small fish, inhabits the waters of the Carolinas.

BEFORE quitting this family, we must briefly notice the handsome OPAH, or KING-FISH (*Lampris luna*).

This beautiful species seems to be the sole representative of its genus, it having been separated from the genus Zeus, in which it had formerly been placed, in consequence of its single dorsal fin. It sometimes attains to a considerable size, a specimen having been taken which measured five feet in total length, and weighed about one hundred and fifty pounds. The flesh of this fish is red, very good, and is said to resemble that of the salmon.

The color of the Opah is bright green on the upper part of the back and sides, with reflections of purple and gold in certain lights. The fins and eyes are scarlet, and a number of round spots of pale gold are scattered upon the sides.

The Opahs (family *Lamprididae*) are fishes of large size and gorgeous coloration, inhabiting the open Atlantic. A single genus is known. *Lampris guttata* is sometimes seen off Newfoundland. It is estimated as one of the most gorgeously colored fishes known. Sun-fish is a local name.

WE now arrive at a rather large family of fishes, which has been separated from the mackerels on account of certain anatomical variations, which will be mentioned at the end of the volume.

The CORDONNIER, or COBBLER-FISH, has derived its popular name from the long sharp spines of the dorsal and anal fins, which are thought to resemble the awl and bristles employed by cobblers in their trade. This fish is a good example of the large genus to which it belongs, and in which no less than seventy species have been classed. It is found in various localities, from the Red Sea throughout all the Indian seas, and is tolerably common. The form of this fish is sufficiently curious to render it a conspicuous species, and it may be easily distinguished from its many congeners by the oblong spot on the operculum, and the six black bands that are drawn across the body and reach nearly to the abdomen.

ANOTHER species of this genus is the RUDDER-FISH, (*Caranx carangus*), so called because it is fond of hovering about the rudders of vessels, apparently for the sake of picking up the

refuse food that is thrown overboard. It is rather a pretty fish, the general color being silvery white and blue. The lateral line is covered, near the tail, with a row of spinous plates. It is somewhat remarkable that this fish, when hooked, emits a rather loud chattering kind of noise, thought to proceed from the passage of air through the gills. The flesh of the Rudder-fish is rather coarse, but is digestible and nourishing. Another fish (*Pammelas perciformis*), found in the seas of Northern America, is sometimes called by the name of Rudder-fish.

The family *Carangidæ*—from *Caranx*, the generic name of several of the groups—embraces twenty-five genera, and one hundred and eighty species, called, collectively, Pilot Fishes. Most are widely distributed, and are excellent food. They abound in warm waters, and move northward in summer. The familiar Horse Crevallé is one of the group; and the Mackerel Scads. The Cobbler-fishes, Moon-fishes, and the notable Pompano, also are included. The Common Pompano (*Trachynotus carolinus*) is one of the choicest food-fishes in the south. It ranges northward to Cape Cod, though is not taken so far north in quantities.

CLOSELY allied to these fishes is the well-known HORSE MACKEREL (*Trachurus saurus*), sometimes known by the popular name of SCAD. Its picture is to be seen on page 245.

This species is common in the European seas, and occasionally appears in enormous shoals, almost rivalling in numbers those of the common mackerel, and crowding so closely against each other that they cannot escape if threatened by danger, and may be taken out of the sea by hand or dipped out in buckets. The flesh of the Horse Mackerel is rather coarse, and when fresh is held in very slight esteem. However, it readily takes salt, and is then much eaten, especially during the winter months.

The color of the Horse Mackerel is dusky olive on the upper part of the back, changing in certain lights to resplendent green, which descends down the sides, and is variegated by wavy bands of blue. The sides of the head and the abdomen are silvery-white. The lateral line is furnished with a row of strong and deeply keeled bony plates, which give to the hinder part of the body a somewhat squared outline.

THE well-known SWORD-FISH, represented in the accompanying full-page illustration, derives its popular name from the curious development of the snout, which projects forward, and is greatly prolonged, into a shape somewhat resembling a sword-blade. The "sword" is formed by the extension of certain bones belonging to the upper part of the head.

This fine fish is found in the Mediterranean Sea, and also in the Atlantic Ocean, and in the former locality is often very plentiful. The Sicilian fishermen are accustomed to pursue the Sword-fish in boats, and mostly employ the harpoon in its capture. The weapon is not very heavy, and by a strong and practised hand can be hurled to some distance.

The fishermen are accustomed to chant a kind of song, set to words which no one can understand, but which are supposed to be the more efficacious for their incomprehensibility. This song is thought by some writers to be a corruption of some old Greek verses, and the fishermen believe that the Sword-fish is so fond of this song that it follows the boat in which it is sung. They will not venture to speak one word of Italian, thinking that the Sword-fish would understand what they were saying, learn that they contemplated its death, and then dive and make its escape. No bait of any kind is employed, the unintelligible chant being thought to be far more efficacious than any material aid.

The flesh of the Sword-fish is always eatable and nourishing, and in small specimens is white and well-flavored.

The use of the "sword" is not clearly ascertained. In all probability the fish employs this curious weapon in gaining its subsistence, but the precise mode of so doing is not known. It is an ascertained fact that the Sword-fish will sometimes attack whales, and stab them deeply with its sharp beak; and it is also known that this fish has several times driven its beak so deeply into a ship that the weapon has been broken off by the shock. In such cases, the blow is so severe, that the sailors have fancied that their vessel has struck upon a rock. Several museums possess examples of pierced planks and beams, but it is possible that the



SWORD-FISH.

fish may have struck them by accident, and not in a deliberate charge. The Sword-fish generally go in pairs.

The food of this creature is rather varied, consisting of cuttle-fish, especially the squid, and of small fishes, neither of which animals would in any way fall victims to the sword. It certainly has been said that the weapon is used for transfixing the flat fish as they lie on the bed of the sea, but this assertion does not appear to be worthy of credit.

The young and adult specimens are very different from each other. In the young, the body is covered with projecting tubercles, which gradually disappear as it increases in size, and when it has attained the length of three feet, they are seldom to be seen. Those on the abdomen remain longer than the others. The dorsal fin extends in the young specimens from the back of the head to the root of the tail, but the membranes and spines of its centre are so extremely delicate, that they are soon rubbed away, and the adult specimen then appears to have two dorsal fins.

The color of the Sword-fish is bluish-black above, and silvery-white below. The whole body is rough, and the lateral line is almost invisible. The usual length of the Sword-fish is from ten to twelve feet, but specimens have been seen which much exceed those dimensions. A few examples of the Sword-fish have been captured that measured seven feet in length.

The Sword-fishes, family *Xiphiidae*, have three genera and about five species. They are large, strong fishes, and all good for food. Off Portland, Me., they frequent in considerable numbers. The fishermen here find it profitable to fit out for their capture. The vessels are provided with resting bars on the bow-sprit, and a lance is always at hand on the bar. When the Sword-fish is seen the fisherman hastens to his bar, and, leaning over it, to make all firm, he hurls the spear, and usually secures his prize. The handle slips out of the iron spear, and the line which is fast to the spear-head, serves to haul the fish on board. The flesh of the Sword-fish is very excellent; rather dry, but the union of the flavor of mackerel and halibut renders it quite a good food-fish.

THE SAILOR SWORD-FISH is still of much more curious aspect. It is a representative of a genus of Sword-fishes that have been separated from the previous genus on account of the very great height of the dorsal fin.

The Sailor-Sword fish is sometimes called the FAN-FISH or SAIL-FISH, and is said to possess the power of raising or lowering the enormous dorsal fin just as a lady opens or closes her fan. Sir J. Emerson Tennent mentions this fish in the following terms: "In the seas around Ceylon, Sword-fishes sometimes attain to the length of twenty feet, and are distinguished by the unusual height of the dorsal fin. Those both of the Atlantic and Mediterranean possess this fin in its full proportions only during the earlier stages of their growth. Its dimensions even then are much smaller than in the Indian species; and it is a curious fact, that it gradually decreases as the fish approaches to maturity; whereas in the seas around Ceylon, it retains its full size throughout the entire period of life. They raise it above the water while dashing along the surface in their rapid course, and there is no reason to doubt that it occasionally acts as a sail."

In this genus the ventral fins are reduced to one, two, or three spines, which in the present species are two in number. The tail is very deeply forked, and the enormous dorsal fin is a uniform deep blue.

WE now arrive at the large family of the Gobies, which include many curious fish.

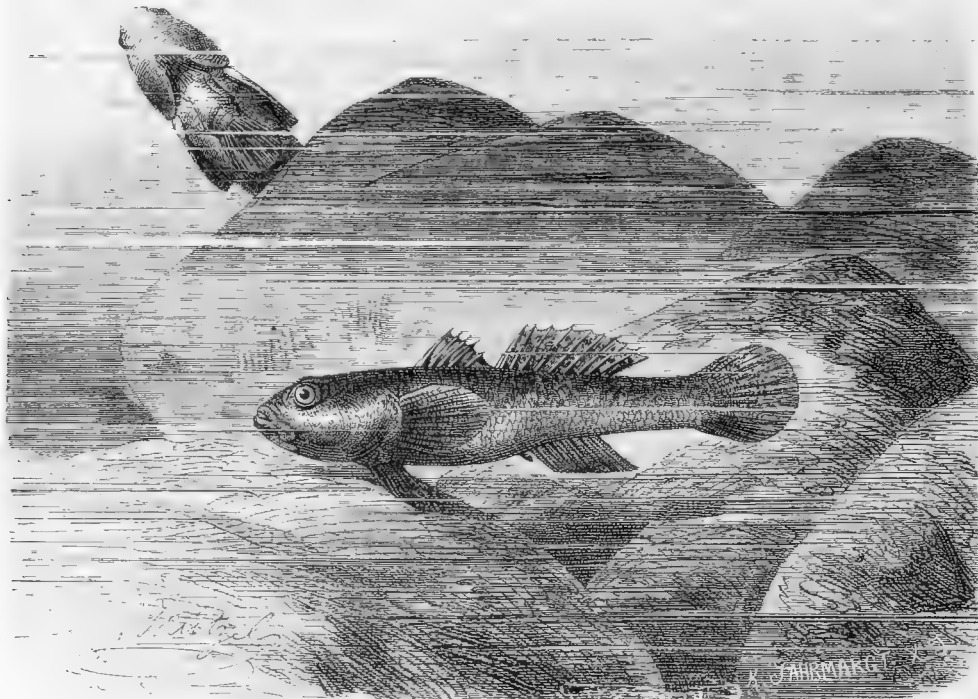
The BLACK GOBY, sometimes known as the ROCK-FISH, is a moderately common example of the enormous genus to which it belongs, and which contains more than a hundred and fifty authenticated species. The members of this genus may easily be recognized by the peculiar form of the ventral fins, which are united together so as to form a hollow disc, by which they can attach themselves to rocks or stones at pleasure. In fact, this disc, although differing in shape, acts on exactly the same principle as that of the sucking-fish.

The Black Goby prefers the rocky to the sandy coasts, and may be found in the pools left by the retreating tide. Some naturalists deny that the disc is used for adhesion, but I

have caught and kept many Gobies, and have frequently seen them sticking to the sides of the vessel in which they were confined. The adhesion was achieved with astonishing rapidity, and the little fish contrived to hold itself with wonderful tenacity. The surface of the Black Goby is very slippery, owing to the abundant mucous secretion which is poured from the appropriate glands, but after it has been in spirits for some time, the edges of the scales begin to project through the mucous, and are exceedingly rough to the touch.

Several species of Goby inhabit the American shores, such as the POLEWIG, or SPOTTED GOBY (*Gobius minutus*), a rather pretty little fish, transparent golden-gray, with a multitude of tiny black dots upon the back, and generally marked with some darkish blotches upon the sides, and a black spot on the dorsal fin. The TWO-SPOT GOBY (*Gobius Ruthen sparii*) is another species, and may be distinguished by the two deep brown spots on either side, one just above the root of the pectoral fin, and another on the side of the tail.

In some places along the sea-coast, the Gobies are known by the popular appellation of Bull-routs, and are rather feared on account of the sharp bite which their strong jaws and pointed teeth can inflict upon the bare hand.



POLEWIG, OR SPOTTED GOBY.—*Gobius minutus*.

The general color of this fish is blackish-brown above, changing to white along the abdomen and under the chin. The length of this species seldom exceeds five or six inches.

The Gobies, family *Gobiidae*, are carnivorous fishes, mostly of small size, living on the bottoms near the shores in warm regions. Some inhabit fresh waters, and others live indiscriminately in either fresh or salt water. There are sixty to seventy genera, and nearly four hundred species.

THE pretty GEMMEOUS DRAGONET, FOX-FISH, SCULPIN, or GOWDIE, can easily be distinguished from any other species, on account of its very remarkable shape

It is not a very uncommon fish, and is captured either with the hook or in a net, the latter being the ordinary method of securing it. It is rather a voracious fish, and feeds chiefly on

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WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston, who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield, and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities. Our endeavor has been to find an author whose work would be noted for its fund of anecdote and vitality rather than for merely anatomical and scientific presentation, and we arrived at the conclusion that we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work—a work most popularly approved by speakers of the English language. It would be superfluous to say one word concerning the standard character of his book, from the pages of which old and young at the other side of the Atlantic have obtained so much instruction and rational amusement. Avoiding the lengthened dissertations and minute classifications of specialists, he presents to his readers in popular terms a complete treatise on the Animal Kingdom of all climes and countries. The one objection that could be urged against it was, that animal life in America might be treated more fully and American forms given more consideration. In order to obviate this drawback and to do full justice to the creatures of our own country, we secured the aid of Dr. J. B. HOLDER, of the American Museum of Natural History in New York, an undoubted American authority, who has adapted Wood's work to American wants and given prominence to American forms of Animal life.

The splendid work on Rodentia, by Allen, Coues, and others, will be fully consulted. The valuable work on North American Birds, by Baird, Brewer, and Ridgway, will be the guide in the treatment of birds. The late arrangement of the classification and nomenclature of North American Birds, by Mr. Ridgway, and the Committee on that subject of the Ornithologists' Union, will be utilized in full. The arrangement of Mammals will be after the latest classification by Professor Flower, of the Zoological Society of London.

Terms of Publication.

The extent of the work will be 68 parts of 28 pages, at the price of 25 cents each. The entire publication will contain 34 Oleographs and 68 Full Page Engravings on Wood, besides many hundreds of exquisite Illustrations interspersed through the text. No subscriber's name is received for less than the entire set, and no order can be cancelled after acceptance of first four parts. The Publisher guarantees to complete the work in sixty-eight parts. The parts are payable only as delivered, the carrier not being permitted to receive money in advance, nor to leave parts on credit. Subscribers who remove, or who are not regularly supplied, will please address the Publisher by mail.

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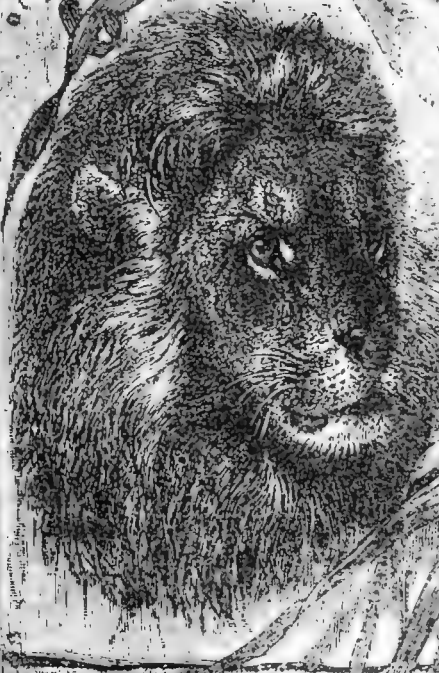
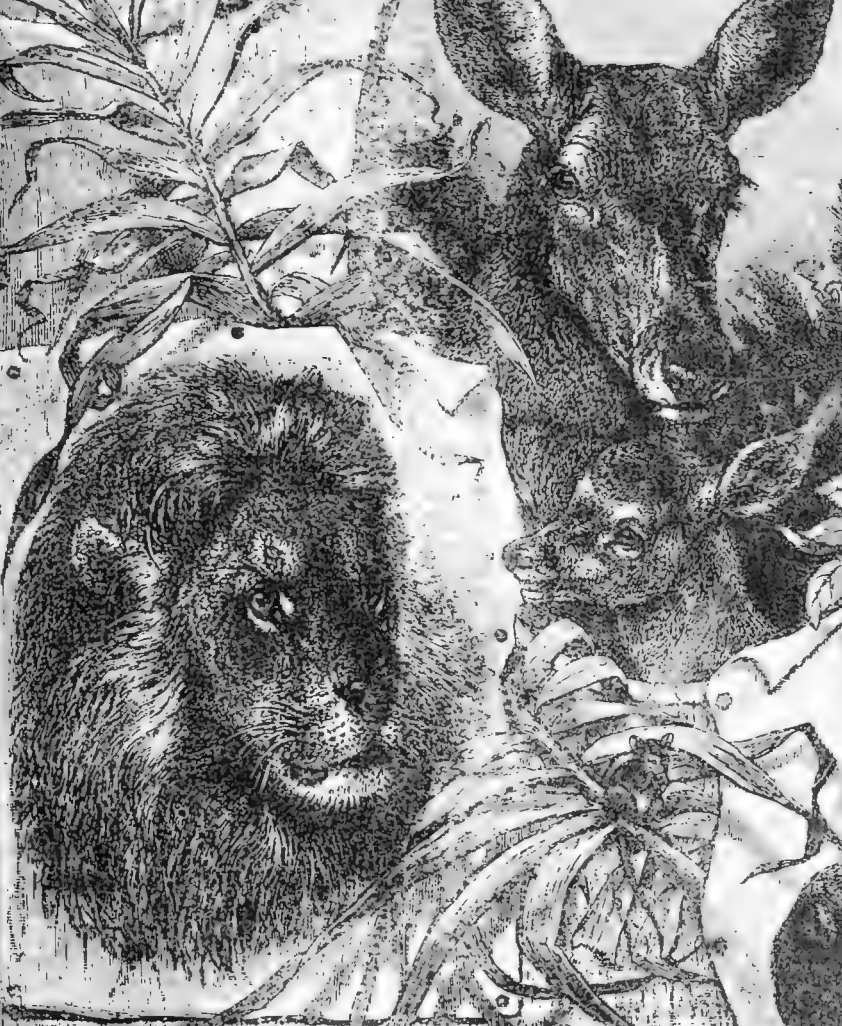
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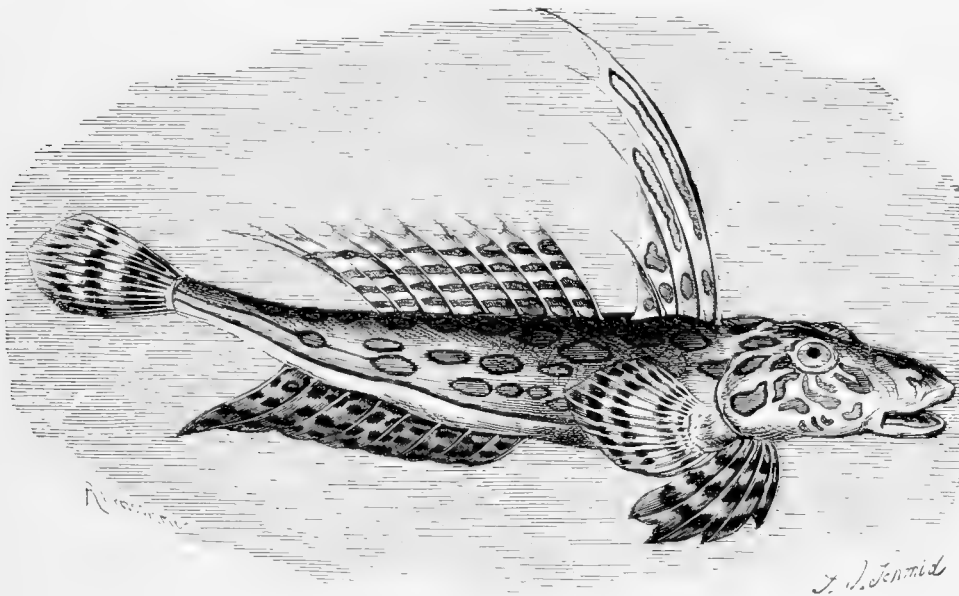


Selmar Hess,
Publisher
New York

mollusks and marine worms. The flesh of this species is firm, white, and well-flavored, and in spite of its small size the Dragonet repays the trouble taken in its capture. It generally remains near the bottom of the sea, and does not often enter shallow water except when young, when it approaches the shore, and sometimes is taken in the net of the shrimper.

It is a lovely fish, well deserving its name of Gemmeous Dragonet, as its scales glitter as if set with gems, and of Gowdie, or golden, on account of the gilded lustre of its exterior. The name of Dragonet is given to it on account of the dragon-like aspect of the body and fins.

The color of this beautiful fish is golden-yellow of different shades, variegated with spots and streaks of sapphire upon the head and sides. The under surface is white. The first dorsal fin consists of four rays, the first being enormously lengthened, and reaching, if depressed, to the base of the tail. The succeeding rays rapidly diminish in length, the fourth being extremely short, barely an inch in length. The pectorals are rounded and triangular, the central ray being the largest. The length of the Gemmeous Dragonet is about ten or eleven inches.



GEMMEOUS DRAGONET.—*Callionymus lyra*.

More than twenty species of Dragonets are known, spread over a very large portion of the globe, and inhabiting the temperate seas of the Old World, and the Indian Ocean from Mozambique to the Western Pacific Islands. They are marine fishes, and inhabit the bottom of the sea at no great distance from the shore.

WE now come to a very small, but curious family, termed Discoboli, or Quoit-fishes, because the spines of the ventral fins are modified into a flattened disc, something like the quoits of the ancients. This disc has a soft, leathery margin, and enables them to attach themselves to rocks or stones, after the manner of the gobies.

A very good example of these curious fishes may be found in the LUMP-SUCKER, otherwise called the LUMP-FISH, SEA-OWL, and COCK-PAIDLE, the latter name being given to it on account of the elevated ridge along the back, which is covered with a notched and tuberculated skin not unlike the comb of the cock.

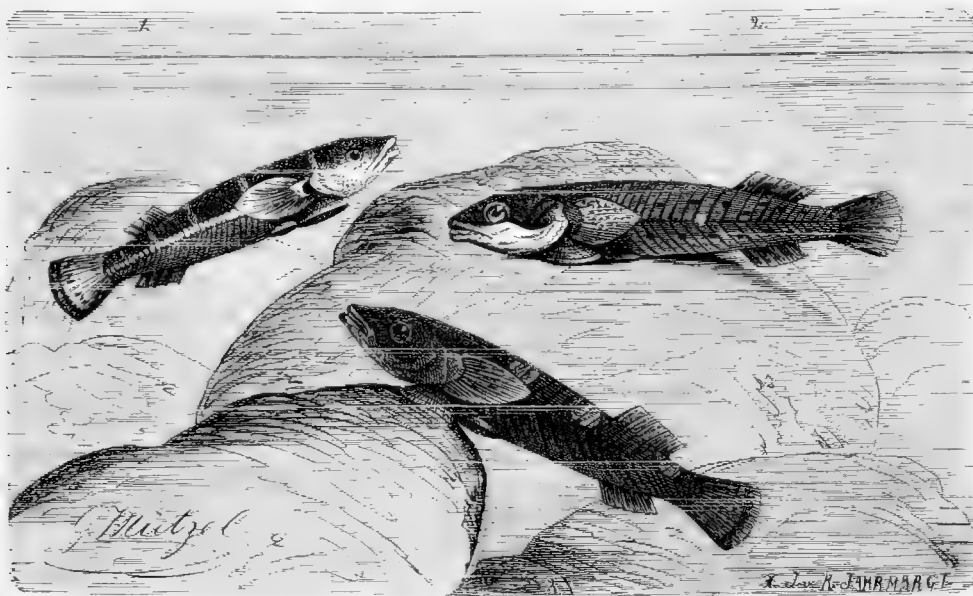
The sucker or disc of this fish is capable of very powerful adhesion, retaining its hold with such tenacity, that on one occasion, when a Lump-fish was placed in a pail containing several gallons of water, it immediately affixed itself to the bottom, and held so firmly, that when grasped by the tail and lifted, it raised the vessel in which it was placed, notwithstanding the combined weight of the water and pail.

length. Its color is rather dull orange above, with bluish reflections, and white below. The fins are of a rather deep orange hue.

ANOTHER small family now comes before us, called the Frog-fishes, from the froggish aspect of the body, and especially of the head.

The TOAD-FISH is a very curious-looking creature, with its flattened and wide head, gaping mouth, and spacious gill-cover. All the members of this genus are carnivorous fishes, and are spread through the coasts of the tropical regions, where they are mostly found on the bottom and partially buried in the sand or mud, in hope of surprising the active prey on which they feed. Some species, however, are found even in the temperate seas.

The Toad-fish inhabits the East Indian seas, and has been taken at the mouth of the Ganges. Its color is brown, marked with a much darker tint, and the fins are streaked and blotched with similar colors. The body is without scales



MONTAGUE'S SUCKER. *Liparis montagui*.

The Toad-fishes, family *Batrachidae*, are included, twelve species in five genera. They are carnivorous coast fishes, mostly of the warmer seas. The young of some fasten themselves upon rocks by means of ventral discs, which, however, disappear. Common names of them are Oyster-fish and Sarpo.

THE FISHING-FROG, ANGLER-FISH, or WIDE-GAB, which is shown in the lower figure of the illustration on page 242, has long been famous for the habit from which it has derived its popular name.

The first dorsal fin is almost wholly wanting, its place being occupied merely by three spines, movable by means of certain muscles. The manner in which these spines are connected with the body is truly marvellous. The first, which is furnished at its tip with a loose shining slip of membrane, is developed at its base into a ring, through which passes a staple of bone that proceeds from the head. The reader may obtain a very perfect idea of this beautiful piece of mechanism by taking a common iron skewer, slipping a staple through its ring and driving the staple into a board. It will then be seen that the skewer is capable of free motion in every direction.

The second spine is arranged after a somewhat similar fashion, but is only capable of being moved backwards and forwards. Fishing-Frogs are sometimes found in the shops, and the inquiring reader will find himself amply repaid if he purchases one of these fishes and

dissects its head, merely for the purpose of seeing the beautiful structure which has been briefly described.

The use of these spines is no less remarkable than their form.

The Fishing-Frog is not a rapid swimmer, and would have but little success if it were to chase the swift and active fishes on which it feeds. It, therefore, buries itself in the muddy sand, and continually waves the long filaments with their glittering tips. The neighboring fish, following the instincts of their inquisitive nature, come to examine the curious object, and are suddenly snapped up in the wide jaws of their hidden foe. Many fishes can be attracted by any glittering object moved gently in the water, and it is well known by anglers how deadly a bait is formed of a spoon-shaped piece of polished metal, furnished with hooks, and drawn quickly through the water.

The arrangement of the spines in this fish—which is equally well known in our American waters—as our author says, will well repay the examination. We have frequently seen these fishes in the market, brought there as curiosities, but have seen very large specimens on Nahant beaches. One example was about five feet in length, the head being about one-third as much in width. The gape of such a head is enormous, and the creature had partially swallowed a cod-fish of the largest kind, which, with its head protruding, was heavy enough to weigh the Angler to the bottom, when the heavy seas threw it with its prey to the shore. The first free spine on the top of the head is about nine inches in length, and with its bit of membranes as bait, is a veritable fishing-rod. The creature is sluggish, and, lying on the soft bottom, partly covered, it moves this rod gently, and thereby attracts the luckless fishes that form its food.

THE very odd-looking creature called the WALKING-FISH, is one of the strange and wild forms that sometimes occur in nature, and which are so entirely opposed to all preconceived ideas, that they appear rather to be the composition of human ingenuity than beings actually existing. The traveller who first discovered this remarkable fish would certainly have been disbelieved if he had contented himself with making a drawing of it, and had not satisfied the rigid scrutiny of scientific men by bringing home a preserved specimen.

THE TOAD-FISH (*Antennarius histrio*) is the curious little creature that is seen at times floating on the surface, evidently distressed on account of its body being unduly inflated. Its habit is to inflate itself, but often it seems to be helpless in this state. Its curious nest, made among floating algæ on the ocean, is familiar to readers of popular books on Natural History. This fish is so decorated by algæ-like excrescences it becomes a complete piece of deception. It is difficult to distinguish the difference between the fish and the surrounding sea-weed.

THE BAT-FISH (*Malthea vespertilio*) is a sluggish fish, found in the warmer waters. Its whole appearance is that of a creature adapted to live on the bottom. The pectoral fins are developed into feet-like organs, and it actually crawls like a reptile. Its more interesting feature lies in the development over its mouth of an erectile club-shaped fleshy process, which protrudes from a concave locality just over its mouth. Lying in the mud secure in its protective resemblance to the surrounding bottom, it causes this erectile organ to turn slowly in imitation of a worm, which it resembles. Any inquisitive body that comes within reach is taken in below, the great mouth being quite ready, and capable of swallowing anything near its own size.

THE important family of the Blennies comes next in order. They are all carnivorous fishes, many being extremely voracious, and are spread over the shores of every sea on the globe. They mostly reside on or near the bottom.

THE SEA WOLF, SEA CAT, or SWINE-FISH, is one of the fiercest and most formidable of the finny tribes that are found on our coast, and has well earned the popular names by which it is known.

The general color of the Sea Wolf is brownish-gray, with a series of brown vertical stripes and spots over the upper parts; the under parts are white. On European shores it attains a

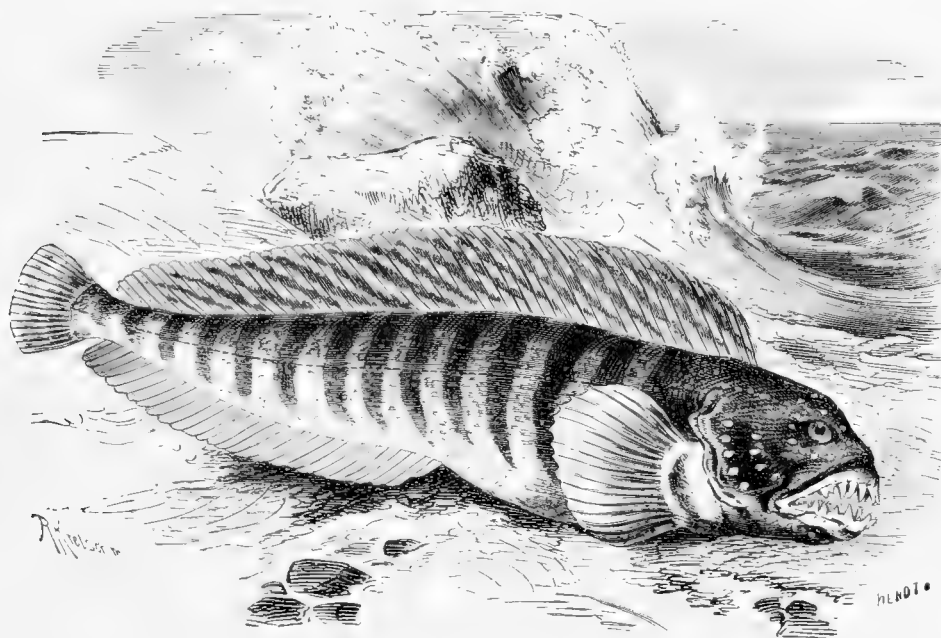
length of six or seven feet, but in the northern seas, where it thrives best, it greatly exceeds those dimensions. There is an American variety where the vertical streaks are modified into round spots of blackish-brown.

The Sea Wolf is taken by the fishermen of Swampscott, and along the shores of New England, in winter frequently, and once was considered a nuisance, as it interfered with cod-fishing. It has been found to be a valuable food-fish, since the considerable advance in the price of cod-fish and haddock. Blennies are numerous among the rocks on the eastern coast—the Butter-fish among them.

The typical genus of this family is represented by several specimens, of which the EYED BLENNY is one of the most conspicuous.

This pretty fish is not very common. From the elevated dorsal fin, and the bold dark brown spot that decorates it, this Blenny has sometimes been called the Butterfly-fish. In the Mediterranean it is tolerably common, and lives mostly among the seaweed, where it finds abundance of the smaller crustacea and mollusks.

The dorsal fin of this fish is very large, being greatly elevated and extending from the back of the head almost to the tail. The dark spot is placed between the sixth and eighth rays.



SEA WOLF. - *Anarrhichas lupus*.

The color of the Eyed Blenny is pale brown, patched here and there with a darker tint. The dark spot on the fin is mostly edged with white or very pale yellow. The length of this fish is seldom more than three inches.

Among other species of Blenny the SHANNY, or SHAN (*Blennius pholis*) is tolerably common in European seas.

PASSING by the remaining Blennies, all of which are very similar in habits and general appearance, we must pause for a short space to examine a very curious species belonging to the same family, called the JUMPER-FISH (*Salarias tridactylus*).

This odd little fish offers no remarkable beauties of color or form, being of a simple dark brown, and without any salient points of external structure; but it is possessed of a wonderful power of suddenly leaping out of the water, darting over the wet stones and rocks and snapping up flies and other insects with the nimble agility of the lizard. It can scramble up a nearly perpendicular face of rock, and is so wary and agile, that on the least attempt to seize it, the little creature darts towards the sea and is nearly certain to make its escape. While engaged in this pursuit, the Jumper-fish adheres so tightly to the rock, that it is not detached

even by the shock of repeated waves. It is quite a little fish, not more than four inches in length. Its residence is in the seas of the East Indian Archipelago. At least fifty species of the Salariae are known to zoologists.

THE BUTTER-FISH, SWORDICK, or SPOTTED GUNNEL (*Centronotus gunellus*), belongs to this family, and is evidently one of the transitional species between the true blennies and those which are placed at the end of the family.

This fish is frequently captured, especially on the rocky shores, and is mostly found hidden under stones and sea-weeds in the rock-pools left by the receding tide. The name of Butter-fish is very appropriate, and is given to it on account of the plentiful mucous secretion which is poured over its body, and which renders it so slippery that it can with difficulty be retained in the hand. It is quick and agile in its movements, and even if confined within the limits of the rocky pool is not easily captured.

The body of this fish is much elongated and somewhat eel-shaped, the head is small, the muzzle blunt, and the dorsal fin is low and long, extending the whole length of the back. The ventral fins are very small. The color of the Swordick is brown, in some specimens with a purple and in others with a golden wash. Along the base of the dorsal fin, and in some individuals upon the fin itself, are a number of bold, black spots, each with a white streak on either side. A dark brown stripe is also drawn from the eye to the lower jaw. The length of the Butter-fish is about six inches.

OUR last example of this family is the well-known VIVIPAROUS BLENNY, called also by the popular names of EEL-POUT, LUMPER, GUFFER, and GREENBONE, the last-mentioned title being given to it because, when boiled, the bones have a green hue. It is illustrated, with the Lump-fish, on page 254.

As its name imports, the Viviparous Blenny lays no spawn, but produces its young alive, and able to shift for themselves. In one case, where a female fish of about fifteen inches in length was taken, the young were about four inches long. It is a very curious fact, that the size of the new-born young seems to depend upon that of their parent, the offspring of a Blenny of seven inches in length measuring only one inch and a half.

The flesh of this fish is tolerably good, but is not in very great repute, so that it is but seldom to be seen in the markets. It generally hides itself under stones or sea-weed, preferring the large, heavy algæ, called tang.

The body of this fish tapers gradually from the shoulders to the tail, in thickness as well as in depth, and when examined with a pocket magnifier, the surface appears to be studded with circular depressions. Its general color is pale brown, and its length varies between six and sixteen inches.

PASSING by several small families, we come to a very curious fish, denominated the RIBAND-SHAPED VAAGMAR, sometimes called the DEAL-FISH (*Trachypterus arcticus*).

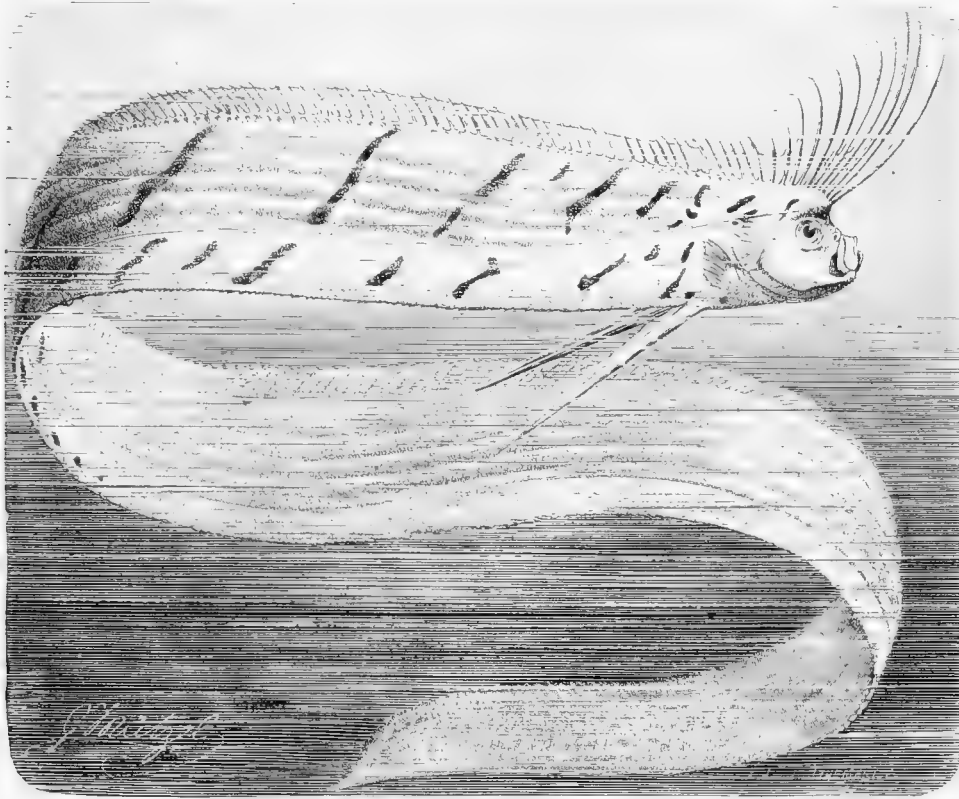
This singular fish is remarkable for the extreme compression of the body, a specimen three feet in length not being thicker than an ivory paper-knife. The dorsal fin of this fish extends completely along the back; there is no anal fin, and the tail fin stands boldly erect, like the closed tail-feathers of a fan-tail pigeon. The general color of the Vaagmår is silvery-white, and the body is covered with very small scales. The dorsal fin is bright orange, sometimes being of a blood-red, and the tail fin is of the same hue. On each side are two oval spots of blackish-gray, set obliquely on the body. The length of this fish often reaches six feet.

It is one of the northern fishes.

A SPECIES even still more remarkable is, on very rare occasions, obtained on the North Sea; but, owing to the extreme fragility of its structure, it is mostly deficient in some of its parts. Our picture of this creature is remarkably true to nature.

The OARED GYMNETRUS, or RIBBON-FISH (*Regalecus banksii*), as it is called, is also

greatly compressed throughout its length, and is equally delicate with the last-mentioned species. It is chiefly notable for the very odd structure of the ventral fins, which are reduced to long, slender filaments, much resembling in shape the long tail-feathers of the racket-tail humming-bird. This fish sometimes attains very great dimensions; specimens have been taken measuring twelve feet in length. Its color is silvery-gray, mottled with dusky spots of varying depth, which are most conspicuous towards the head. The whole surface of the skin



OARED GYMNETRUS, OR RIBBON-FISH.—*Regalecus bankii*. (One-twelfth natural size.)

is plentifully studded with bony tubercles, and on the line of the abdomen each tubercle is furnished with a hooked point directed backwards. Along the lateral line runs a row of elongated flat scales.

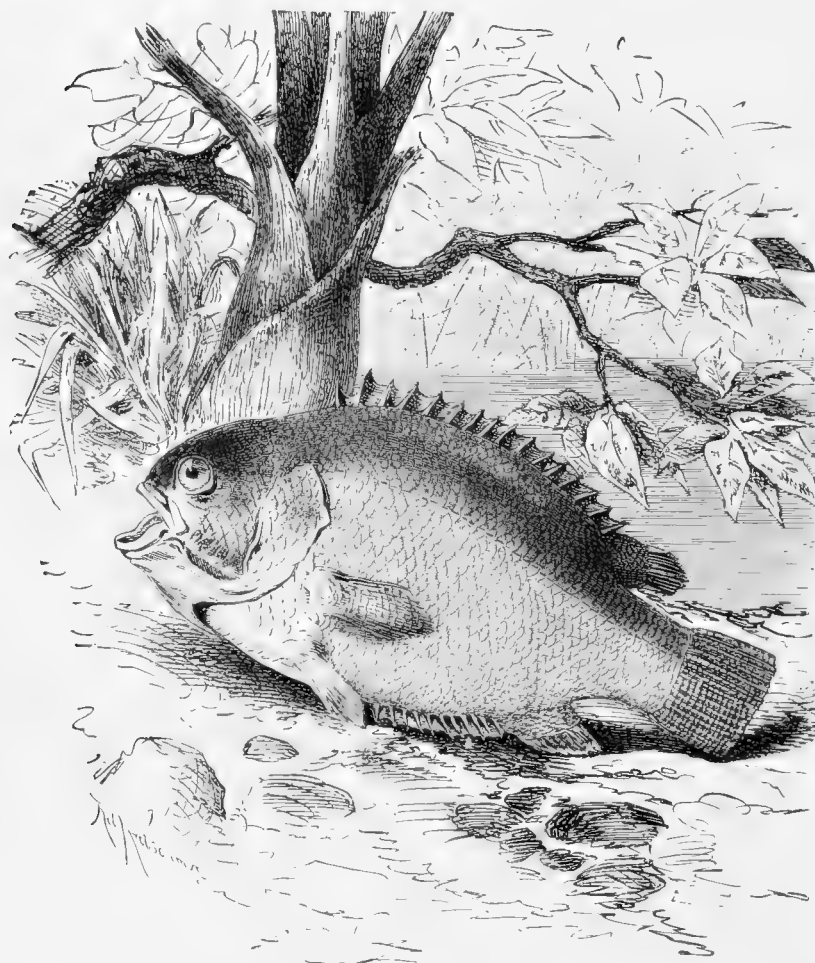
IN the next family, the tail is mostly armed with one or more bony spines or plates, small in the young, but increasing in size with the dimensions of the fish.

The SEA SURGEON (*Acanthurus chirurgus*) is a good type of these fishes, and derives its popular name from the sharply-pointed and keen-edged spine on the side of the tail, which cuts and wounds like a surgeon's lancet. The generic name, signifying Thorn-tail, is given to it in consequence of this structure. This species is found on the Atlantic coasts of tropical America and Africa, and is tolerably plentiful in the Caribbean seas. The scales of this fish are very small, and the single spine on each side of the tail is movable and set in a longitudinal groove. Its food is of a vegetable nature.

In color it is rather variable, but the ground tint is usually of a brownish hue, and the operculum has a black edge. In some specimens the end of the tail is marked with a white band, which encroaches on part of the tail fin, and there is also a narrow white edge to that fin. There are in certain individuals a few darkish streaks drawn across the body, some black longitudinal stripes on the dorsal and anal fins, and in the young the sides are marked with darkish waving lines. This fish sometimes attains a rather large size, a specimen being nineteen inches in length. The genus is rather comprehensive, containing between forty and fifty known species.

This remarkable fish is common on the Florida Reef. We have kept it in our aquarium, and found it wonderfully lively and interesting. It is one of the few fishes that seem to have strong combative impulses. It will bear no trifling, but strikes powerfully with its tail, the sharp lance-like weapon proving dangerous to its foes. Pass a rod lightly enough towards it, and the Surgeon instantly turns, and, facing the object, makes a thrust with savage celerity.

NEARLY allied to the surgeon-fish is a very curious species, called the UNICORN THORNTAIL (*Naseus unicornis*), on account of the singular structure of the forehead, which is modified in front into a long and horn-like protuberance, rather conical in shape, and projecting forwards in a line with the body. This horn is not to be seen in the young fish, and only attains its full dimensions when its owner has reached adult age. Sometimes the horn is longer than the snout, but in most specimens it is slightly shorter. Each side of the tail is furnished with two lancet-bearing plates, which are not movable.



CLIMBING PERCH.—*Anabas scandens*. (One-half natural size.)

This species is found from the Red Sea to Japan and Polynesia. Its color is brownish-gray, and the dorsal and anal fins are marked with longitudinal blue stripes. The largest specimen I have known of measures twenty-two inches in length, and its horn is three inches long.

THE extraordinary fish called, from its habits, the CLIMBING PERCH, is a native of Asia, and is remarkable for its apparent disregard of certain natural laws.

This singular creature has long been celebrated for its powers of voluntarily leaving the failing streams, ascending the banks, and proceeding over dry land towards some spot where its unerring instinct warns it that water is yet to be found. There are several fish which are known to have this power; the common eel, for exam-

ple, which has frequently been observed crossing the fields in its passage from one stream to another. I have even seen the eels creeping over rocks, and contriving, in some mysterious manner, to crawl along the flat horizontal surface of an overhanging rock as easily as a fly walks on the ceiling. But I believe that the eel only passes over moist ground, whereas the *Anabas* seems quite indifferent to such considerations, and takes its journey over hard, dry, and dusty roads, heated with the burning beams of the noonday sun, without appearing to feel much inconvenience from the strange nature of the transit.

Several species, of which the *Anabas Scandens* has been chosen as the best example,

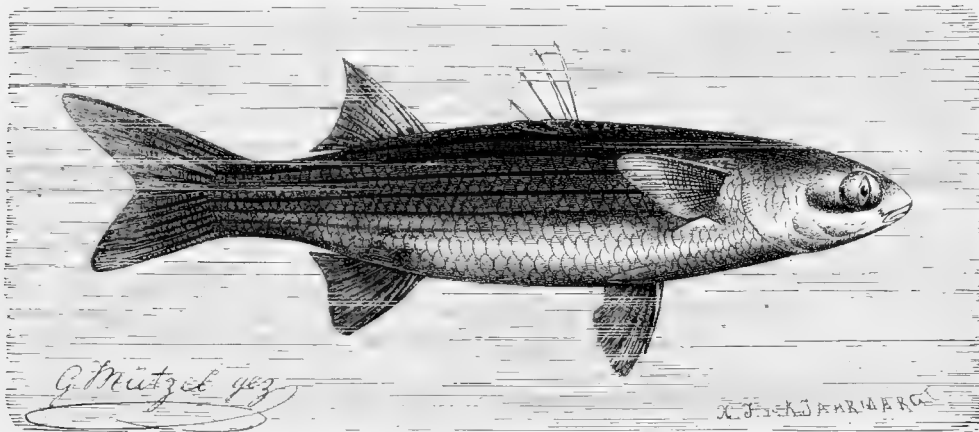
possess this singular property of walking over dry ground, so that the old proverb of a fish out of water is, in these cases, quite inapplicable.

It is known of the Climbing Perch that the fishermen of the Ganges, who subsist largely on these fishes, are accustomed to put them into an earthen pan or chatty as soon as caught; and although no water is supplied to them, they exist very well without it, and live this strange life for five or six days.

On opening the head of this fish, the curious structure which enables it to perform such marvellous feats is clearly seen. Just within the sides of the head, the "pharyngeal" bones, *i. e.*, the bones that support the orifice between the mouth and gullet, are much enlarged, and modified into a series of labyrinthine cells and duplications, so that they retain a large amount of water in the interstices, and prevent the gill-membranes from becoming dry. Some writers say that this fish is capable of climbing up the rough stems of palm-trees, in search of the water that lodges between the bases of the dead leaves and the stem, but this account is now held unworthy of belief. In the Tamoule language it called Paneiri, or Tree-climber.

THE small genus *Atherinidæ* has a representative in the SAND SMELT (*Atherina presbyter*), a pretty little fish, and one that is of great use to fishermen, both for sale and for bait.

It is extremely plentiful here in America, as well as in Europe, and in many places is sold as the true smelt, which it somewhat resembles in flavor and the peculiar odor as of cucumber.



GRAY MULLET. *Mugil capito*.

Owing to the small size of this fish the net is the usual mode of capture, the fashion of which varies according to the locality. On some coasts the net is about ninety feet in length and eighteen in depth, and is drawn along the sands by the united aid of one party in a boat and the other on the shore. In other places, however, it is circular and supported on an iron hoop. It is then baited with broken crustacea and lowered into the water. At intervals it is raised smartly to the surface, and the entrapped Sand Smelts removed.

The color of the Sand Smelt is the palest pink, diversified with a broad belt of shining silvery-white, which is drawn along the side. The cheeks, gill-covers, and the base of each pectoral fin are of the same white hue. Upon the upper part of the back and head are a great number of little black spots. The length of the fish is from six to seven inches.

WE now come to the important family of the *Mugilidæ*, of which the common GRAY MULLET is a good example. In all these fish there are two dorsal fins, the first having four stiff spines. They are spread over all sea-coasts and fresh waters of the temperate and tropical regions. The mode of feeding is rather curious. These fish live chiefly on the soft organic substances that are found mixed with weed and sand, and in swallowing the food a considerable amount of sand is taken into the mouth. The fish, however, is furnished with a kind of self-filtering apparatus, by means of which the heterogeneous mass is raked and sifted, as it were, and the indigestible portions rejected.

The Gray Mullet deserves notice as being one of the most daring and ingenious of the finny race, and is, in fact, a very fox for artfulness. The idea of constraint is most obnoxious to it, and its instincts of freedom are so strongly developed that it endeavors to recover its liberty in the most extraordinary ways.

If, for example, it has been inclosed in a net, it will at once dart to the side and try to leap over the head-rope into the open sea. Moreover, if one fish succeeds in the attempt, the remainder immediately follow their leader, like a flock of sheep jumping over a hurdle. If the net is raised so high that the leap is impracticable, the fish tries to creep under it; and if that mode of escape be cut off, it examines every mesh, in hopes of finding some defective spot through which it may insinuate itself. Mr. Couch mentions that he has seen a Gray Mullet, after trying all other modes of escape, deliberately retire to the greatest possible distance from the wall of net, and then dash furiously at the meshes, as if to break through them.

The genus *Mugil* is very large, containing between sixty and seventy species.

Mullets of the Florida waters are numerous. A novel method of taking them we witnessed at Punta Rassa, on the Gulf coast. They are about eighteen inches in length, and have very wide backs. The shoals are few in number. Negro boys took them in this manner: common "grains," or spear, secured to a long handle by a line, the latter is held upright in the palm, the line retained; the pole is tossed upwards to return spear first directly over the broad backs of the fishes, and, as a rule, it strikes home.

THE fishes belonging to the family of the *Ophiocephalidæ*, or snake-headed fishes, are able to leave the water for a time and to crawl upon land, deriving their power from a curious structure of the breathing organs. It has already been stated that a fish can breathe as long as the delicate membranes of the gills are wet; and that in those fishes which are able to live out of water for any length of time, a peculiar modification of the breathing organs is requisite in order to supply the needful moisture. In the family to which the climbing perch belongs, a series of thin laminated plates are arranged in a cavity above the gills, thus retaining a sufficient supply of water between the laminæ. In the present genus, however, there are none of these laminæ, but the water is retained in a simple cavity which communicates with the gills.

Of this family the CORA-MOTA, or GACHUA (*Ophiocéphalus gachua*), is a good example.

This fish is a native of the fresh waters of Eastern India and its archipelago, and in its general shape and movements is so very snake-like that Europeans will seldom eat it. The Cora-mota is common in the ponds and dykes of Bengal; and is one of the fish popularly supposed to be rained from the clouds, as it is generally to be found on the grass after a heavy shower. However this may be in other instances, it is tolerably clear that the Cora-mota has been in concealment during the drought, and ventures into the fresh wet grass as a welcome change from the muddy ditches in which it has been forced to reside. It can also find a plentiful supply of food on the moist herbage; and as on account of its peculiar formation it is able to move on land with considerable ease, its migrations will often extend to considerable distances.

The Cora-mota is remarkably tenacious of life, and can survive the severest wounds for a wonderfully long period. The natives of India take advantage of this peculiarity, and with the disregard of inflicting torture that seems to be inherent in the Oriental mind, are in the habit of selling the fish piecemeal, and cutting it up for sale while still living. Indeed, the *habitués* of the market will not pay the best price if the fish does not flinch from the knife.

The color of this species is brown crossed with several dark bars. Its length seldom exceeds a foot.

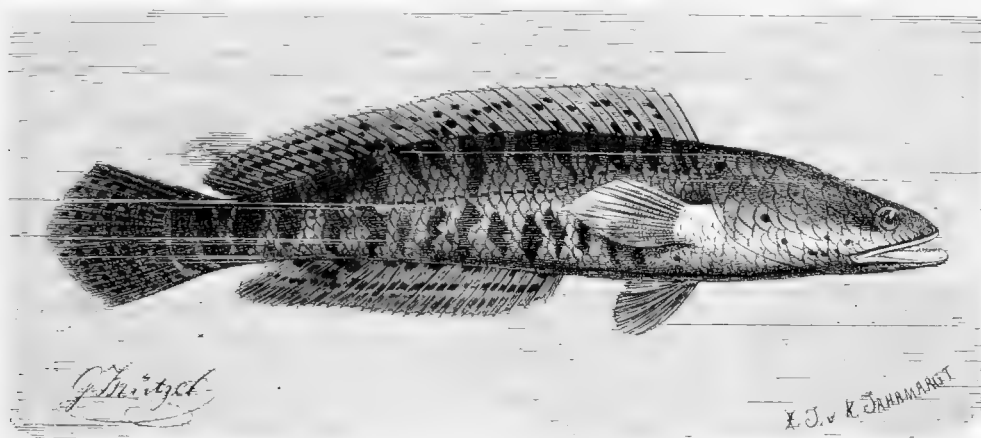
Another species of this genus, the BARCA (*Ophiocéphalus barca*), is a much handsomer fish, attains a considerable size, and is considered to be useful for the table. This fish is one of the mud-lovers, living for the most part in holes excavated in the banks of Indian rivers, and only putting out its head in search of prey.

The color of this species is violet spotted profusely with black, and the fins are marked with sundry bold bars and dots. In length it often attains three feet.

THE remarkable BAND-FISH, or SNAKE-FISH (*Cépolá rubescens*), is an example of a curious family, consisting of one genus only, and about seven species.

The Band-fish is not uncommon in the Mediterranean, though it is seldom taken off the English coasts. Its body is long and much compressed, like that of the vaagmår, already described; and when winding its way through the translucent water, its carmine body with the glittering scaly mail have earned for it the popular names of FIRE-FLAME and RED RIBAND.

Little is known of its habits, except that it is a shore-loving fish, delighting to bask under the heavy masses of sheltering sea-weed, and that it feed smostly on mollusks and crustacea. Several specimens of this fish have been found on the beach after a storm; and Mr. Yarrell



BARCA.—*Ophrocephalus barca*.

remarks, with some acumen, that all the fish formed after this pattern, with their compressed bodies affording little resistance to the water, and their length preventing the concentration of muscular force upon a single centre of motion, are ill fitted for combating tempestuous waters, and are flung about at the mercy of the waves.

The head of the Band-fish is small, and the eye is full and very large, its diameter being nearly half the depth of the head. The body is greatly compressed, slender, and very smooth; the scales being minute and glittering in the sunbeams. The dorsal fin extends from the top of the head to the end of the tail, and the anal fin is nearly as long. Its color is rather variable, shades of purple and orange exhibiting themselves in certain specimens. In all examples, however, red is the predominant hue. The length of the adult Band-fish is usually about fifteen or twenty inches.

IN the curious species which belong to the genus *Centriscidæ*, or spike-bearing fishes, the body is much compressed, and one of the spines of the first dorsal fin is long, sharp, and powerful. The bones which form the front of the head are greatly prolonged, and are modified into a kind of long tube, at the end of which is placed the narrow mouth. It is thought that the fish obtains its food by sucking it along the tube, the needful vacuum being formed by the dilatation of the throat.

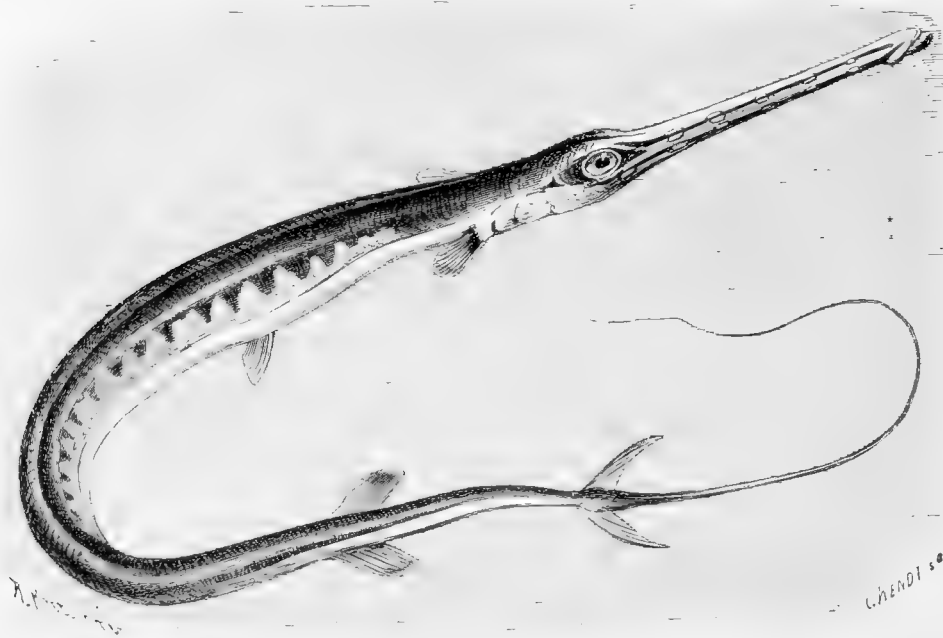
THE BELLOWS-FISH, sometimes called the TRUMPET-FISH and the SEA SNIPE, is most common in the Mediterranean. It prefers to reside in moderately deep water, and is mostly found where the bottom of the sea is muddy. Its food is not precisely known, but is thought to consist of minute marine animals. The first spine of the dorsal fin is enormously large, strong, sharply pointed, and armed on its under surface with a row of saw-like teeth, that must render it a very efficient weapon of offence. The spine is also movable. The flesh of this fish is eat-

able; but as the head occupies so large a portion, the amount of flesh is rather small when compared with the size of the fish.

THE family which now comes before our notice is in many ways remarkable, and deserves some little attention before proceeding to the remaining fishes.

In the *Fistularidæ* the snout is greatly prolonged, as in the preceding family, and bears the mouth at the end of a bony tube. The body, however, is extremely long and snake-like, and there is no long spine to the dorsal fin. There are only two genera in this family, the one being covered with scales, and the other destitute of these appendages.

The TOBACCO-PIPE FISH is found in several parts of the tropical Atlantic, and is notable for its very peculiar form. The body is without scales, and the tail-fin is deeply forked, the



TOBACCO-PIPE FISH.—*Fistularia tabaccaria*.

two central rays being sometimes united and prolonged into a lengthened filament, and at others separate, but still elongated. The outer edge of the tube is either smooth or very slightly notched. The color of this fish is greenish olive, and the upper parts of the body are marked with blue streaks and spots. In some specimens, the back takes a reddish brown hue.

THERE is a curious family of fishes, termed the *Mastacembelidæ*, in which the body is long and eel-like, covered with little scales, and remarkable for the odd-looking snout and its appendage.

In these strange-looking fishes, of which the SPOTTED MASTACEMBELUS (*Mastacembelus maculatus*) is a good example, the dorsal fin is very long, its front portion consisting of a number of short free spines. The anal fin is also furnished with similar spines, and the ventral fins are altogether wanting. The gill-openings are reduced to a narrow slit, and the movable appendage of the upper jaw is smooth on its under side. The jaws are furnished with minute teeth, and the lower jaw is but slightly movable. In all the species of this genus, with the exception of the Spotted Mastacembelus, the præoperculum is armed at its angle with small teeth.

This species is found in the fresh waters of Java and Sumatra. The dorsal fin joins that of the tail, which is again joined by the long anal fin. The color of the fish is brown, diversified with darker blotches, and the fins are edged with yellow.

FLAT FISHES; PLEURONECTIDÆ.

THE Flat Fishes, as they are popularly called, or the Pleuronectidæ, as they are named scientifically, are among the most remarkable of the finny tribe. The latter name is of Greek origin, and signifies side-swimmer, in allusion to the mode of progression usually adopted by these fishes.

The COMMON SOLE is one of the most familiar of the flat fishes.

The Sole can be taken by the line, but the fishermen always use the trawl-net, a kind of huge dredge, with a mouth that often exceeds thirty feet in width. As these nets are drawn along the bed of the sea, the great beam which edges the mouth scrapes the mud and sand, and alarms the fish to such an extent that they dash wildly about, and mostly dart into the net, whence they never escape. Vast numbers of Soles are taken by this method of fishing, and as the trawls bring to the surface enormous quantities of crustaceans, mollusks, zoophytes, and other marine inhabitants, the energetic naturalist cannot employ his time better than in taking a sail in one of these boats, and enduring a few hours' inconvenience for the sake of the rich harvest which he is sure to reap.

It is a hardy fish, and can soon be acclimatized to live in fresh water; and it is said that under such circumstances the fish can be readily fattened, and becomes nearly twice as thick as when bred in the sea. Sometimes the Soles venture into the mouths of rivers, passing about four or five miles into the fresh water, and depositing their multitudinous eggs in such localities.

The ZEBRA SOLE is a native of Japanese waters, and is remarkable for the waving dark streaks with which its body is covered, and which bear a great resemblance to the stripes upon the zebra's hide. In habits it appears to resemble the common species.

The LEMON SOLE, or FRENCH SOLE (*Solea pegasus*), derives the former of these titles from the lemon-yellow color of its upper surface, and the latter from the localities in which it is most commonly found. It is found generally about sixteen miles off the English coasts. The color of this fish is orange, mixed with light brown, and mottled with little round spots of wood-brown. It is wider in proportion to its length than the common Sole. Another species, the VARIEGATED SOLE (*Solea variegata*), may be known by the reddish-brown color, clouded with dark brown. The body is rather thick in proportion to its length.

The SOLENETTE, or LITTLE SOLE (*Monochirus linguatulus*), is seldom more than five inches long, and of a reddish-brown color, without cloudings.

Perhaps the most remarkable of these fishes is the TRANSPARENT SOLE (*Achirus pellucidus*.)

This rare and interesting fish is a native of the Pacific Ocean, and is notable for the extreme pellucidity of its body, which is so marvellously transparent, that when swimming in a vase of water, or lying on the bottom, the algæ or stones can be distinctly seen through its structures. It is quite colorless, except a very slender and very delicate pink streak on the edge of the back, and several similar lines upon the sides; the perfect but glass-like skeleton is hardly to be detected, and even the viscera are almost invisible. It is a very little fish, appearing not to exceed two inches in length; but its width is proportionately great, so that the fish assumes a nearly circular form. The eyes are silvery-white, and the pectoral fins are wholly absent.

The AMERICAN SOLE (*Achirus lineatus*). This fish is found from Cape Cod southward. At one time a notion prevailed that the flesh was not eatable, but the truth is, it is not only wholesome, but very delicate. It is called Calico and Hoe-choke Cover Clip in New Jersey, and Spotted Sole in Massachusetts.

THE well-known TURBOT, so widely and so worthily celebrated for the firm delicacy of its flesh, inhabits many of the European coasts, and is generally found in tolerable abundance. Like all flat fishes, it mostly haunts the sandy bed of the sea, but will sometimes swim boldly to the surface of the water. It is a restless and wandering fish, traversing considerable distances as it feeds, and generally moving in small companies.

The SPOTTED TURBOT (*Bothus maculatus*) is a small species, not very familiar; called in New Jersey Window Pane, and in New York Sand Flounder. Its range is from Cape Cod to Hatteras. Mitchell described it as the New York Plaice (*Pleuronectus maculatus*), and it is also called Watery Flounder. It has been sold in New England as English Turbot, and is nearly, if not quite equally good a food-fish, as the latter. Its common name, Sand Flounder, associated with that of the miserable Flounders of our harbors, does not help its reputation as an edible. A species called Smooth Plaice is common along the coast from Maine southward. Several other species of Flounders are known.

ANOTHER flat fish, the BRILL (*Pleuronectes rhombus*), called in Scotland the BONNET FLEUK, and in other places known by the names of KITE and BRETT, is held in much estimation for the sake of its flesh, which is but little inferior to that of the turbot, and is, indeed, sometimes fraudulently substituted for that fish. The Brill resembles the turbot in food and habits as well as in appearance, but does not attain the same dimensions, seldom exceeding seven or eight pounds in weight. The skin of the dark side is devoid of the bony tubercles which are found in the turbot. Its color is reddish-brown, mottled with a darker tint of the same color, and variegated with numerous round white spots of a pearly lustre. On account of these spots the Brill is sometimes called the PEARL. When young, the pale reddish-brown is covered with spots of black or very dark brown.

PASSING by the two species of Topknots, we come to the PLAICE, so well known by the bright red spots which are scattered over its dark side.

This is one of the commonest of the flat fishes, and, happily for the poor, is taken in such quantities that it supplies nutritious aliment at a very low rate of purchase. It is taken chiefly with the trawl-net, but can be captured with the line, as it bites freely at a bait, generally the common lugworm, and is one of the fish that is most usually caught by amateur sea-fishers. Even the shrimpers take large quantities of small Plaice in their nets; and along the coast this fish is so numerous, that at low water it may be seen in great numbers darting over the sandy flats, the white surface glittering in the light as the little creatures dash wildly along in their terror of the approaching enemy.

THE FLOUNDER, MAYOCK FLEUK, or BUTT, is quite as common as the plaice, and is found in salt, brackish, or fresh water, sometimes living in the sea, sometimes inhabiting the mouths of rivers, and sometimes passing up the stream for many miles. As this fish is capable of living in fresh water, it has often been transferred to ponds, and will there fatten rapidly.

The color of the Flounder is usually brown, taking a darker or lighter shade, according to the nature of the ground on which the fish rests, those that inhabit the muddy shores being nearly black, and those which prefer the sand taking a yellower hue. Generally, the eyes and the color are on the right side, but reversed specimens are very common, and in some instances the fish has been entirely white or wholly brown. The average weight of the Flounder is three or four pounds.

ONE or two other examples of the flat fishes deserve a passing notice.

The COMMON DAB (*Platessa limanda*) is plentiful upon sandy coasts, and may at once be recognized by the roughness of its surface, or structure, which has gained for it the specific title of Limanda, or file-back—the Latin word *lima* signifying a file. Its flesh is very good, and is thought to be in best condition from the end of January to April. Its color is pale brown, and its length seldom exceeds eight inches.

A VERY large species of flat fish is called the HALIBUT (*Hippoglossus vulgaris*). The flesh is tolerably good, but is rather dry and without much flavor. It is rather longer in proportion to its width than is generally the case among flat fishes. Its color is brown of different shades, and the surface smooth, the small, oval-shaped scales which cover it being soft and without projections. This fish attains a large size, specimens of five feet in length not being uncommon.

The largest example on record measured above seven feet in length, and weighed more than three hundred pounds.

The Halibut is found in all northern seas, south, to France and San Francisco. It reaches a weight of 400 pounds. Dr. Storer records an example, on the authority of Mr. Newcomb, a noted fishmonger of Boston Market, as weighing 420 pounds, after the head and bowels were removed. The Halibut fishing of Grand and George's Banks is an important industry.

As an edible it ranks high. Great numbers are taken in Massachusetts Bay. Dr. Storer adds, in relation to weight: "The largest specimen of which I have any certain knowledge, was taken at New Ledge, near Portland, Maine, in 1807, and weighed upwards of 600 pounds."

At Nantucket there were once employed eighty vessels, of from 60 to 80 tons burthen each, in this fishery. Ancient names of this fish are *Fler*, and *Helbut*.

A species called Greenland Halibut is found in the northern seas.

THE COD.

THE well-known COD-FISH is a native of many seas, and in some localities is found in countless legions.

This most useful fish is captured in vast numbers at certain seasons of the year, and is always taken with the hook and line. The lines are of two descriptions, namely, the long lines to which a great number of short lines are attached, and the simple hand-lines which are held by the fishermen. The long lines sometimes run to an extraordinary length, and shorter lines, technically called snoods, are affixed to the long line at definite distances. Whatever may be the length of the snoods, they are fastened at intervals of double their length, so as to guard against the entanglement of the hooks. For example, if the snoods are six feet long, they are placed twelve feet apart on the line; if four feet long, eight feet apart, and so on.

To the end of each snood is attached a baited hook, and as the sharp teeth of the fish might sever a single line, the portion of the snood which is near the hook is composed of a number of separate threads fastened loosely together, so as to permit the teeth to pass between the strands. At each end of the long line is fastened a float or buoy, and when the hooks have been baited with sand lance, limpets, whelks, and similar substances, the line is ready for action.

The boat, in which the line is ready coiled, makes for the fishing-place, lowers a grapnel or small anchor, to which is attached the buoy at one end of the line, and the vessel then sails off, paying out the line as it proceeds, and always "shooting" the line across the tide, so as to prevent the hooks from being washed against each other, or twisted round the line, which is usually shot in the interval between the ebb and flow of the tide, and hauled in at the end of about six hours.

As soon as the long line has been fairly shot, and both ends firmly affixed to the grapnels, the fishermen improve the next six hours by angling with short lines, one of which is held in each hand. They thus capture not only Cod-fish, but haddock, whiting, hake, pollack, and various kinds of flat fishes. On favorable occasions, the quantity of fish captured by a single boat is very great, one man having taken more than four hundred Cod alone in ten hours.

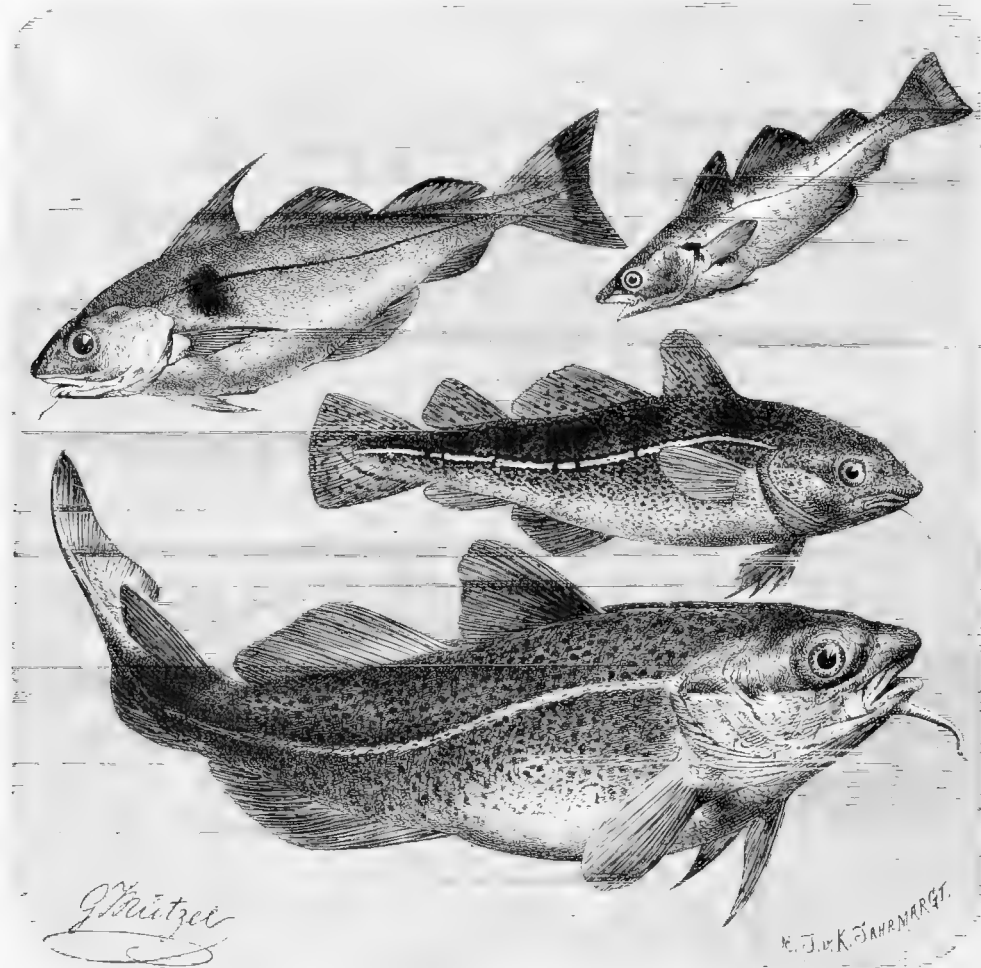
The Cod is a most uncertain fish in its habits, sometimes haunting the same locality for a number of successive years, and then suddenly leaving it and repairing to some spot where not a fish might be found on the preceding year. New fishing-grounds are frequently discovered, and it sometimes happens that the fishermen are fortunate enough to alight on a spot hitherto untouched, where, to use the graphic description of a sailor, the Cod are "as big as donkeys, and as common as blackberries."

Rockall, for instance, is one of the discoveries of this nature. It is a sandbank in the North Atlantic, about 136 miles from St. Kilda, and only distinguishable by a small rock like a rude haystack. The Cod are there so plentiful and so large that each fishing-boat sold her five days' catch for \$700; and after due preparation, the fish were disposed of at nearly double that price.

A great part of the estimation in which this fish is held depends upon the perfect manner in which it takes salt, and the length of time during which it can be preserved in an eatable

state. Salted Cod is to many persons a great dainty, but to others, among whom I must be reckoned, it is insufferably offensive, and even with all the additions of sauce and condiment is barely eatable.

The Cod is sometimes sent away in a fresh state, but is often split and salted on the spot, packed in flats on board, and afterwards washed and dried on the rocks. In this state it is called Klip-fish or Rock-fish. The liver produces a most valuable oil, which is now in great favor for the purpose of affording strength to persons afflicted with delicate lungs or who show symptoms of decline. The best oil is that which drains naturally from the livers as they are thrown into a vessel which is placed in a pan filled with boiling water. The oil is then carefully strained through flannel, and is ready for sale.



HADDOCK.—*Morrhua aeglefinus*. WHITING.—*Merlangus vulgaris*. COD.—*Gadus aeglefinus*.

The roe of the Cod is useful for bait, the sardine in particular being very partial to that substance. Much of the roe is stupidly wasted by the fisherman, who carelessly flings into the sea a commodity of which he can sell any amount, and for which he can obtain two dollars and a half per hundredweight. In Norway, the dried heads of the Cod are used as fodder for cows, and, strange to say, the graminivorous quadrupeds are very fond of this aliment.

Like several other marine fish, the Cod can be kept in a pond, provided the water be salt; and if the pond should communicate with the sea, these fishes can be readily fattened for the table. Several such ponds are in existence, and it is the custom to transfer to them the liveliest specimens that have been caught during the day's fishery, the dead or dying being either sold or cut up as food for their imprisoned relatives. These fishes are extremely voracious, and will eat not only the flesh of their kinsmen, but that of whelks and other mollusks,

which are abundantly thrown to them. It is found that under this treatment the Cod is firmer, thicker, and heavier in proportion to its length, than if it had been suffered to roam at large in the sea.

The color of the Cod is ashen-green, rather mottled with deeper tints, and the abdomen is white. The head is very large, there is a long, fleshy barbule on the chin, and the pupil of the eye is blue. Varieties in color and even in form are not uncommon, and in some cases are thought to be produced by difference of diet and locality. The average length of an adult Cod-fish is about three feet, and its weight twelve pounds.

The Common Cod (*Gadus callarias*, L.), having a range extending from the northern seas to Virginia, and from Oregon to Japan, is the most important of all food-fishes. It is taken along the coast of Massachusetts during the whole year, leaving the vicinity of land in February and going into deeper water. During the preparation of the State Reports of Massachusetts on Natural History, Dr. Storer, of Boston, had occasion, in his task of writing up the histories of the fishes, to consult several well-known and reliable authorities. Among them, Jonathan Johnson, of Nahant, is prominent. We had the pleasure of his acquaintance, and have personal knowledge of the great services he, as well as some others in the trade, extended to scientific observers. He states that the largest Cod he has seen taken weighed eighty-eight pounds. Mr. Holbrook, a fishmonger in Boston Market, reported to Dr. Storer that he "saw taken, in the spring of 1807, at New Ledge, near Portland, Me., a Cod that weighed one hundred and seven pounds, which had barnacles on its head as large as one's thumb."

The AMERICAN COD is very voracious, attacking and feeding on smaller fishes, crustaceans, and marine shell-fishes. During the winter months the Cod-fishes have their stomachs full of small mollusks, crustaceans, worms, etc., which are obtained on the rocks in deep water. Boston is supplied largely with fresh Cod and haddock by small vessels sent out from Nahant and Swampscott. These vessels average about fifty tons, and are built much after the models of the pilot-boats, being staunch and fleet. The writer once accepted an invitation to take a place on board and accompany the crew on one of their winter day trips. "Green's Harbor ground" is a favorite place for Cod and haddock fishing at this season. There we came to anchor after three hours' sail; having started from home at the early hour of 2 A. M. This early start brings them on the grounds at daylight, when the fishes bite more briskly. Of the six men, each has his boat on deck. They are put out at distances from each other, and after four or five hours' fishing are ready to be picked up; the vessel lying to during the day until then. We were clothed, like the others, in heavy woollens, and an oil-cloth suit over all, with "Sou-Wester" hat. The boots are immensely heavy, and being soaked with tar, become impervious to wet. Heavy woolen mittens for the hands, most singularly afford complete comfort during the intense cold by frequent immersion in a bucket of sea-water, the mittens being soaked in it. So long as this was done the hands remained warm. Green's Harbor is directly opposite Daniel Webster's estate, at Marshfield, Mass., and is a favorite resort for fishermen for Boston market. Cod-fish that live around the shore, among the algæ, become delicate, and are often quite brilliant in color. Their flesh is tender and sweeter than those of the deep sea.

The TOM COD is a miniature of the Cod-fish, reaching in the colder waters of Maine about twelve inches. But farther south it is usually about eight inches in length. In the fall, when the first cold weather comes, this is called Frost-fish, and is taken by the hook from our wharves. It is a savory fish. Dr. Mitchell says it has been taken in great numbers in the creeks by a common hoe, the fishes being so abundant. Its range is from Newfoundland to Hatteras.

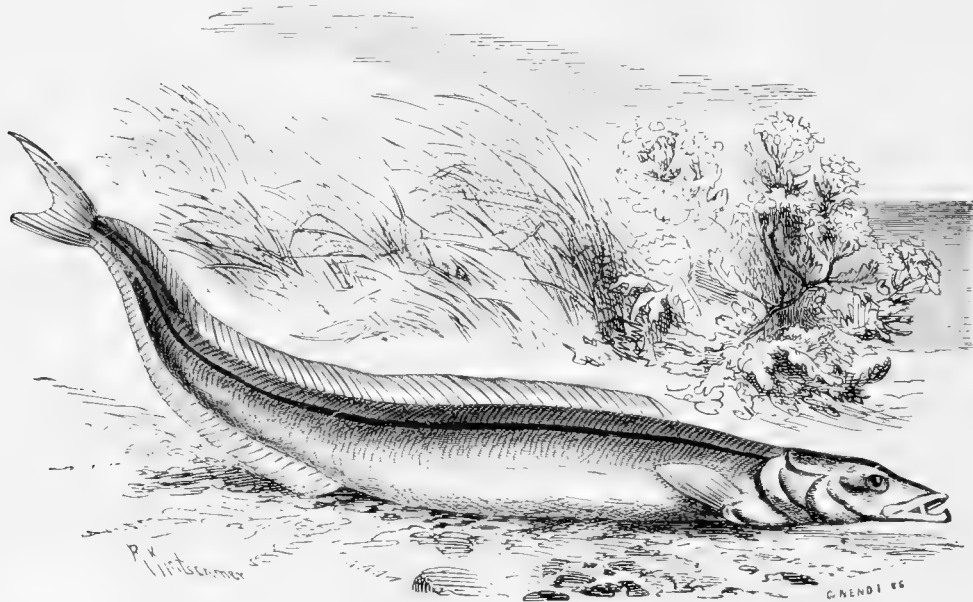
The Codlings, of genus *Phycis*, are represented by several species in our American waters north of Hatteras. One is called Squirrel Hake, and Chuss in New York; American Hake in New England. It is also called Ling, a picture of which will be seen on same cut with Sly Silurus, on a following page. These fishes are caught at night. During the bright summer nights, off Nahant, the light dancing dories of the Swampscott fishermen may be seen manned by busily engaged fishers for the local markets. This fish varies from ten to thirty pounds weight. Cusk is another variety allied to the preceding.

OF several other species of this genus we may mention the DORSE (*Morrhua callarias*), the HADDOCK (*Morrhua æglefinus*), a well-known and very valuable fish, which is represented in the previous illustration, and the WHITING, POUT, SMELTIE, or KLEG (*Morrhua lusca*), so often manufactured into whittings by the simple process of slicing off certain parts of the fish, skinning it, and pushing its tail through the head. In this state it is sold and consumed as whiting; and as one fish is just as good as the other, the consumer suffers no injury, and the enterprising vendor is recompensed for his trouble. The Pout is graphically termed by the fishermen the Stinkalive, because it becomes putrid so soon after death. While living, various iridescent colors play over the surface of the fish, but as soon as it is dead the colors and the dark bands disappear, and the whole upper surface becomes of a dull yellow-brown, the abdomen being whitish with a tinge of blue-gray.

THE common WHITING (*Merlangus vulgaris*), which is also figured in the previous illustration, is closely allied to the fishes of the preceding genus, and is too well known to need description. The COAL-FISH (*Merlangus carbonarius*), and the POLLACK (*Merlangus pollachius*), belong to the same genus as the whiting; and the HAKE (*Merluccius vulgaris*) is closely allied to them.

THE EELS.

IN the large and important group of fishes to which our attention is now drawn, the ventral fins are wholly wanting, the body is long, snake-like, smooth, and slimy



SAND EEL, OR HORNELS.—*Ammodytes tobianus*.

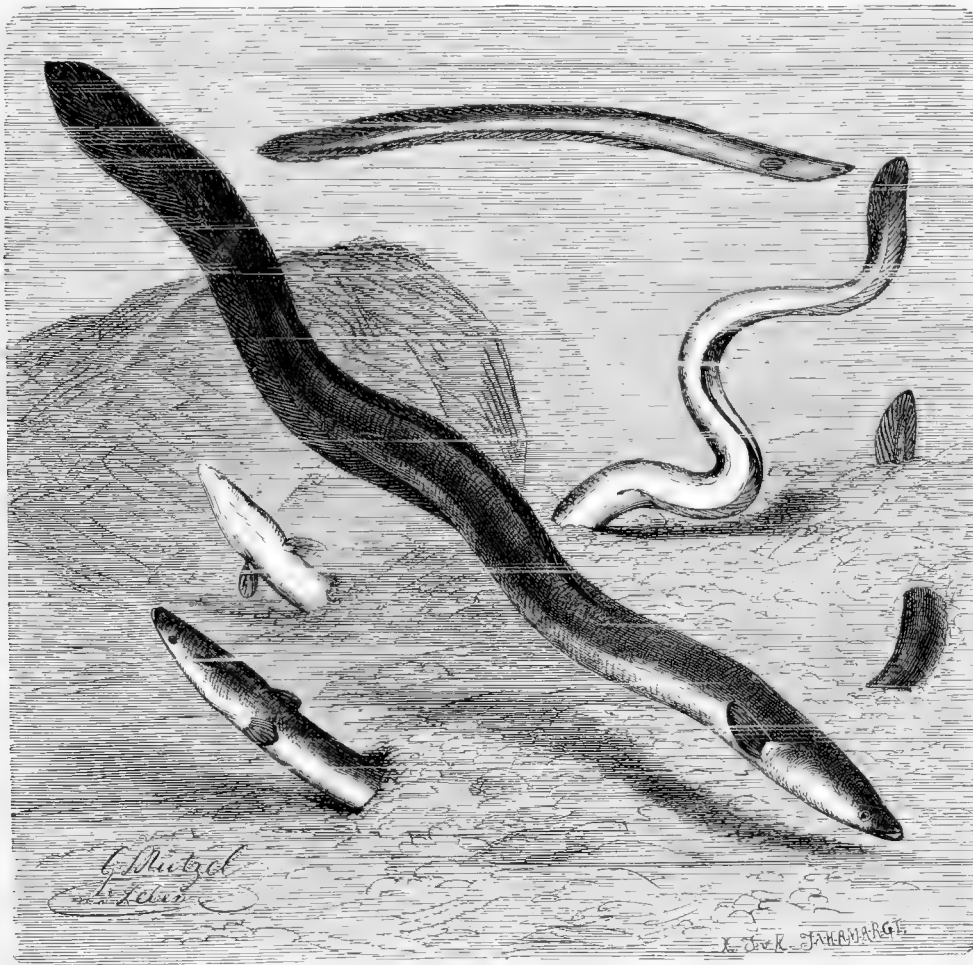
on the exterior, and in many cases covered with very little scales hidden in the thick, soft skin.

OUR first example is the SAND LAUNCE, a very common fish on many coasts, and usually found wherever the shore is of a sandy character. The generic name *Ammodytes* signifies sand-diver, and is given to this fish in consequence of its habit of burying itself in the wet sand, where it remains hidden and secure from marine foes.

THE FIERASFERS are small fishes of tropical waters, parasitic or commensal in echinoderms and mollusks; allied near the eel-pouts and sand eels.

While resident on the Florida Reef, at Fort Jefferson, we discovered a *Fierasfer* living in a large *Holothuria*. At this time, 1859, this was a novelty to naturalists. Since then species have been found in other parts of the world, and in various objects.

The large *Holothuria*, or Sea Cucumber of the Reef, is often eighteen inches in length; and it is abundantly spread over the reef in shoal water. The visitor, in sailing leisurely in these waters, may reach one easily from his seat in the boat. Lift the creature into a bucket of water: he soon exhausts the oxygen of so small amount of water, and there peeps out from his mouth another creature that requires more oxygen than is left, and thus asserts his rights by leaving. It is a fish, a *Fierasfer*, that so appears, and a delicate transparent one it is, of eight inches in length. Its name *Fierasfer* is derived from the Greek, meaning sleek and



SHARP-NOSED EEL.—*Anguilla acutirostris*.

shining, in allusion to its great delicacy. Its habit of living protected within the halls of the great echinoderm renders its exterior tissues delicate, if indeed it be not originally made so. Who can tell? These cases of parasitic or, more properly, commensal life are, indeed, puzzling. This species is *Fierasfer dubius* (Putnam), and its locality is recorded as Florida Keys to Cuba.

ANOTHER species of this genus, the SAND EEL, or HORNELS (*Ammodytes tobianus*), is sometimes mistaken for the preceding species, from which, however, it may be distinguished by its greater size, its larger head, the farther setting back of the dorsal fin, the browner color, and more opaque body. When full-grown, the Sand Eel will reach the length of a foot or thirteen inches.

THE SHARP-NOSED EEL, represented in the engraving on page 271, derives its name from the shape of its head, and by that structure may be distinguished from the second species. In their habits the Eels are so similar, that the present species will be taken as an example of the whole genus.

Eels are found in almost all warm and temperate countries, and grow to a very large size in tropical regions. They are, however, impatient of cold, and in the extreme northern or southern parts of the world are not to be found. In many of the Pacific islands these fish are held in great estimation, being preserved in ponds and fed by hand, and in New Zealand they afford one of the staple articles of consumption. In some parts of the world, however, a strong prejudice exists against Eels, probably on account of their resemblance to snakes, and even a hungry man will not eat one of these wholesome and nutritious fish.

The Eel is one of the most mysterious river fishes, and although much is now known that formerly was involved in obscurity, there is still much to learn respecting its habits, and, more especially, its mode of reproduction. It is probable, that difference of locality may influence the Eel and cause difference of habit; but it is certain, that, if a number of practical observers set themselves to watch the Eel and its customs, their accounts would vary in the most perplexing manner, and to build a theory upon so unsafe a basis is quite impossible.

The Common Eel (*Anguilla rostrata*) is abundant along the Atlantic coast, from Maine to Mexico, ascending all the streams and resident in the Mississippi valley.

The BROAD-NOSED EEL is at once to be distinguished by the greater breadth of its head, bluntness of its nose, and soft unctuousness of its body. It does not seem to attain so great a size as its sharp-nosed relative. Besides these species, I mention a third Eel, the SNIG, which is known by its olive-green back and the golden-yellow of the under parts. The Grig is a term applied by fishermen to any Eel of a small size, and even the name of Snig is employed in a very vague fashion.

THE well-known CONGER EEL is a marine species, very common in our seas, and being most usually found on the rocky portion of the coast.

This useful fish has, of late years, come into more general use than formerly, and its good qualities are more appreciated. The flesh, though not very palatable if dressed unskilfully, is now held in some estimation, and for the manufacture of soup is thought to be almost unrivalled. The fishermen can now always obtain a ready sale for the Congers; and those which are not purchased for the table are mostly bought up and made into isinglass. It often attains to a very great size, measuring ten feet in length, and weighing more than a hundred pounds.

The Conger Eel (*Conger niger*) is the same in species, found in Europe and East Indies, and on our Atlantic coast. In Europe it grows to a large size, and appears to be more plentiful, weighing one hundred pounds and measuring ten feet in length. A strong diversity of opinion exists concerning its value as food. In the fourteenth century it was prized, and was reserved by the nobility. A special preparation of this fish formed an established trade in the west of England in the time of King John. This preparation was dried Conger, called *Conger doust*, or Sweet Conger, which was exported to Spain.

THE beautifully mottled MURÆNA is tolerably common in the Mediterranean, but is scarce towards the northern coasts.

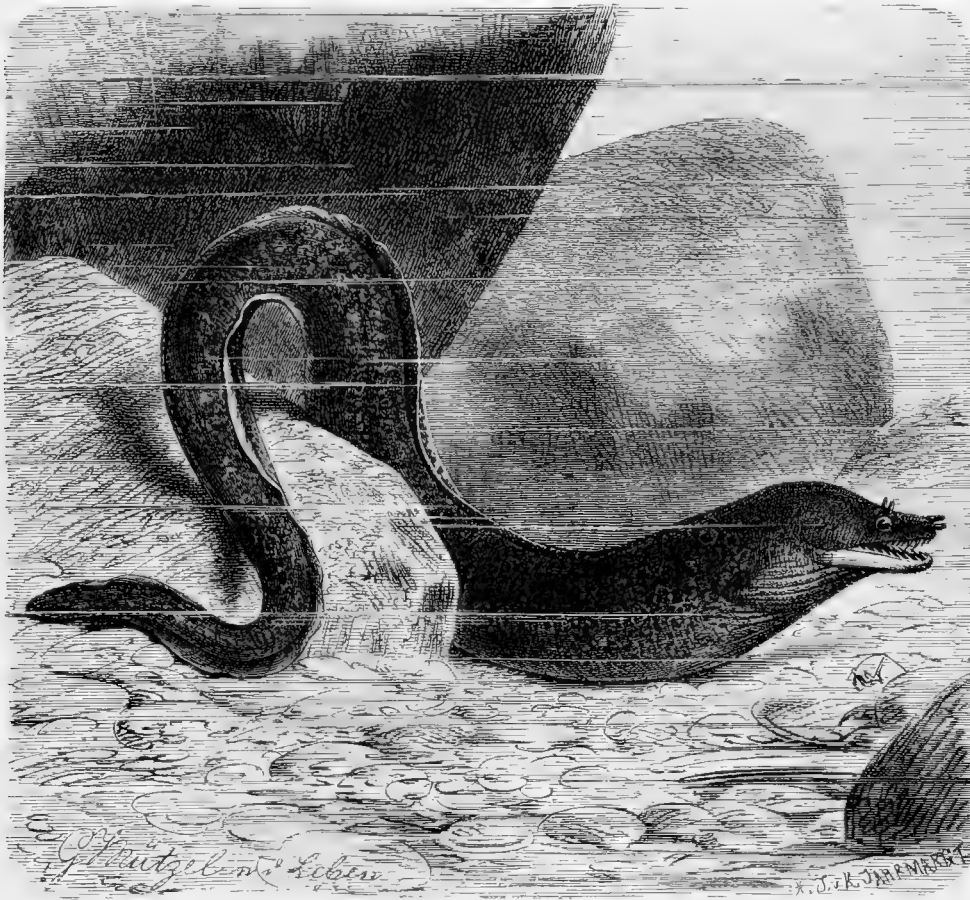
In former days the Muræna was held in great distinction by epicures; and the wealthy were accustomed to preserve them in ponds built for that special purpose. In these ponds the Muræna were fattened, and several of the aristocrats labored under the imputation of feeding them with an occasional slave, whenever an ill-fated domestic had the misfortune to offend them. The flesh is very white in color, and of a peculiar and very delicate flavor. This fish can live either in salt or fresh water, but appears to prefer the sea.

The color is golden-yellow in front and purple towards the tail; and the whole body is covered with bands, irregular rings, and spots of deep and pale gold, purple, and brown.

The dorsal fin begins a little behind the head and runs to the tail, where it is united with the anal fin. Both these fins are, however, low and fleshy, and not at all conspicuous. The length of this fish is extremely variable; one captured specimen measured four feet four inches in length.

The Muræna, or Moray (*Muræna melanotis*), is found from Charleston, S. C., to Florida. Its usual length is about twenty inches. Its shape is somewhat like that of the Blennies. Its propensity to bite, and general appearance, are suggestive of snake.

THE ELECTRIC EEL is even more remarkable for its capability of delivering powerful electric shocks than the torpedo.



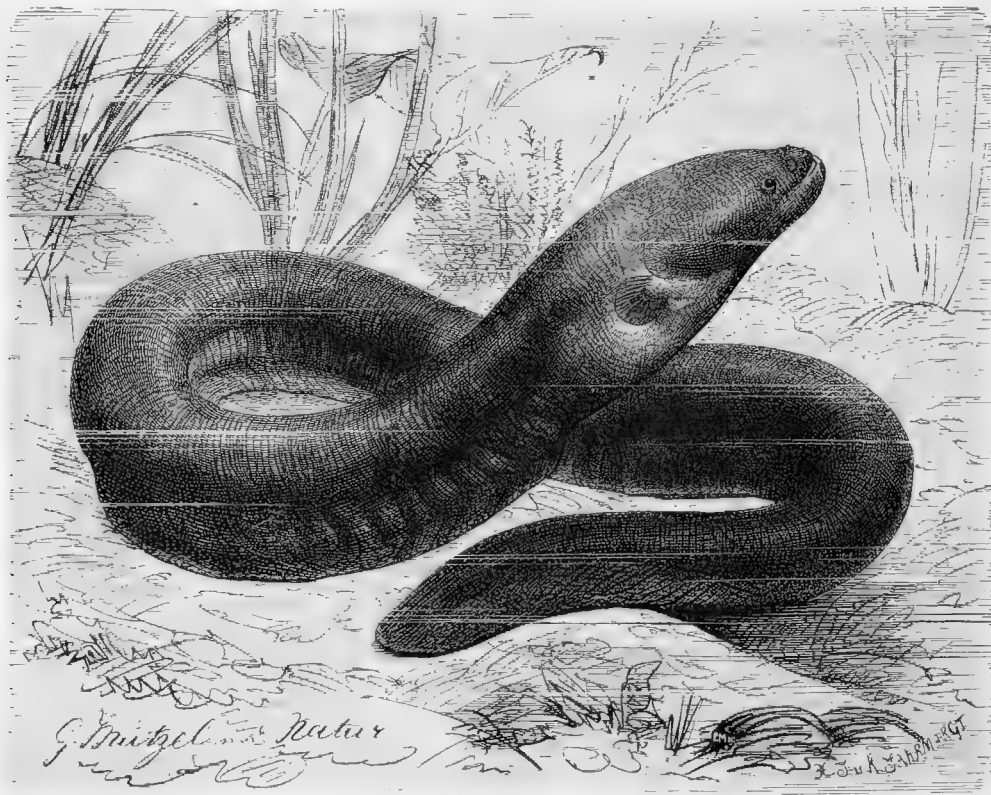
MURÆNA.—*Muræna helena*.

The Electric Eel is a native of Southern America, and inhabits the rivers of that warm and verdant country. The organs which enable it to produce such wonderful effects are double, and lie along the body, the one upon the other.

The reader will remember that in the torpedo the electric effect was produced by a number of little columns; in the Electric Eel, the corresponding organ consists of a great number of divisions, technically called "septa," which are again subdivided by lesser transverse membranes. One organ is always larger than the other; and it was found that in a fish measuring about two feet four inches in length, there were thirty-four septa in the larger organ and fourteen in the smaller. On an average two hundred and forty transverse membranes are packed in each inch, thereby giving a vast extent of electricity-producing surface. It was calculated by Laccépède, that the expanse of this organ in an Electric Eel of four feet in length is equivalent to one hundred and twenty-three square feet, while that of a large torpedo only equals fifty-eight feet.

In the native country of these fishes they are captured by an ingenious but somewhat cruel process. A herd of wild horses are driven to the spot and urged into the water. The alarmed Gymnoti, finding their domains thus invaded, call forth all the terrors of their invisible artillery to repel the intruders, and discharge their pent-up lightnings with fearful rapidity and force. Gliding under the bellies of the frightened horses, they press themselves against their bodies, as if to economize all the electrical fluid, and by shock after shock generally succeed in drowning several of the poor quadrupeds.

Horses, however, are of but slight value in that country, hardly, indeed, so much valued as pigeons in North America, and as fast as they emerge from the water in frantic terror, are driven back among their dread enemies. Presently the shocks become less powerful, for the Gymnotus soon exhausts its store of electricity, and when the fishes are thoroughly fatigued they are captured with impunity by the native hunters. A most interesting account of this process is given by Humboldt, but is too long to be inserted in these pages.



ELECTRIC EEL.—*Gymnotus electricus*.

Several of these wonderful fish have been brought to foreign countries in a living state. I well remember a fine *Gymnotus* that lived in captivity. Numbers of experimenters were accustomed daily to test its powers; and the fatal, or at all events the numbing, power of the stroke was evident when the creature was supplied with the fish on which it fed. Though blind, it was accustomed to turn its head towards the spot designated by the splashing of the attendant's finger, and as soon as a fish was allowed to fall into the water the *Gymnotus* would curve itself slightly, seemed to stiffen its muscles, and the victim turned over on its back, struck as if dead by the violence of the shock.

When full-grown, the Electric Eel will attain a length of five or six feet, and is then a truly formidable creature. The body is rounded, and the scales small and barely visible. According to Maregrave, the native name for this fish is Carapo.

WE have already seen some examples of fishes where the body is extremely transparent, and now come to an entire family where this peculiarity is the chief and most obvious characteristic.

The skeleton of the Leptocephalidæ, or Glass Eels as they are termed, from their Eel-like shape and singular translucency, is very imperfect, merely consisting of cartilage, and so slight that even in the head, where the greatest strength is required, the brain can be seen through the translucent skull in which it lies. Their bodies are always extremely compressed and mostly leaf-like, so transparent that when lying in a vessel containing water they would hardly be noticed, and the lateral line is formed by the intersection of the muscles.

The PIG-NOSED GLASS EEL may be known by the lengthened form of its head and snout, which are far longer in proportion to the dimensions of the fish than in any other member of the family. The generic term *Hyoprurus* literally signifies swine-beaked, and in former days was applied to a certain kind of galley which had a long and slightly turned-up beak. The sudden height of the body just behind the head is very remarkable, and on close examination, a row of mucous pores will be found along the jaws and on the head. The eyes are not very large, and the general length of the species is between four and five inches. As its specific name imports, it has been taken at Messina.

The HAIR-TAILED GLASS EEL is much longer in proportion than the last-mentioned species, and its body is so extremely compressed that it is hardly thicker than the paper on which this account is printed. This species is also found at Messina. The jaws are short and round, the eye rather small, and the tail tapers away to a hair-like point. The length of this fish is rather more than a foot, and a row of minute points runs along each edge of the body.

The typical genus *Leptocephalus* is a rather large one, containing more species than the four preceding genera together.

The ROUND-HEADED GLASS EEL derives its specific name of *Tænia*, or tape-worm, on account of its resemblance to that unpleasant internal parasite. Its head is, as its name denotes, short and much rounded, and the eyes are globular, projecting, and extremely large. The jaws are tolerably well furnished with small teeth. In shape it is long and rather rounded, and the absence of fins renders its resemblance to a tape-worm extremely striking. It seems to be an Asiatic species, having been captured in India and the neighboring islands.

In the ANGLESEY MORRIS (*Leptocephalus morrissi*), another example of this genus, the head is blunt, the eye moderate, the body much compressed, and deepest at the latter third of its length. When living, its polished surface reflects gleams of iridescent light as it winds its graceful way through the sea weeds among which it loves to sojourn, like a ribbon of animated nacre. But when dead and placed in spirits, all the delicate opalescence of its body fades, and soon deteriorates into an opaque dull whiteness like wet parchment.

THE BLIND-FISH.

THE reader will remember that on several occasions it has been deemed expedient to give examples of remarkable deviations from the ordinary system, and to call attention to the wonderful economy of nature, which is most averse to wastefulness, and declines to expend its powers on organs that if existing would be in abeyance. A recent example of such modification has been given in the proteus, on page 186, that curious reptile, or semi-reptile, which inhabits caves wherein penetrates no ray of light, and which, having no need of external eyes, is altogether devoid of such useless organs.

The BLIND-FISH of America affords another instance of similar economy in structure. Living, like the proteus, in a subterranean and perfectly dark grotto, it needs no eyes, and in consequence possesses none, their place being merely indicated by two minute black dots on the sides of the head. The head is naked, but the body is covered with scales and the jaws are furnished with some small but sharp teeth. Its color is whitish-gray, as is, indeed, mostly the case with animals that have been long deprived of the color-giving sunlight. The grotto which contains this very remarkable little fish is in Kentucky.

Of the Blind-fishes, family *Amblyopsidæ*, living in caves, three genera are now known.

Amblyopsis spelæus is found in the caves of Indiana and Kentucky. These Blind-fishes are of small size, living in subterranean streams and ditches of Central and Southern United States.

Four species are now known. F. W. Putnam has given us all the information yet procured about them.

THE HERRING TRIBE; CLUPEIDÆ.

WE now come to that most valuable family of fishes, the Herring tribe, called technically *Clupeidæ*, from the Latin word *clupea*, a herring.

THE well-known ANCHOVY is properly a native of the Mediterranean Sea, though it often occurs on northern coasts. Indeed, one practical writer on fishes thinks that the capture of the Anchovy off northern shores is a task that would be highly remunerative if properly undertaken, and that, with proper pains, the markets in the north might be fully supplied with Anchovies from their own seas.

This little fish has long been famous for the powerful and unique flavor of its flesh, and is in consequence captured in vast quantities for the purpose of being made into Anchovy sauce, Anchovy paste, and other articles of diet in which the heart of an epicure delights. Unfortunately, however, the little fish is so valuable, that in the preparations made from its flesh the dishonest dealers too often adulterate their goods largely, and palm off sprats and other comparatively worthless fish for the real Anchovy. As the head is always removed before the process of potting is commenced, the deception is not easily detected—the long head with its projecting upper jaw and deeply cleft gape affording so clear an evidence of the identity of the fish, that no one would venture to pass off one fish for the other, if the heads were permitted to remain in their natural places. The flavor of the veritable Anchovy is rudely imitated by various admixtures, and its full rich color is simulated by bole armoniac and other abominations.

The very long generic title *Engraulis encrasicolus* was given to it in ancient times, and is still retained, as being quite appropriate. Its literal signification is “gall-tinctured,” and the name has been given to it on account of the peculiar bitter taste of the head, in which part the ancients supposed the gall to be placed.

THE COMMON or ALLICE SHAD is extremely plentiful on some of our coasts, but appears to be a rather local fish, and while it abounds in some places, to be wholly absent from others.

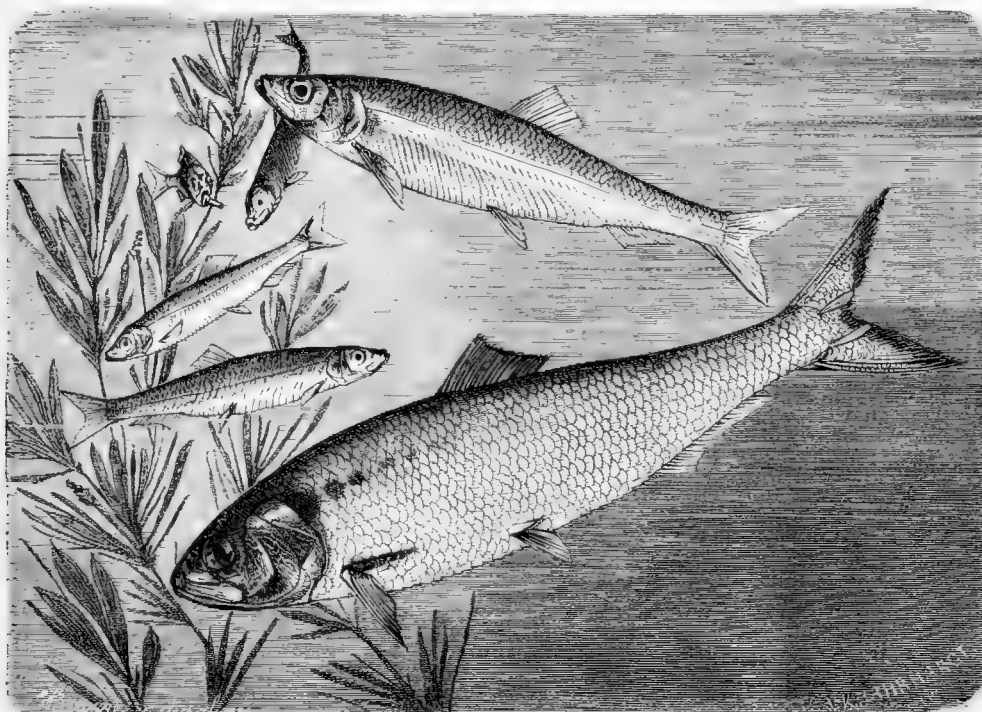
The Shad is fond of ascending rivers, especially if the water be clear; and while the Thames was still unstirred by the paddles of multitudinous steamboats, and unpolluted by the contents of countless sewers, this fish would ascend the river for a considerable distance, and has been taken in good condition near Hampton Court. Some persons think that the flavor of the fish improves in proportion to its proximity to the river source. Except in size, the Shad bears a very close resemblance to a herring, and in some places is called the King of the Herrings.

The color of the Shad is dark blue on the upper part of the head and back, variegated with glosses or reflections of brown and green, either color predominating according to the angle at which the light falls upon the surface. The remainder of the body is white. There is another species of this genus, the TWAITE SHAD (*Alosa finta*), which is about half the size of the Allice Shad, weighing on an average about two pounds. Both these fish may be at once distinguished by a deep cleft or notch in the centre of the upper jaw.

Shad (*Clupea sapidissima*). This valuable fish is found ranging from Newfoundland to Florida. Mitchell says it is a regular visitor, coming to us from the ocean as in yearly migration; in March ascending towards the head of the Hudson and other rivers, to breed. Its average weight is four pounds. The Shad-fishing of the New England States is considerable—in the Connecticut River especially. Some are taken in the Merrimack River. Unlike most

others of its genus that come to us from the north, this fish comes from the south, to deposit its spawn. In Charleston, S. C., it appears in January, proceeding steadily along the coast, at Norfolk in February, and reaching New York in March or April, in accordance with the state of the season. On the coast of Massachusetts it appears in May. The Shad that reach the headquarters of the Hudson attain a distance of one hundred and fifty miles from the mouth. Shad in New England rank low, as the salt-water fishes of the northern coast are superior. East of Boston, Shad are regarded as little better than herring.

THE HERRING (*Clupea harengus*) is undoubtedly the most valuable of fishes, and the one which could least be spared. In Europe it is at once the luxury of the rich and the nourishment of the poor, capable of preservation throughout a long period, easily packed, quick and simply dressed, and equally good whether eaten fresh or salted, smoked or potted.



1. TWAITE SHAD.—*Alausa finta*. 2. SPRAT.—*Clupea sprattus*. 3. HERRING.—*Clupea harengus*. (One-third natural size.)

During the greater part of the year, the Herring lives in deep water, where its habits are entirely unknown. About July or August, the Herring is urged, by the irresistible force of instinct, to approach the shores for the purpose of depositing its spawn in the shallow waters, where the warm rays of the sun may pour their vivifying influence upon the tiny eggs that will hereafter produce creatures of so disproportionate a size, and where the ever-moving tides may fill the water with free oxygen as the waves dash on the shores and fall back in whitened spray, thus giving to the water that sparkling freshness so needful for the development of the future fish.

The Herring is called Alewife in New England, Gaspereau in the British provinces, Spring Herring, Blue-back, Saw-belly, and Cat-thresher in Maine. The Narragansetts called it Aumscrag. Its range is from Newfoundland to Florida. It is thought that Herrings winter in the Arctic Circle and pass southward. They appear off the Shetland Islands in April and May, but the grand shoal is not seen until June. The main body is described as altering the appearance of the ocean miles in extent, divided in columns of six units' length. In America the shad run up the rivers in March, the streams being so full they are trampled on at fording-places.

In Massachusetts the Taunton River is a famous place for Alewives. The erection of

dams, however, here as elsewhere, has served to check their increase. The English Herring was once declared to be distinct, but is now regarded as identical with the present species. The celebrated White-bait was once regarded as an English Herring of a peculiar small kind, but now it is definitely known that White-bait is the young of the common Herring. Mr. Blackford informed us that the White-bait, precisely similar to the English, is taken off Coney Island. Young White-bait were kept in aquarium until they had grown to be twelve inches in length.

HARD HEAD, or MENHADEN (*Brevoortia tyrannus*) Moss-bunker, Bony-fish, White-fish, Bug-fish, Fat-back, Yellow-tail, Pogy, Poghagen, Skippaughs, or Bunkers, so called in various places. This is one of the most familiar of native fishes, though it is not a food-fish, but a very valuable one in its services to the fishermen as bait. It is even so numerous at times as to be taken in vast quantities for manuring land. Its oil is used largely in cheap painting.

ANOTHER species of this fish, called LEACH'S HERRING (*Clupea leachii*), is captured during the winter months; the roe being well developed at the end of January, and the spawn deposited in February. It is a small species, between seven and eight inches in length.

The common SPRAT is another very useful fish, though not so extensively valued as the herring.

Like that fish, it swims in vast shoals during the spawning season, which immediately succeeds that of the herring, so that from July to February and March the public can command a continual supply of fresh sea-fish, which can be purchased at so cheap a rate as to be within the reach of all classes, and are, nevertheless, of such excellent flavor that if they were as scarce as they are plentiful, they would be held in high estimation at the tables of the wealthy. To the taste of many persons, however, the Sprat is too rich and too strongly flavored to be in much request.

This fish is captured in nets of various kinds, the nature of the net mostly depending on that of the locality; and as it swims in shoals quite equal in numbers to those of the herring, it is taking in countless multitudes when the boats happen to be fortunate in their selection of a fishing-ground. Now and then the "take" is so enormous that even the European markets, which usually absorb every eatable article which can be brought for sale, and often anticipate the future crops or supplies, are at times so overstocked with Sprats that the fishermen can find no ordinary sale for their perishable goods, and are perforce obliged to dispose of them to the farmers, who spread them over their lands for manure, most unfragrant but exceedingly fertilizing. In color it is very like the herring.

One or two members of this genus demand a brief notice.

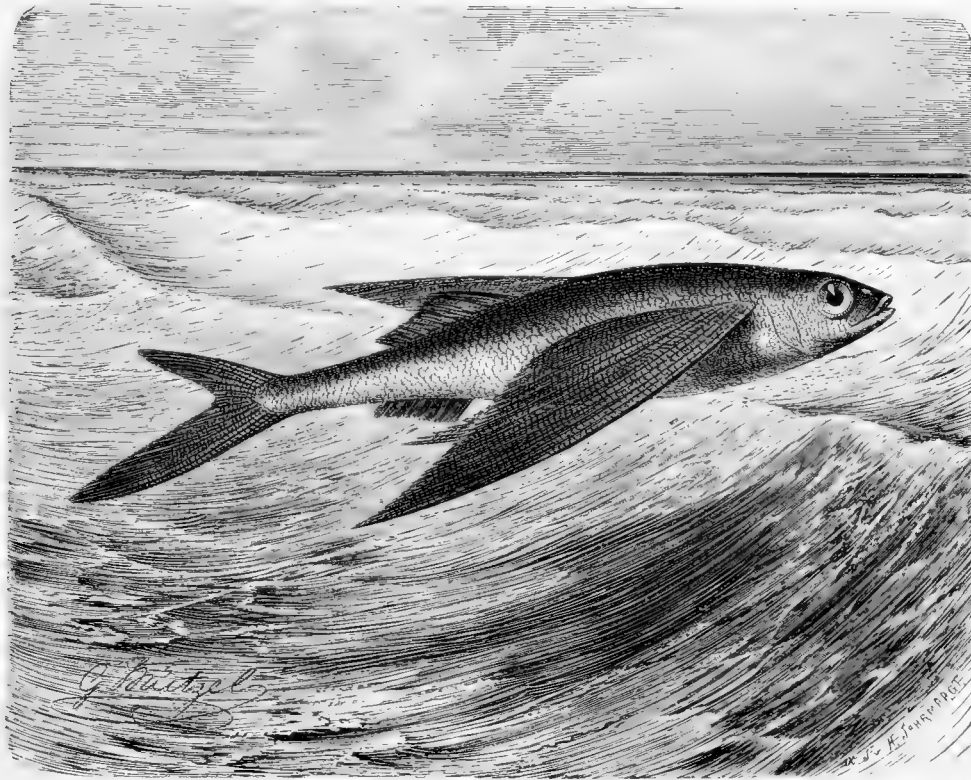
The PILOHARD, or GIPSY HERRING (*Clupea pilchardus*), is another of the gregarious fish, and is taken about the month of August by a wonderfully intricate system of boats and nets that seem capable of sweeping every fish out of the sea. Though very like the herring, it may easily be distinguished by the position of the dorsal fin, which is set so far forward that if the fish be held by the first ray of that fin its body slopes upward, whereas in the herring it is nearly balanced and slightly inclines downward.

THE far-famed FLYING-FISH exists in many of the warmer seas, and derives its popular name from its wonderful powers of sustaining itself in the air. Its picture is placed on the next page.

The passage of this fish through the atmosphere can lay no just claim to the title of flight, for the creature does not flap the wing-like pectoral fins on which it is upborne, and is not believed even to possess the power of changing its course. As much of the history of the Flying-fish has been given while treating on the coryphene, the reader is referred to the description of that fish on page 248, where may also be seen an illustration of the attitudes

assumed by the Flying-fish as it speeds its course through the air while attempting to avoid its deadly foe beneath.

BEFORE proceeding to our next example of the finny tribes, we must briefly notice a curious fish which seems to be a kind of balance to the sword-fish already mentioned, the "sword" in this instance belonging to the lower instead of the upper jaw, and being formed by a prolongation of its bones. It is known by the scientific name of *Hemiramphus argenteus*, and is found near the surface of the water in the Pacific Ocean. Its color is uniform silvery white, and its average length is only four inches.



FLYING-FISH.—*Exocoetus volitans*.

THE odd-looking GAR-FISH is known by a vast variety of names, such as SEA PIKE, MACKEREL GUIDE, SEA-NEEDLE, LONG-NOSE, GORE-BILL, HORNFISH, and GREENBONE, the last-mentioned title being given to it because, when it is boiled, its bones are of a bright green hue. The name of Mackerel Guide is owing to the fact that its spawning season exactly precedes that of the mackerel, and the other names explain themselves.

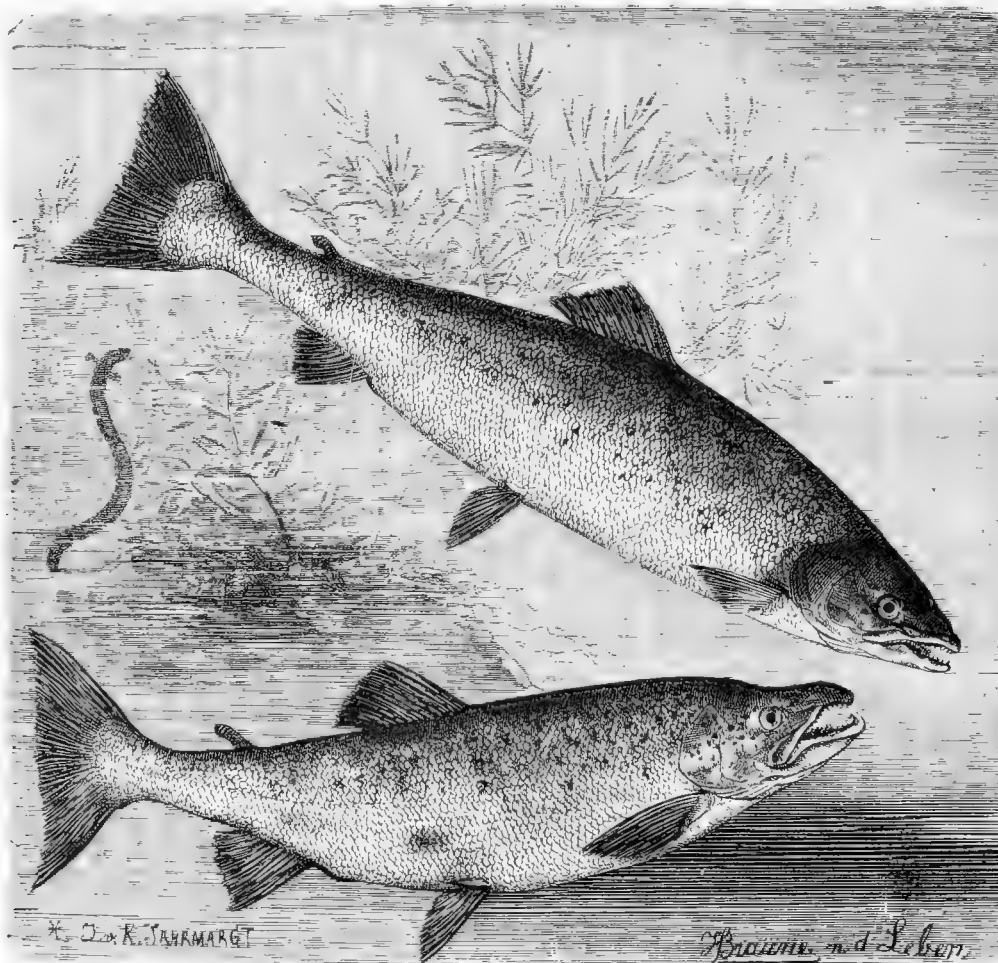
THE fierce and voracious PIKE has well earned its titles of Fresh-water Shark and River Pirate, for though perhaps not one whit more destructive to animal life than the roach, gudgeon, and other harmless fish, the prey which it devours are of a larger size, and its means of destruction are so conspicuous and powerful, that its name has long been a by-word for pitiless rapacity.

SALMON, TROUT, CARP, ETC.

THE SALMON is undoubtedly the king of river-fish; not so much for its dimensions, which are exceeded by one or two giant members of the finny tribe, but for the silvery sheen of its glittering scales, its wonderful dash and activity, affording magnificent sport to the angler, the interesting nature of its life from the egg to full maturity, and last, but not least, for the exquisite flavor and nutritive character of its flesh.

In former days, before civilization had substituted man and his dwellings for the broad meadows and their furred and feathered inmates, the Salmon was found in many rivers. Now, however, there are but few streams where this splendid fish can be seen, for, in the greater number of European rivers, the water has been so defiled by human agency that the fastidious Salmon will not suffer itself to be poisoned by such hateful mixture of evil odors and polluted waters; and in the few streams where the water is still sufficiently pure for the Salmon to venture into them, the array of nets, weirs, and all kinds of Salmon traps is so tremendous, that not one tith of the normal number are now found in them.

The ingenuity which has been exhibited in the invention of these "infernal machines," as the fixed nets have been justly termed, and the amount of labor which has been expended in



SALMON.—*Salmo salar*. SALMON TROUT.—*Salmo trutta*.

their manufacture, are worthy of a better cause; for in their arrangement the habits of the fish have been carefully studied, and, in their manufacture, its capabilities have been foreseen. The evil has, of late years, arisen to so great a height, that the Salmon would soon have been extirpated from European rivers, had not the nation wisely interfered to prevent the loss of so much national wealth, and given the fish a fair chance of re-establishing itself in its former plenty.

The short-sighted persons who plant all these obstructions forget that by this wholesale destruction of the Salmon they are acting against their own interests, and that if they destroy the ill-conditioned and young fish, as well as the adult and healthy Salmon, they condemn themselves to the probability of eating bad fish for the present, and the certainty of total deprivation for the future. The fact, however, seems to be, that each petty proprietor of a fishery is jealous of the neighbors above and below him, and indiscriminately slaughters all

Animate Creation.

WE have concluded to submit for public patronage a work with the above title, being a series of exquisite Engravings representing the ANIMAL WORLD, executed with great scientific accuracy, and accompanied by full Descriptive Text, written in popular terms, so as to delight and instruct the people. Anyone who has considered the subject must be at a loss to understand why an ILLUSTRATED NATURAL HISTORY, comprehensive and at the same time popular, has not before this been published in this country. Indeed any lover of animals who has visited the great museums and zoological gardens and has had access to books of engravings in the public libraries, could not fail to remark the wealth of material in existence devoted to this subject. Being confirmed in our conviction of the desirability of such a work, we laid under contribution the best existing authorities for the production of most perfect representations of all the more important living creatures, and among the artists whose delineations will delight the reader, we may mention Harrison Weir, Wolf, Coleman, Fr. Specht, and Mutzel. By far the majority of the engravings in these volumes are from drawings made from the *living* animals, many at the Zoological Society's Gardens in London, England.

We purpose that our patrons shall be aided and interested in their study by such an array of pictures as has never before embellished any Natural History. In numerous instances the engraving is printed in oil-colors, and this portion of the illustrations has been taken charge of by Messrs. L. Prang & Co., of Boston, who we believe rank foremost for high artistic results in this department of printing. These Oleographs were copied under the superintendence of Mr. Prang from the renowned "Tafeln" of "Brehm's Thierleben," so that they may be declared perfectly reliable.

We sought competent advice from various sources as to the most suitable text that should accompany this panorama of handsome Engravings. It was found impossible to embody all the present ideas of naturalists in a single work like this on account of the rapid advances and constant changes in their knowledge of, and habits of thought respecting, the Animal World. And it seemed to us correct that the true object of Zoology is not to arrange, to number, and to ticket animals in a formal inventory, but to inquire into their life-nature, and not simply to investigate the lifeless organism.

What do we know of "Man" from the dissecting-room? Is it not Man, the warrior, the statesman, the poet, etc., that we are interested in? With all veneration which attaches itself to those who are the accredited possessors of abstruse learning, their inordinate use of phraseology detracts too much, we fear, from the fascination that the study of the Animal World would otherwise yield, and as we are not content to have our work restricted to a favored few, we thought the task placed in our hands to be to keep the work free from a repellant vocabulary of conventional technicalities. Our endeavor has been to find an author whose work would be noted for its fund of anecdote and vitality rather than for merely anatomical and scientific presentation, and we arrived at the conclusion that we could not do better than avail ourselves of the Rev. J. G. Wood's comprehensive work—a work most popularly approved by speakers of the English language. It would be superfluous to say one word concerning the standard character of his book, from the pages of which old and young at the other side of the Atlantic have obtained so much instruction and rational amusement. Avoiding the lengthened dissertations and minute classifications of specialists, he presents to his readers in popular terms a complete treatise on the Animal Kingdom of all climes and countries. The one objection that could be urged against it was, that animal life in America might be treated more fully and American forms given more consideration. In order to obviate this drawback and to do full justice to the creatures of our own country, we secured the aid of Dr. J. B. HOLDER, of the American Museum of Natural History in New York, an undoubted American authority, who has adapted Wood's work to American wants and given prominence to American forms of Animal life.

The splendid work on Rodentia, by Allen, Coues, and others, will be fully consulted. The valuable work on North American Birds, by Baird, Brewer, and Ridgway, will be the guide in the treatment of birds. The late arrangement of the classification and nomenclature of North American Birds, by Mr. Ridgway, and the Committee on that subject of the Ornithologists' Union, will be utilized in full. The arrangement of Mammals will be after the latest classification by Professor Flower, of the Zoological Society of London.

Terms of Publication.

The extent of the work will be 68 parts of 28 pages, at the price of 25 cents each. The entire publication will contain 34 Oleographs and 68 Full Page Engravings on Wood, besides many hundreds of exquisite illustrations interspersed through the text. No subscriber's name is received for less than the entire set, and no order can be cancelled after acceptance of first four parts. The Publisher guarantees to complete the work in sixty-eight parts. The parts are payable only as delivered, the carrier not being permitted to receive money in advance, nor to leave parts on credit. Subscribers who remove, or who are not regularly supplied, will please address the Publisher, by mail.

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The late CHARLES DARWIN writes:—"The illustrations are the best I ever saw in any work. I find it superfluous to enter here into particulars, as I already, in the 'Descent of Man,' have willingly and openly confessed how much I have profited by Mr. Brehm's book, and how highly I esteem it."

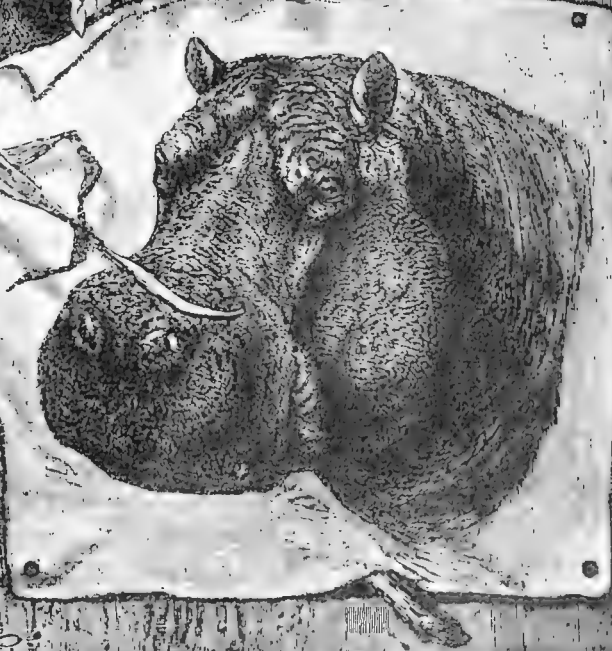
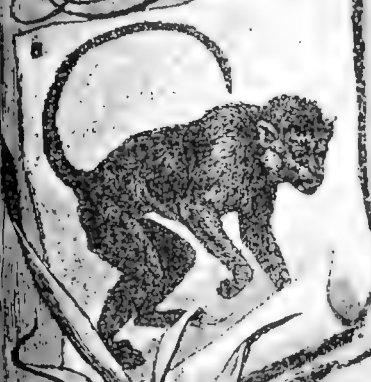
Sir JOHN LUBBOCK, Bart., D.C.L., writes:—"You have, I think, done good service in publishing them. They are certainly very admirable."
W. B. CARENTON, M.D., LL.D., writes:—"I can quite endorse the favorable opinions already given by distinguished zoologists as to the high character of the illustrations generally."

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fish that he can capture in his own waters, simply that they may not pass into those of his neighbor.

The preservation of this noble fish is truly a subject of national importance, and it is to be hoped that, by judicious legislation and active administration of the law, the Salmon may no longer be the rich man's luxury, but again hold its legitimate place as the poor man's cheap subsistence.

The life history of the Salmon is very interesting, and in many parts not a little mysterious. In the short space which is allowable for the subject, I will endeavor to trace the life of a Salmon from its earliest entrance into the world to its exit therefrom; putting forward no particular theories, but merely enumerating the accredited observations that have been made on this curious subject.

We will begin with the cradle that is prepared for the expected brood. This is a groove in the gravelly bed of a river, and is scooped out by one or both of the parents. Even here a discrepancy exists between practical observers, some of whom aver that the groove is made by both parents, by means of rooting with their noses in the ground; others that the male Salmon scoops out the gravel with a hook-like appendage that is developed on his chin during the breeding-season; while others declare that the male never troubles himself about the labor of scooping the groove, his duty being to watch over his mate and to fight any other fish of his own sex and species who may intrude upon their home, and that the whole task devolves upon the female, who executes it by twirling her tail and not by grubbing with her snout.

The whole process of depositing the numerous eggs occupies on the average about ten days, and, after it is accomplished, the parent fish leave the eggs to be hatched by surrounding influences, while they themselves quit the spot and remain in the river for a short period while they recover from the exhaustion caused by the process. During this period they are unusually ravenous, and vast quantities of the young of their own kind, which are about that time abundant in the river, fall victims to their insatiable appetite. After a time, and about the months of March and April, they drop down from pool to pool, in any flood which may seem favorable to them, until they reach the sea, where they are supposed to remain from six weeks to three or four months, when they again seek the river, vastly increased in weight and improved in condition.

The Salmon must be eaten fresh. If it be cooked within an hour or two after being taken from the water, a fatty substance termed the "curd," is found between the flakes of flesh. If, however, more than twelve hours have elapsed from the death of the fish, the curd is not to be seen, and the Salmon is much deteriorated in the judgment of epicures.

The size of this fish is extremely variable, some specimens having been caught that weighed sixty pounds, and Mr. Yarrell mentions one case where a female Salmon was captured and was remarkable for weighing eighty-three pounds. This great weight was owing more to the depth and thickness of the fish than the length.

The Salmon is common to all rivers of the Atlantic coast north of Cape Cod. It is found only in the coldest waters, and is equally distributed in Europe and America. It is not plentiful now south of the St. Lawrence River. The numerous dams have been a potent cause of their scarcity.

A large number of species have come to light in late years over the northern portions of the continent.

The mountain streams of the Great West afford abundance of Salmon trout.

Several Pacific Ocean Salmons are known.

The Grayling (*Thymallus*) is an allied form; two species were found in the rivers and lakes of Michigan.

WHITE FISH (*Coregonus clupeiformis*). This is a notable food-fish of the Great Lakes; most highly prized. Numbers of species are also known in the lakes.

The SMELT (*Osmerus mordax*) is a well-known food-fish, highly prized by some. Its range is from Nova Scotia to Hatteras. In the fall, when the frost-fish or tom-cod is appearing, the Smelt come in vast numbers. It is a small fish, yet it is caught by hook.

Angling for it is pleasant sport. Picturesque scenes are often noticed in Boston harbor, when the water is frozen over solid. Holes are cut in the ice, and Smelts taken through them by line and hook. Tents are spread, and the scene becomes exceedingly active and curious. DeKay says this beautiful fish "derives its name from the fact that its smell resembles that of cucumbers."

NEXT to the salmon, the bright-scaled carmine-speckled active Trout is perhaps the greatest favorite of anglers, and fully deserves the eulogies of all lovers of the rod; its peculiarly delicate flesh, its fastidious voracity, and the mixture of strength, agility, and spirited courage with which it endeavors to free itself from the hook, forming a combination of excellences rarely met with in any individual fish.

The Trout is found in rapid and clear-running streams, but cares not for the open and shallow parts of the river, preferring the shelter of some stone or hole in the bank, whence it may watch for prey. Like the pike, it haunts some especial hiding-place, and, in a similar manner, is sure to take possession of a favorable haunt that has been rendered vacant by the demise of its predecessor or its promotion to superior quarters. Various baits are used in fishing for Trout, such as the worm, the minnow, and the fly, both natural and artificial, the latter being certainly the neatest and most artistic method. The arcana of angling are not within the province of this work; and for information on that subject, the reader is referred to the many valuable works which have been written by accomplished masters of the art.

There is a curious method of catching Trout, much in vogue among the juvenile fishers. This process is called "tickling," and is managed as follows: The tickler gets quietly into the stream, and walks slowly along the banks, feeling carefully for any depression or cavity. One hand is then introduced very gently, while the other is placed over the entrance of the hole, the fingers being spread so as to prevent the exit of any fish that may happen to be resident in that locality. Several such cavities may be tried without success, but at last the smooth side of a fish is felt by the finger-tips.

The startled fish gives a great flounce on being touched, and tries to dash out of the hole, but, being checked by the spread hand, retires to the recesses of its cavern. The finger-tips are then gently brought against the abdomen of the fish, which soon endures the contact, and permits the hand gradually to inclose it. As soon as that is the case, the fish is suddenly grasped, snatched out of the hole, and flung ashore before it can find time to struggle from the captor's hold. Some accomplished ticklers aver themselves to be capable of thrusting the fore-finger into the gill and out at the mouth, and hooking out the fish in this singular manner.

The color of the Trout is yellowish-brown above, speckled with dark reddish-brown, and a number of carmine spots are scattered along, each side of the lateral line. The abdomen is silvery-white, and the lower part of the sides rich golden-yellow. There is, however, considerable variation in the color of the Trout, the locality having considerable influence upon the tints.

One or two other species of this genus require still a passing notice.

The BULL, or GRAY TROUT (*Salmo eriox*) is found plentiful.

It often attains a very large size, but a specimen weighing more than fifteen pounds is not very common.

The SALMON TROUT (*Salmo trutta*) is another species, and in general habits is very like the Salmon, migrating to the sea, and returning to the rivers in a similar fashion. It is illustrated with the Salmon on page 280.

The CHARR (*Salmo salvelinus*), the well-known and delicately flavored SMELT (*Osmerus eperlanus*), called also the SPIRLING or SPARLING, the GRAYLING (*Thymallus vulgaris*), the VENDACE (*Coregonus willoughbii*), and the ARGENTINE (*Scopelus humboldtii*), so useful for bait, all belong to the same family as the salmon and the trout. The accompanying illustration represents two of them.

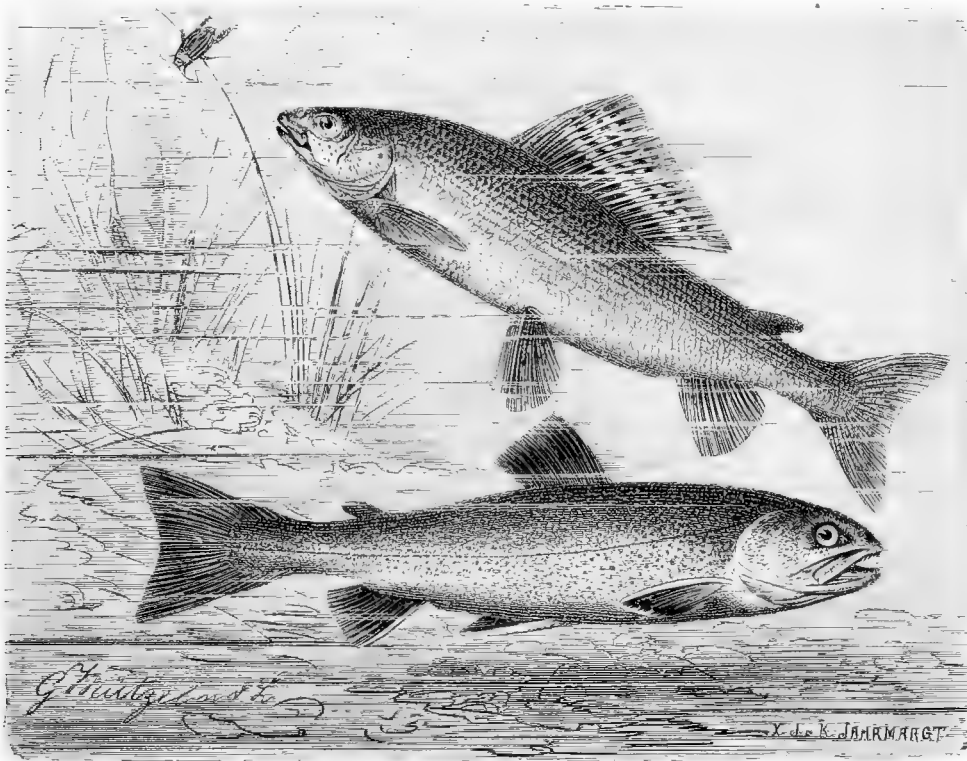
The PIRAYA, or PIRAI, has been removed from the salmonidæ and placed in another family on account of certain structural differences.



TROUT.

This fish is very plentiful in the rivers of Guiana and Brazil, where it swims in large troops, and is, according to many accounts, a very unpleasant neighbor. It is a most voracious being, with teeth nearly as sharply edged as those of the shark, and a boldness little short of that fish's well-known audacity. It is said, according to Spix, that if even so large an animal as an ox happens to get into one of their shoals, it is immediately assailed, and bitten so severely that it may succumb under its injuries before it can cross a stream thirty or forty feet in width. According to some authors, one of the South American tribes are in the habit of placing their dead in the streams, leaving them to the attacks of the Piraya, which in a single night will clear away the whole of the soft parts, and leave a clean skeleton ready for their peculiar mode of sepulture. Even living human beings seem to enjoy no immunity from this hungry fish, but to be liable to severe bites while bathing.

Be these stories literally true, or only exaggerations of reality, the jaws and teeth of the Piraya are perfectly capable of inflicting such injuries as have been briefly described. The



GRAYLING.—*Thymallus vulgaris*. CHARR.—*Salmo salvelinus*.

teeth are nearly flat, triangular, and with edges sharp as those of lancets, and are employed by the Macoushi Indians to sharpen the points of those fearful wourali-poisoned arrows so well known to fame since they were brought by Mr. Waterton from Guiana. A part of the jaw containing five or six teeth is carefully cleansed, a hole is bored through the jaw-bone, and a string is passed through the hole and fastened to the edge of the quiver. The arrows are readily sharpened by placing the points between any two teeth and drawing them rapidly through the edges. There are now before me several of these arrows, kindly given me by Mr. Waterton, and which have been sharpened by this process.

In a neighboring family is placed a very remarkable fish, called the LUMINOUS SCOPELUS (*Scopelus stellatus*).

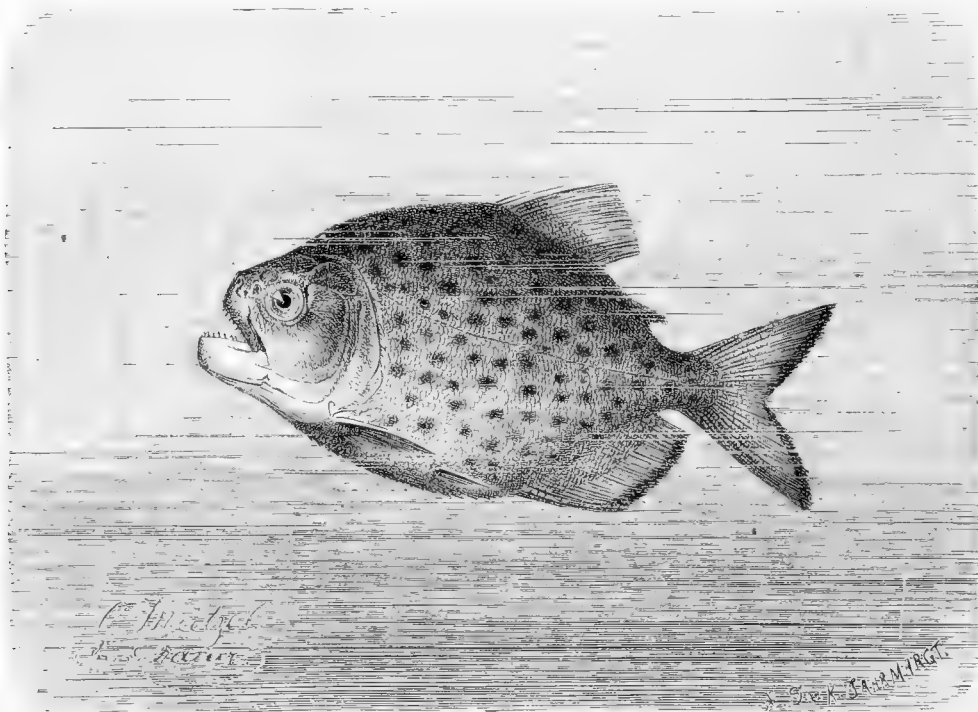
THE fish which is represented in the illustration on page 285, may fairly take rank as one of the oddities of the finny race.

Flat-headed, round-bodied, and strong-scaled, with projecting eyes of most remarkable

formation, the STAR-GAZER has long attracted the attention of naturalists, and given the anatomical investigator much trouble in unravelling the intricate mechanism of its eyes. At a first glance, the fish appears to possess four distinct eyes, each of these organs being divided across the middle, and apparently separated into two distinct portions. In fact, an opaque band runs transversely across the cornea of the eye, and the iris, or colored portion, sends out two processes which meet each other under the transverse band of the cornea, so that the fish appears to possess even a double pupil. Still, on closer investigation, the connection between the divisions of the pupil are apparent, and can readily be seen in the young fish. The lens is shaped something like a jargonelle pear, and is so arranged that its broad extremity is placed under the large segment of the cornea.

The Star-gazer is a native of Surinam, and is one of the viviparous fish. Three species of this genus are now known to naturalists.

THOUGH not so brightly spotted as the trout, nor so desperately active when hooked, and very inferior in flesh, the CARP is yet in much favor with anglers, on account of its extreme



PIRAYA.—*Serrosalmo piraya*.

cunning, which has earned for the fish the name of Fox of the waters. As the number of fish is so great, and our space so small, it will be needful to compress the descriptions as much as possible, and to omit everything that does not bear directly on the subject.

The Carp is found both in rivers and lakes, and in some places, among which the palaces of France may be mentioned, will often grow to an enormous size, and become absurdly tame, crowding to the bank on the least encouragement, and poking their great snouts out of the water in anxious expectation of the desired food. It is most curious to watch these great creatures swimming lazily along, and to see how completely they have lost the inherent dread of man by the exercise of their reasoning powers, which tell them that the once-feared biped on the bank will do them no harm, but, in all probability, will be the means of indulging their appetite with favorite food.

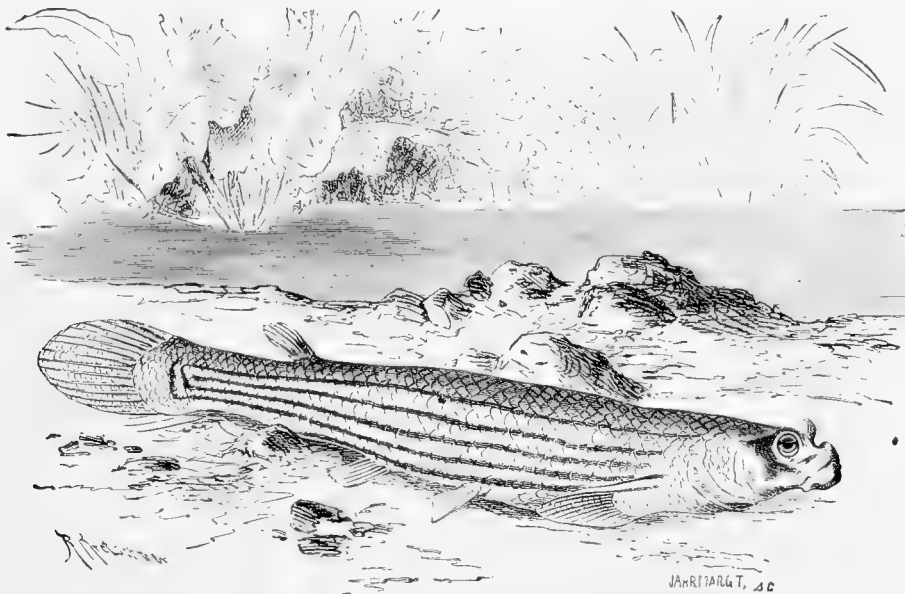
The Carp is one of the fish that retains its life for a lengthened period even when removed from the water; and if carefully packed in wet moss so as to allow a free circulation of air, will survive even for weeks. Anglers never seem sure of the Carp—taking plenty on one day

and none at all for a week afterwards, the fish having been aroused to a sense of their danger, and declining to meddle with anything that looks as if it might hide a hook. Even the net, that is so effectual with most fish, is often useless against the ready wiles of the Carp, which will sometimes bury itself in the mud as the ground line approaches, so as to allow the net to pass over it; or, if the ground be too hard for such a manœuvre, will shoot boldly from the bottom of the water, leap over the upper edge of the net, and so escape into the water beyond.

A fine Carp, say of six or seven pounds, is a truly handsome fish, its large shining scales lying on its body in the most beautiful regularity, and gleaming with olive-brown washed with gold. The abdomen is white, with a tinge of yellow.

The beautiful GOLD-FISH (*Cyprinus auratus*), so familiar as a pet and so elegant as it moves round the glass globe in which it is usually kept, is another member of this large and important genus. It seems to have been brought from China, and has almost acclimatized itself to the cold seasons of some countries. Its habits and splendid coloring are too well known to need description.

Another well-known member of the same genus is the BARBEL, a fine but not brilliant fish, which is common in many of the European rivers.



STAR-GAZER. - *Anableps tetrophthalmus*.

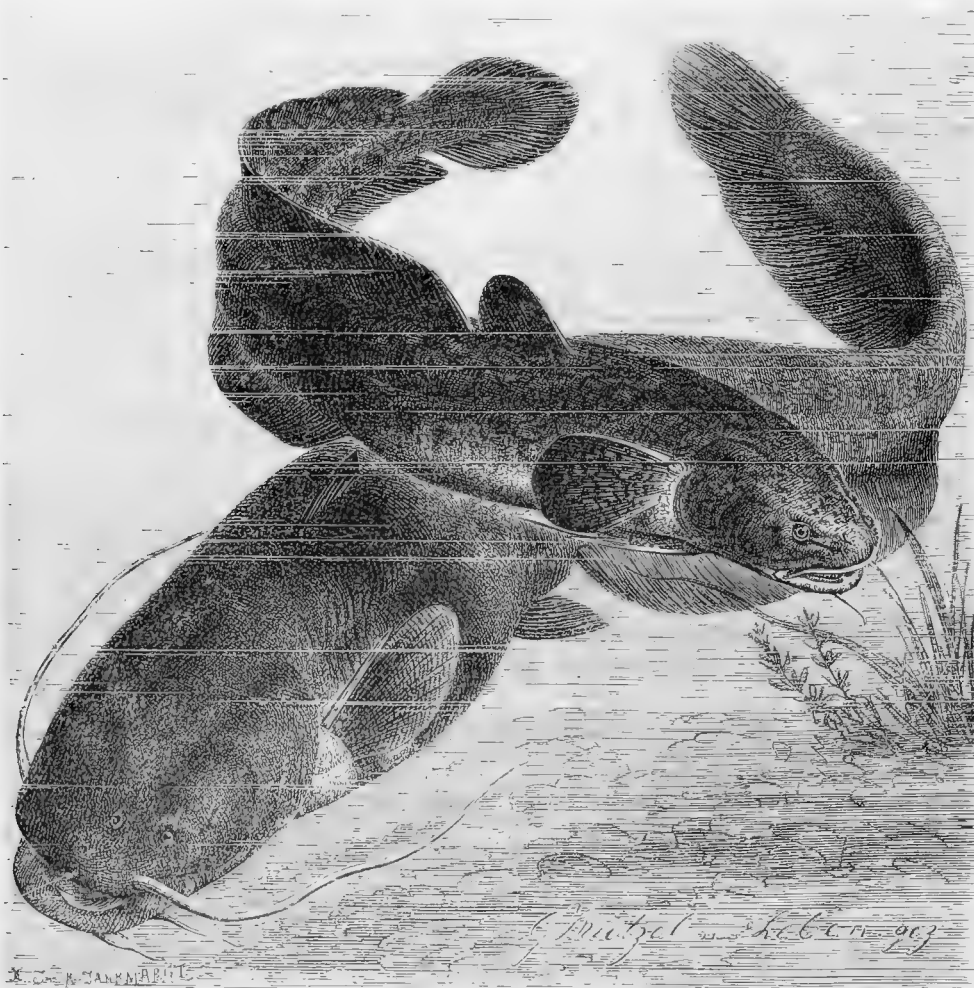
This fish may easily be known, from the four fleshy appendages, called beards or barbules, which hang from the head, two being placed on the nose and the other two at each angle of the mouth. It is one of the mud-loving fish, grubbing with its nose in the soft banks for the purpose of unearthing the aquatic larvæ of various insects which make their home in such places, and being, in all probability, aided by its barbules in its search after food. The Barbel is sometimes so deeply occupied in rooting about the bank, that an accomplished swimmer may dive to the bed of the river, feel for the Barbel along the banks, and bring it to the surface in his bare hand.

THE TENCH prefers the slowest and muddiest rivers, and thriving well in ponds and lakes, or even clay pits. No water, indeed, seems to be too thick, muddy, or even fetid, for the Tench to inhabit, and it is rather curious that in such cases, even where the fishermen could scarcely endure the stench of the mud adhering to their nets, the fish were larger sized and of remarkably sweet flavor.

In the winter months the Tench is said to bury itself in the mud, and there to remain, in a semi-torpid condition, until the succeeding spring calls it again to life and action. The color of the Tench is greenish-olive, darker above than below, and with a fine golden wash.

THE BREAM is mostly found in rather large lakes or in slowly running rivers. Although the flesh of the Bream is not held in any great estimation, being poorly flavored and very full of bones, so that, in spite of the great depth of its body, there is scarcely sufficient flesh to repay the trouble of cooking, still, the fish was formerly in much repute as a delicacy; so that either the fish seems to have deteriorated, or the present generation to have become more fastidious. Spring and autumn furnish the best Bream, and the flesh can be dried something like that of the cod-fish.

The color of the Bream is yellowish-white, except the cheeks and gill-covers, which have a silvery lustre without any tinge of yellow. Sometimes the Bream attains a considerable size, reaching a weight of twelve or fourteen pounds.



LING.—*Lota culgaris*. SLY SILURUS.—*Silurus glanis*. (One-quarter natural size.)

THE ROACH is a fish especially dear to scientific anglers, on account of its capricious habits, and the delicate skill required to form a successful Roach-fisher.

An angler accomplished in this art will catch Roach where no one without special experience would have a chance of a bite, and will succeed in his beloved sport through almost every season of the year, the winter months being the favorites. So capricious are these fish, and so sensitive to the least change of weather, that a single hour will suffice to put them off their feed, and the angler may be suddenly checked in the midst of his sport by an adverse breeze or change in the temperature.

The Roach is a gregarious fish, swimming in shoals, and keeping tolerably close to each other. It is not a large species, all over a pound being considered as fine specimens, and any that weigh more than two pounds are thought rare. It is a pretty fish, the upper parts of the

head and body being grayish-green glossed with blue, the abdomen silvery-white, and the sides passing gradually into white from the darker colors of the back. The pectoral, ventral, and anal fins are bright red, the former having a tinge of yellow, and the dorsal and tail fins are brownish-red.

CLOSELY allied to the roach is the DACE (*Leuciscus vulgaris*), a common and small species that inhabits most English streams. The well-known CHUB (*Leuciscus céphalus*) also belongs to this genus, as does the BLEAK (*Leuciscus alburnus*), in many countries called the TAILOR BLAY by the ignorant, from the idea that whenever any other fish, especially the pike, wounds its skin, it immediately seeks the aid of the Bleak, which, by rubbing its body against the wound, causes the torn skin to close. The beautifully white crystalline deposit beneath the scales was much used in the manufacture of artificial pearls, hollow glass beads being washed in the interior with a thin layer of this substance, and then filled with white wax. The scales of the white-bait were also used for the same purpose. The MINNOW (*Leuciscus phoxinus*) is another member of this large genus, and is too well known to need description.

WE now come to another family, selecting as an example a tolerably well-known species.

The SLY SILURUS, sometimes called the SHEAT-FISH, is found in many rivers in different parts of the world.

As may be seen by the engraving, it is a curious-looking fish, and is easily recognizable by the six tentacular appendages of its mouth, the two that are situated on the upper lip being of very great length. The precise object of these tentacles is not quite clear, though some persons believe them to be used as decoys, like the fin rays of the fishing frog, and to be employed in enticing unwary fish within reach of the mouth. Dr. Günther has kindly informed me, that he has often seen these fishes at liberty in their native streams, and that they are capable of directing the points of the tentacles towards any object that they seem anxious to examine. It is, therefore, probable, that these curious appendages are employed as organs of touch. It is one of the mud-loving fishes, and has a custom of hiding itself in holes, or nearly burying itself in the soft alluvium of the river's bed.

The flesh of the Silurus is not held in very high estimation, although its flavor is good; for it is so fat and gelatinous, that it is difficult of digestion, and not to be eaten by persons of small assimilative powers. A kind of coarse isinglass, or very fine glue, is made from the swimming-bladder of this fish. The eggs of the Silurus are not very numerous, in proportion to the size of the adult fish, and are of a greenish color. They are much eaten by the various fish.

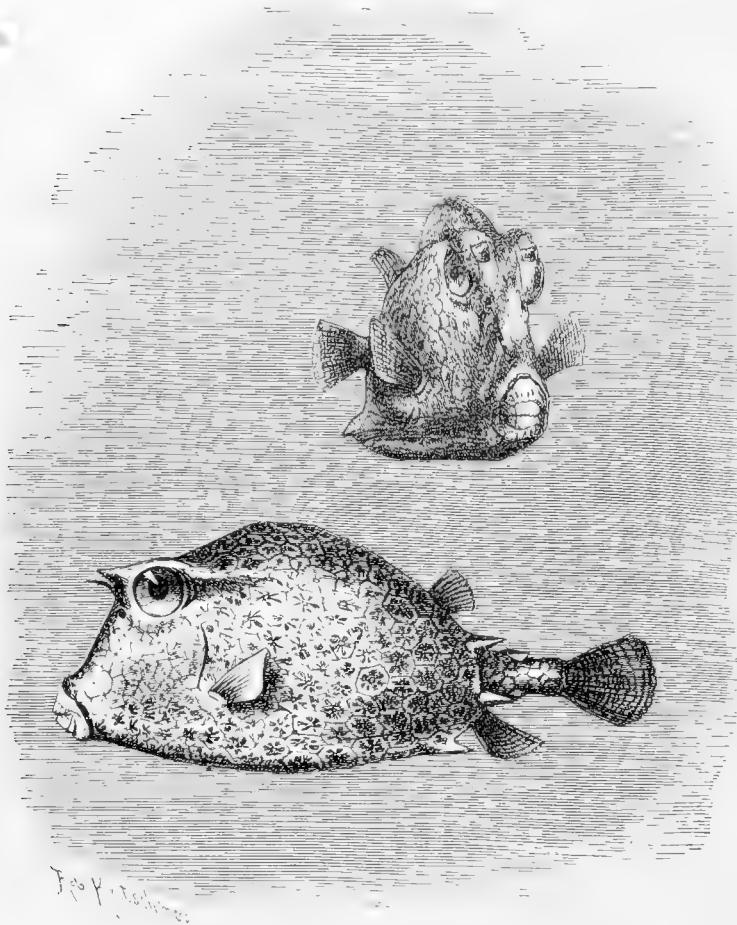
The color is dark green above the lateral line, and of a paler tint below it, and a number of spots are scattered over the body without any apparent arrangement. The abdomen is of a yellowish color, and the fins are tinted with blue and yellow. The Silurus sometimes reaches a considerable size, specimens of seven feet in length and weighing from seventy to eighty pounds having been captured.

PLECTOGNATHI.

A VERY curious order of fishes now comes before our notice. These creatures are called Plectognathi, because their jaws are coalescent.

THE remarkable family of the Trunk-fishes, or Sclerodermi, are known by the curious structure of the external surface, which is composed of a series of hard scales forming a continuous bony armor.

In the genus *Ostracion*, of which the HORNED TRUNK-FISH, or COFFER-FISH, is a good example, the body is either three or four-sided, and covered with a solid coat of mail formed of six-sided plates or scales, and pierced with holes, through which protrude the mouth, the tail, and the fins. The whole of the interior structure is modified in accordance with this external and inflexible cuirass; and on comparing the general form of this creature with that of certain reptiles, the analogy between the Coffe-fish and the tortoise is too close to escape observation. None of these fishes are in request as articles of food, their flesh being small in quantity, and in some species even thought to have a poisonous effect; but the liver is very large, and yields a tolerable supply of oil. All the Coffe-fishes are natives of the tropical seas, and but few species are known.



HORNED TRUNK-FISH.—*Ostracion cornutus*. (One-quarter natural size.)

WE come now to a very odd-looking fish, called perforce, for want of a popular title, the OREOSOMA, a name framed from two Greek words, and literally signifying hilly-bodied.

This remarkable little fish was captured in the Atlantic by Peron, and has ever been esteemed as one of the curiosities of the animal kingdom. Upon the body there are no true scales; but their place is supplied by a number of bony or horny protuberances, of a conical shape, and serving no ascertained purpose. These cones may be divided into two distinct sets, the larger set being arranged in two ranks, four on the back and ten on the abdomen, and among them are placed the smaller set. The body of this fish is very deep, in pro-

portion to its length; and the operculum has two ridges, terminating in flattened angles. There are two dorsal fins, the first armed with five spines.

The Trunk-fishes are common objects in the tropical waters of Florida. The Cow-fish is a familiar one. Trigger-fishes, allied forms, are also abundant.

THE very curious TRIGGER-FISH is an example of the moderately large genus *Balistes*, inhabiting the warmer seas of many parts of the world, and which, on account of their rough and fierce exterior, are sometimes called FILE-FISHES, or LEATHER-JACKETS.

The name of Trigger-fish is derived from the peculiar structure of the dorsal fin. When the fin is erected, the first ray, which is very thick and strong, holds its elevated position so firmly, that it cannot be pressed down by any degree of force; but if the second ray be depressed, the first immediately falls down like the hammer of a gun-lock when the trigger is pulled. The mechanical structure of these curious rays is extremely interesting, but the description would occupy too much space to be inserted in this work.

A strong feeling against the flesh of this fish exists among sea-faring men, but, like many

other nautical prejudices, is quite without foundation, the flesh being sweet and nutritious, though rather coarse. On the abdomen there is a bony keel, and on each side of the tail there are several rows of horny spines. This species is found in Japanese waters. In color it is one of the most striking of its genus, being tolerably large, and black in color, diversified by some large, pale yellow or white spots upon the sides of the abdomen. Two other species are also given in order to exhibit the curious variety of form and coloring found in these remarkable fish. The BRISTLY TRIGGER-FISH is notable from the quantity of bristle-like appendages to the tail, while the general appearance of the UNARMED TRIGGER-FISH appears to be smooth all over its body. The name of *Balistes* is derived from the ancient weapon of war, termed the *Balista*, which projected a spear or heavy stone with exceeding violence. The curious spine with which the back is armed can be suddenly erected and depressed, as if shot with a spring, and has been compared to the weapon above mentioned. It has been thought, that the flesh of these fishes is poisonous, but the truth of this opinion is very dubious. They are all decorated with bold and sometimes beautiful markings, black, ashen-gray, blue, and yellow being their usual colors.

All the fishes of this genus (which has been divided by some authors into several other genera) are inhabitants of the tropical seas, where they haunt the rocky coasts, and make the ocean radiant with their vivid tintings. To all appearance, they are vegetable feeders, as nothing but crushed sea-weed has been found in their stomachs.

In the members of the family *Gymnodontes*, or Naked-toothed fishes, the jaws project from the mouth, and are covered with a kind of ivory or bony substances, composed of very little teeth fused together.

Tile fishes (*Aleutera*) are equally so. Then there are the Puffers (*Tetraodon*), Blowers, and Swell-toad, so called, quite curious to behold as they paddle in the sea, like heavy hulks that have little propelling power. Allied here is the curious Porcupine-fish (*Diodon*), a veritable hystrix in appearance, sometimes reaching three feet in length.

The URCHIN-FISH, or SEA HEDGEHOG, is a good example of the genus *Diodon*, or Two-toothed fishes; so called because their jaws are not divided, and only exhibit one piece of bony substance above and another below, looking as if the creature only possessed two large teeth.

This curious fish is remarkable for the tremendous array of spiny points which it bears on its skin, and for the power of inflating its body into a globular form, and thus causing the spines to project in every direction, like the quills of an irritated porcupine or a hedgehog that has coiled itself into a ball. From this custom of inflating its prickly body it is sometimes termed the Prickly Globe-fish.

When full-grown, a fine specimen of this fish will measure more than twelve inches in diameter.

The HAIRY URCHIN-FISH is easily recognized by the bristle-like fineness of the spines.

Closely allied to the diodons are the Tetrodons, or Four-toothed fishes, so called because both jaws are divided in the middle, giving them the appearance of possessing four teeth, two above and two below. The spines of these fishes are comparatively small. The Tetrodons are popularly known by the title of BALLOON-FISH, as, like the diodons, they have the power of distending themselves with air, and causing all the spines to erect themselves. When inflated, they necessarily turn on their backs. The STRIPED SPINE-BELLY is a good example of this genus.

BESIDES the tetrodons, this group includes another genus called Triodons, or Three-toothed fishes, the upper jaw being divided into two parts, and the lower remaining entire. The spines are short, and a moderately large sac is seen beneath the body. The POUCHED TRIODON (*Triodon bursarius*) may be selected to represent the genus.

OUR last example of this curious order is the well-known SUN-FISH, which looks just as if the head and shoulders of some very large fish had been abruptly cut off, and a fin supplied to the severed extremity

This odd looking fish can easily be captured. The creature is generally swimming, or rather floating, in so lazy a fashion, that it permits itself to be taken without attempting to escape. In the seas where this fish is generally found, the harpoon is usually employed for its capture, not so much on account of its strength, though a large specimen will sometimes struggle with amazing force and fury, but on account of its great weight, which renders its conveyance into a boat a matter of some little difficulty.

The Mola, or Sun-fish (*Mola rotunda*), Head-fish, so called, as it seems all head. Mola is Latin for mill-stone, and the fish is not unlike a mill-stone in appearance. This is a pelagic, oceanic fish, often seen during summer off our shores. DeKay calls it Short Head-fish. It was known to naturalists of Europe. Its weight reaches five hundred pounds. Its side view presents what would be called a tolerable outline for the head and part of shoulders of a large shark, the posterior part appearing to have been cut perpendicularly through. A thin, narrow fin borders this part, representing a tail, but seemingly of no possible use on such a great, unwieldy creature. Its two great dorsal and ventral fins probably serve it; but curiously, this fish is, as far as we know, never seen swimming upright. It is usually seen lying on its side on the surface of the ocean. When closely approached, it awkwardly sinks out of sight. Rev. Mr. Wood states that the flesh is in good repute among sailors. It certainly is not on this side the Atlantic, as it is like gristle. Boys use it for balls, and it proves to be quite elastic. A large example, captured in Florida and exhibited in New York Aquarium, measured five feet in length.

CREST-GILLED FISHES; LOPHOBRANCHII.

IN the strange-looking fishes, Pegasus and Sea-Dragon, we have further instances of the inexhaustible variations of form and structure with which this world teems, and which seem to be more plentiful, more bizarre, and more incomprehensible in the ocean than on the earth, in the air, or even in the rivers and other fresh waters of the globe.

The order to which these creatures belong is known under the name of Lophobranchii, or Crest-gilled fishes; so called on account of the form of the gills, which are composed of little round tufts, and nearly hidden by the gill-cover. There is but little flesh upon the bodies of these remarkable fishes, which are protected by a hard, bony armor, which, when examined, is found to be most beautifully constructed, so as to protect the animal and to allow of annual increase of dimensions.

IN the family to which belongs the SEA-DRAGON, the breast is developed in a wonderful manner, being always broader than deep, and in some cases the breadth very much exceeding the depth. The mouth is set under the projecting snout in a manner like that of the sturgeon, and the pectoral fins are extremely large and strong, reminding the observer of the same members in the flying gurnards. This seems to be a rather variable species both in form and color.

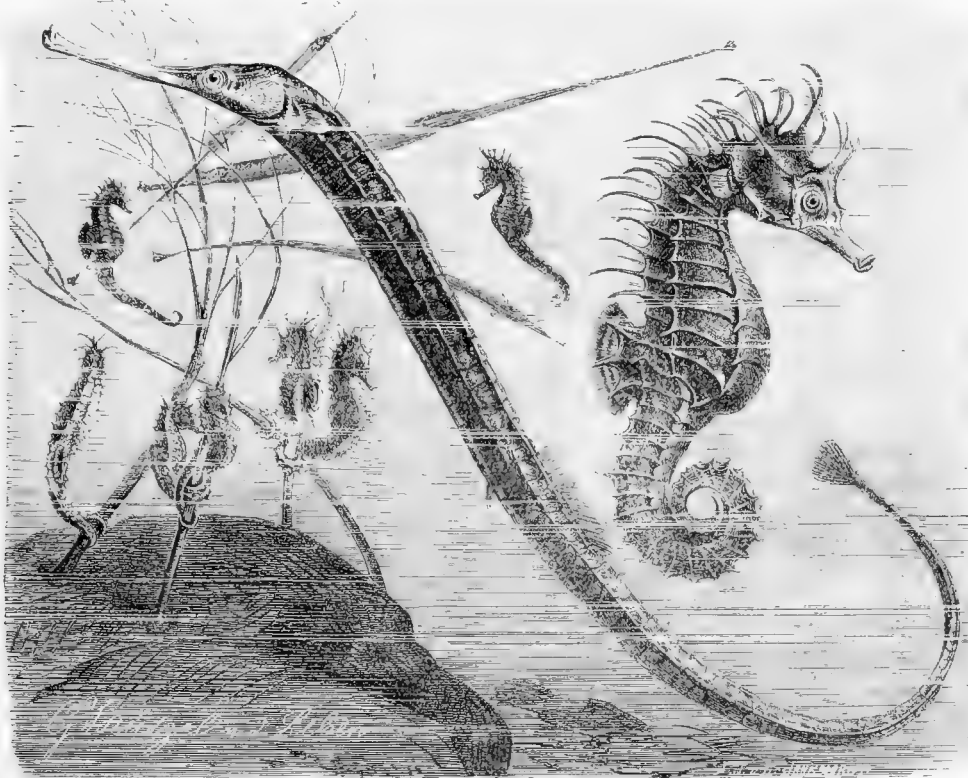
THE PEGASUS does not possess pectoral fins of such great size as the preceding species, but is yet a very remarkable fish. It is rather long-bodied, and the tail is composed of twelve rings. The much elongated snout is flat and thin, and is furnished on its upper edge with short spines directed backwards. Its color is yellowish-brown. The Pegasus is a Javanese creature.

THE family of the Syngnathidæ is represented by several species, two of which are seen in the accompanying illustration.

THE SEA-HORSE is common in many European seas. In all these fishes there is only one

dorsal fin, set far back, and capable of being moved in a marvellous fashion, that reminds the observer of a screw-propeller, and evidently answers a similar purpose. The tail of the Sea-Horse, stiff as it appears to be in dried specimens, is, during the life of the creature, almost as flexible as an elephant's proboscis, and is employed as a prehensile organ, whereby its owner may be attached to any fixed object. The specimens represented in the engraving are shown in the attitude which the creatures are fond of assuming. The head of the Sea-Horse is wonderfully like that of the quadruped from which it takes its name, and the resemblance is increased by two apparent ears that project pertly from the sides of the neck. These organs, are, however, fins, and when the fish is in an active mood, are moved with considerable rapidity. It is rather a remarkable fact, that the Sea-Horse, like the chameleon, possesses the power of moving either eye at will, quite independently of the other, and therefore must be gifted with some curious modification in the sense of sight, which enables it to direct its gaze to different objects without confusing its vision.

The color of this interesting little fish is light ashen-brown, relieved with slight dashes of blue on different parts of the body, and in certain lights gleaming with beautiful iridescent



GREAT PIPE OR BILL-FISH.—*Syngnathus acus*. SEA-HORSE.—*Hippocampus antiquorum*. (One-half natural size.)

hues that play over its body with a changeful lustre. About twenty species of Sea-Horses are known.

In the seas of the Southern Hemisphere, especially in the New Holland waters, there is found sometimes, as a companion of the Sea-Horse, sometimes alone, the HORSE-LIKE PHYLLOPTERYX, a fish which, for its extraordinarily odd aspect, we consider worthy of illustration. This fish, in which are united all the exclusive peculiarities of the family Syngnathidæ, forms a separate genus. As may be seen by reference to the engraving, it is distinguished by many spines, elongated thorns, and tape-like appendages, which float down from all parts of the body. The spines are strong and sharp, the elongated thorns being stiff, while the tape-like streamers are flexible. These three different kinds of appendages take seemingly the function of fins, which, with the exception of the large dorsal fin, and of the small and not clearly visible pectoral fin, are crippled. Its streaming filaments resemble

plants, forming a protection to the fish as it floats among algæ; its general appearance like some floating object covered by leaves of seaweeds. Few examples of protective resemblance are so very apparent, for here the beauty of form so often noticed in fins of fishes, is sacrificed to the more practical and useful imitation of straggling weeds. The male of this sea-horse receives its eggs in a pouch on its ventral surface. When they hatch they press the pouch against some hard substance, which forces them out. The Pipe-fish—of this group—also mimics to a certain extent weeds or floating sticks. The male receives the eggs from the

female, and carries them in a pouch. In one species found in the Indian Ocean, the female carries its young in a pouch formed by the two ventral fins held together by filaments which extend from its sides. The figure given in the illustration is of natural size.



HORSE-LIKE PHYLLOPTERYX.—*Phyllopteryx eques*.

IN the illustration on page 291, is also shown the GREAT PIPE-FISH, which is often called the BILL-FISH and NEEDLE-FISH. It is one of the commonest species of its genus.

This creature is found along the English shores, and can mostly be captured at low water among the sea-

weed that has been left in the rock pools. To watch these remarkable fishes is an interesting occupation, for they assume such odd attitudes and perform such curious movements, that they never fail to arrest the attention, and never tire the observer. Sometimes they may be seen swimming about with tolerable speed like other fishes, their curious dorsal fins working like an Archimedean screw, and their long snouts being poked into every crevice. Sometimes, assuming a perpendicular attitude, they put their noses to the ground, and hold their tails aloft, while with their beak-like snouts they stir the sand, or, by ejecting water from their mouths, blow little hollows in it, probably for the purpose of disturbing the minute crustaceans and other marine creatures that find refuge in such localities.

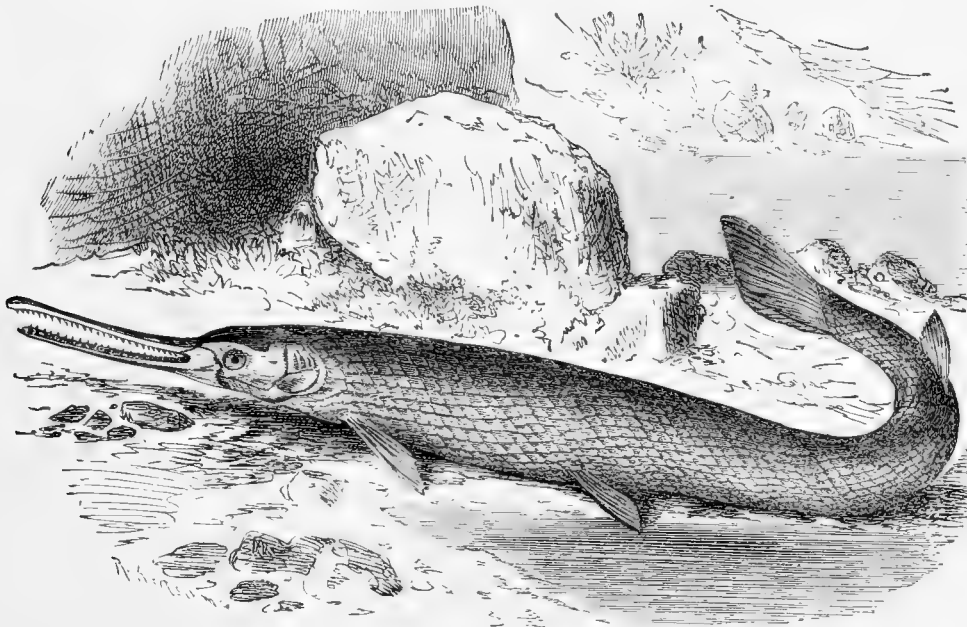
The color of the Great Pipe-fish is pale brown, diversified with transverse bars of a dark tint. The average length of a fine specimen is about eighteen inches, but it is said that the fish sometimes attains a length of two or even three feet.

Several species of this genus inhabit European waters, a rather curious example being the SNAKE PIPE-FISH (*Syngnathus anguineus*). This little fish is remarkably slender, and altogether snake-like in form, its length being about fourteen inches, and its thickness scarcely exceeding that of a common goose-quill. The dorsal fin is set very far forward. The tail fin is very tiny, and might easily escape observation altogether.

THE rather quaint-looking species which is represented in the accompanying illustration, is a good example of a remarkable order of fishes, where the body is covered with hard bony scales that do not overlap each other, but are arranged side by side, like the tiles of a pavement, or the cubes of mosaic work. This bony armor is very hard and smooth externally, being covered with a thin layer of a kind of enamel.

Although popularly called **BONY PIKE**, from the mailed exterior and the lengthened wide-jawed form, which has some resemblance to that of a pike, this fish belongs to a totally different order, and in most points of its construction is formed after a different fashion. The general structure, indeed, of the Bony Pike is very remarkable, and affords another instance of the difficulty with which the fish are classed. The body is elongated, and the jaws are also lengthened and well furnished with teeth, looking very like an exaggerated pike's mouth, or the head of the common gavial of the Ganges. In each jaw there is a single row of sharp and conical teeth, and between them, and on the palate, are numerous other teeth, much smaller in size.

The scales of the Bony Pike are rhombic in form, very like the flat porcelain tiles with which certain ancient chimney-pieces were wont to be decorated, and hardly inferior to those tiles in the polished hardness of their exterior. They are very regularly arranged, being set so as to form a series of oblique rows, extending from the back to the abdomen. As in the sturgeons and sharks, the vertebral column runs along the upper edge of the tail fin. This fish is found in the lakes of America, and sometimes attains a considerable size, being



BONY PIKE.—*Lepidosteus osseus*.

often captured measuring three or four feet in length, and is said sometimes to attain a length of seven feet. Several species are said to inhabit the same waters; but when the remarkable diversity of form and color which often reigns among the fishes is considered, it is highly probable that the supposed species may be nothing more than well-marked varieties. The flesh of the Bony Pike is said to be good.

Bony Pike, Gar Pikes (*Lepidosteus*). Two species of this genus are common in the Great Lakes and rivers of America. Their alliance with forms now extinct renders the species of great interest. Very few are now existing.

THE well-known LAMPREY and its kin are remarkable for the wonderful resemblance which their mouths bear to that of a leech.

They are all long-bodied snake-like fish, and possess a singular apparatus of adhesion, which acts on the same principle as the disc of the sucking-fish, or the ventral fins of the goby, though it is set on a different part of the body. If all had their rights, indeed, the title of sucking-fish ought more correctly to be applied to the Lamprey than to the creature which is at present dignified by that appellation; as the one really applies its mouth to any object to which it desires to adhere, and forms a vacuum by suction, whereas the

THE lesser figure on page 294 represents the LAMPERN, called in some counties of England the LAMPREEN, with that curious faculty of transposition which induces the rustic to speak of thirsting instead of thrusting, and to call birds' nests, birds' neesuns.

The Lampern is plentiful in many rivers, and if the generality of residents near the water were only aware of its excellence for the table, would soon be thinned in numbers. The prejudice that exists against the eel and the lamprey is absolutely mild when compared with the horror with which the Lampern is contemplated. Not only do the ignorant people refuse to eat it, but they believe it to be actually poisonous, and would sooner handle an angry viper than a poor harmless Lampern.

The flesh of the Lampern is remarkably good, and is indeed admired by many who have not the least idea of the fish they are eating.

A beautiful adaptation of structure to circumstances is seen in the POUCHED LAMPREY, an inhabitant of the fresh waters of Southern Australia.

This remarkable fish possesses many points of interest, among which the enormous throat-pouch is the most conspicuous. In the common sea-Lamprey of Europe, the throat is dilatible below, but in the present species the skin is distended so greatly as to form a large pouch, such as is represented in the engraving. Taking into consideration the frequent droughts that take place in the country where this creature lives, it is almost certain that the pouch is intended to hold a supply of water, which will enable respiration to be carried on during the days of drought.

The mouth of this species is very large and filled with formidable teeth, the whole interior of the disc being studded with them, and the tongue armed with two long and sharp fangs that seem calculated to do good service to their owner.

A very remarkable species of lampren, termed the SAND PRIDE, or MUD LAMPREY (*Ammocætes branchialis*), is found in many rivers, and has sometimes been mistaken for the young of the sea-lamprey. It is represented in the lowest figure of the picture on page 294.

It may, however, be distinguished by the form of the mouth, which is of a horse-shoe shape, and incapable of adhesion like that of the fishes belonging to the preceding genus. The Sand Pride, although tolerably common, is not very often seen, owing to its habit of burying itself in the muddy or sandy beds of rivers. Its color is yellowish-brown, the latter tint preponderating on the back and the former beneath. It is a very small species, seldom exceeding six or seven inches in length.

THE MYXINE, or GLUTINOUS HAG-FISH is so remarkably worm-like in its form and general appearance that it was classed with the annelids by several authors, and was only placed in its proper position among the fishes after careful dissection.

The Myxine is seldom taken when at large in the sea, but is captured while engaged in devouring the bodies of other fish, to which it is a fearful enemy in spite of its innocuous appearance. It has a custom of getting inside the cod and similar fishes, and entirely consuming the interior, leaving only the skin and the skeleton remaining. The fishermen have good reason to detest the Myxine, for it takes advantage of the helpless state in which the cod-fish hangs on the hook, makes its way into the interior, and if the fish should happen to be caught at the beginning of a tide, will leave but little flesh on the bones. The cod thus hollowed are technically called "robbed" fish. Six Myxines have been found within the body of a single haddock.

The name of Glutinous Hag-fish is derived from the enormous amount of mucous secretion which the Myxine has the power of pouring, from a double row of apertures, set along the whole of the under surface, from the head to the tail. It is said that the fish is accustomed to envelop itself in a cloud of glutinous matter whenever it is alarmed, and under cover of this substance to escape the view of its enemies; thus presenting a curious parallel to the well-known habit of the sepia and the aplysia, or sea-hare, which, when startled, stain the water with their protective secretion and shoot off under shelter of the sudden darkness.

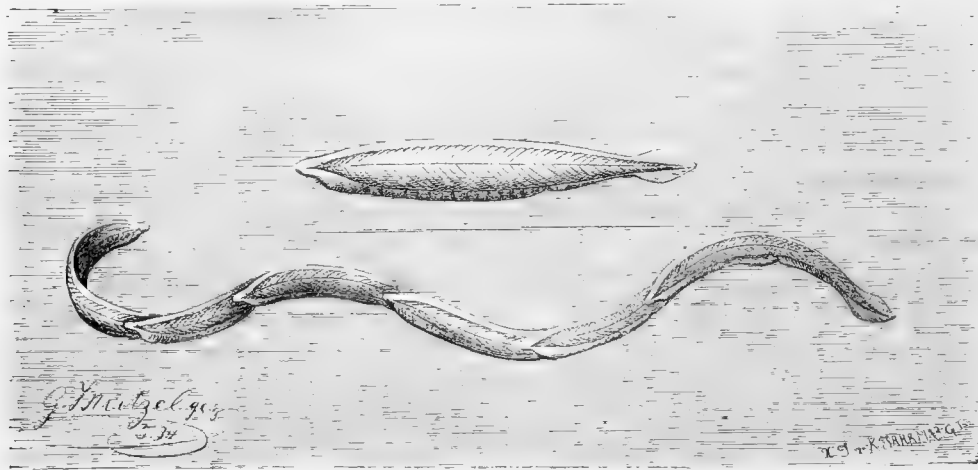
Around the lips of the Myxine are eight delicate barbules, which are evidently intended as organs of touch; the mouth is furnished with a single hooked tooth upon the palate serving

apparently as an organ of prehension, and the tongue is supplied with a double row of smaller but powerful teeth on each side, acting on the principle of a rasp. The Myxine can scarcely be said to possess any bones, the only indication of a skeleton being the vertebral column, which is nothing more than a cartilaginous tube, through which a probe can be passed in either direction. The structure of the breathing-organs is very remarkable. A double row of branchial cells take the place of gills or lungs, and are supplied with water through a spiracle in the upper part of the head, and two little apertures on the under surface.

The color of the Hag-fish is dark brown above, taking a paler tint on the sides, and grayish-yellow below. Its length is generally about a foot or fifteen inches.

THE last of the fishes is a creature so unfish-like that its real position in the scale of nature was long undecided, and the strange little being has been banded about between the vertebrate and invertebrate classes. Between these two great armies the LANCELET evidently occupies the neutral ground, its structure partaking with such apparent equality of the characteristics of each class, that it could not be finally referred to its proper rank until it had been submitted to the most careful dissections. In fact, it holds just such a position between the vertebrates and invertebrates as does the lepidosiren between the reptiles and the fishes.

It has no definite brain, at all events it is scarcely better defined than in many of the insect tribe, and is only marked by a rather increased and blunted end of the spinal cord. It has no true heart, the place of that organ being taken by pulsating vessels, and the blood being



LANCELET.—*Amphioxus lanceolatus*.

quite pale. It has no bones, the muscles being merely attached to soft cartilage, and even the spinal cord is not protected by a bony or even horny covering. The body is very transparent, and is covered by a soft delicate skin without any scales. There are no eyes, and no apparent ears, and the mouth is a mere longitudinal fissure under that part of the body which we are compelled, for want of a better term, to call the head, and its orifice is crossed by numerous cirrhi, averaging from twelve to fifteen on each side. Altogether, it really seems to be a less perfect and less developed animal than many of the higher mollusks.

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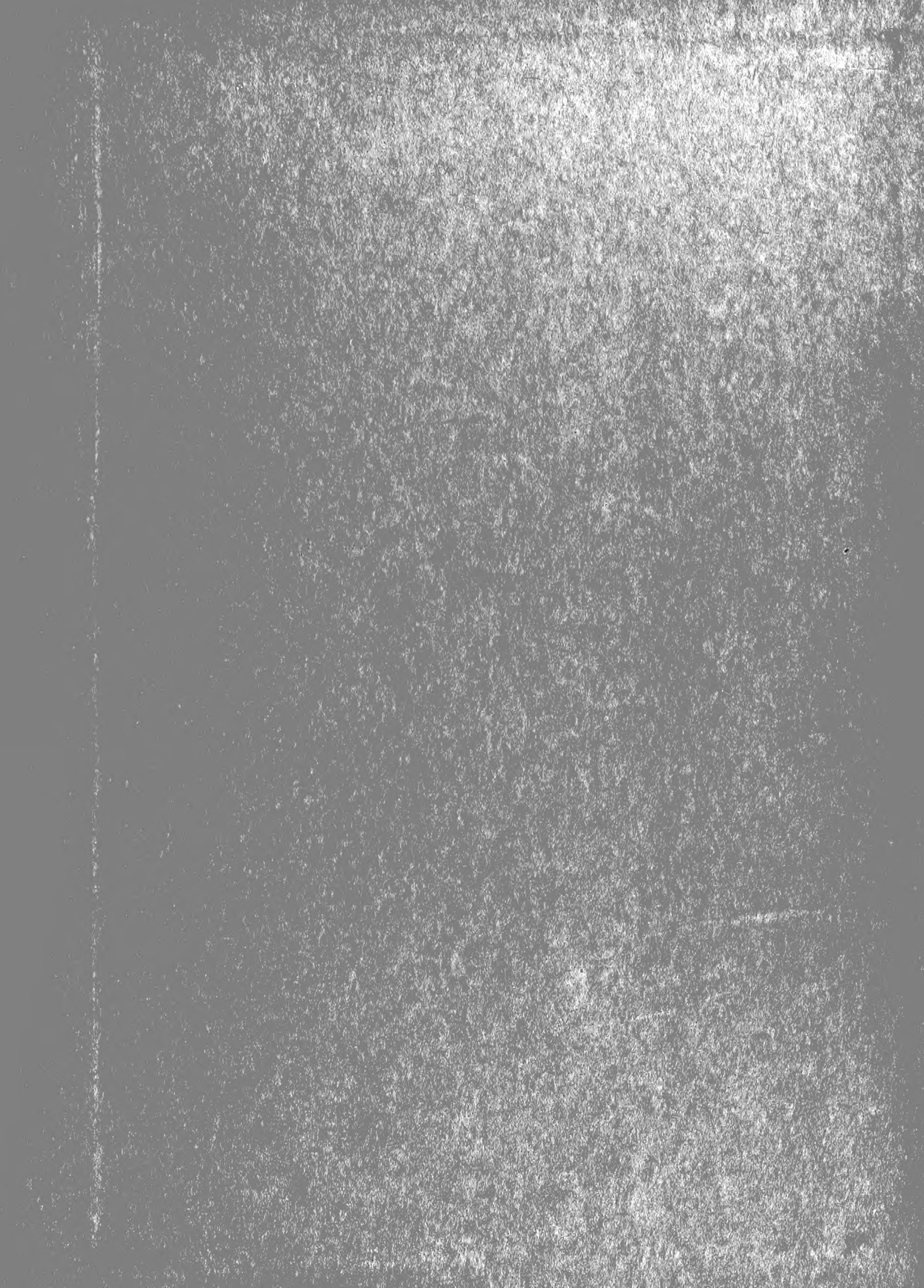
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