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THE BROOK AND ITS BANKS.

By THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

"Whyles owre a linn the burnie plays,
As through the glen it dimpl't;
Whyles round a rocky scaur it strays;
Whyles in a weil it dimpl't;
Whyles glittered to the nightly rays,
Wi' bickering, dancing dazzle;
Whyles cookit underneath the braes
Below the spreading hazel."
Burns: "Halloween."

CHAPTER I.

The many aspects of a brook—The eye sees only that which it is capable of seeing—Individuality of brooks and their banks—The rippling "burnie" of the hills—The gently-flowing brooks of low-lying districts—Individualities even of such brooks—The fresh-water brooks of Oxford and the tidal brooks of the Kentish marshes—The swarming life in which they abound—An afternoon's walk—Ditches versus hedges and walls—A brook in Cannock Chase—Its sudden changes of aspect—The brooks of the Wiltshire Downs and of Derbyshire.

A BROOK has many points of view.

In the first place, scarcely any two spectators see it in the same light.

To the rustic it is seldom more than a convenient water-tank, or, at most, as affording some sport to boys in fishing. To its picturesque beauties his eyes are blind, and to him the brook is, like Peter Bell's primrose, a brook and nothing more.

Then there are some who only view a brook as affording variety to the pursuit of the fox, and who pride themselves on their knowledge of the spots at which it can be most successfully leaped.

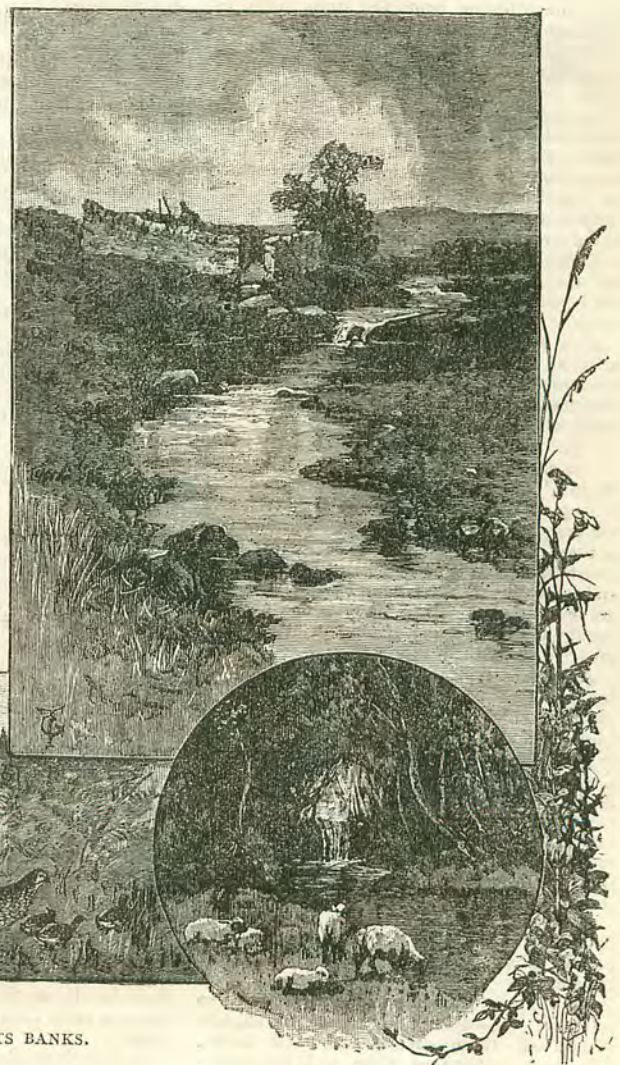
Others, again, who are of a geographical turn of mind, can only see in a brook a necessary portion of the water-shed of the district.

To children it is for a time dear as a playground, possessing the inestimable advantage of enabling them to fall into it and wet their clothes from head to foot.

Then there are some who are keenly alive to its changing beauties, and are gifted with artistic spirit and power of appreciation, even if they should not have been able to cultivate the technical skill which would enable them to transfer to paper or canvas the scene which pleased them. Yet they can only see the surface, and take little, if any, heed of the wealth of animated life with which the brook and its banks are peopled, or of the sounds with which the air is filled.

Happy are those in whom are fortunately combined the appreciation of art and the gift (for it is a gift as much as an eye for art or an ear for music) of observing animal life. To them the

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THE BROOK AND ITS BANKS.

brook is all that it is to others, and much besides. To them the tiniest brook is a perpetual joy, and of such a nature I hope are those who read these pages.

Not only does a brook assume different aspects, according to the individuality of the spectator, but every brook has its individuality, and so have its banks.

Often the brook "plays many parts," as in Burns' delightful stanza, which seems to have rippled from the poet's brain as spontaneously as its subject.

Sometimes, however, as near Oxford, it flows silently onwards with scarcely a dimple on its unruffled surface. Over its still waters the gnats rise and fall in their ceaseless dance. The swift-winged dragon-flies, blue, green, and red, swoop upon them like so many falcons on their prey; or, in the earlier year, the mayflies flutter above the stream, leaving their shed skins, like ghostly images of themselves, sticking on every tree trunk near the brook.

On the surface of the brook are seen the shadow-like water-gnats, drifting with apparent aimlessness over the surface, but having in view a definite and deadly purpose, as many a half-drowned insect will find to its cost.

Under the shade of the willows that overhang its banks the whirligig beetles will gather, sociably circling round and round in their mazy dance, bumping against each other in their swift course, but glancing off unhurt from the collision, protected from injury by the stout coats of mail which they wear.

They really look like unskilful dancers practising their "figures" for the first time. They, however, are not engaged in mere amusement, but, like the water-gnats, are absorbed in the business of life. The naturalist knows, when he sees these creatures, that they do not form the hundredth part of those which are hidden from human eyes below the surface of the little brook, and that the whole of the stream is as instinct with life, as if it had been haunted by the Nipens, the Undines, and the host of fairy beings with whom the old legends peopled every river and its tributaries.

They are just as wonderful, though clad in material forms, as any water spirit that ever was evolved from the poet's brain, and have the inestimable merit of being always within reach whenever we need them.

I will venture to assert that 10 fairy tales, not even excepting those of the "Arabian Nights," can surpass in marvel the true life-history of the mayfly, the frog, the newt, and the dragon-fly, as will be narrated in the course of these pages. I may go even farther, and assert that there is no inhabitant of the brook and its banks whose biography and structure are not full of absorbing interest, and will not occupy the longest life, if only an attempt be made to study them thoroughly.

An almost typical example of slow-flowing brooks is to be found in the remarkable channels which intersect the country between Minster and Sandwich, and which, on the Ordnance map, look almost like the threads of a spider's web. In that flat district, the fields are not divided by hedges, as in most parts of England, or by stone walls—"dykes," as they are termed in Ireland—such as are employed in Derbyshire and several other stony localities, but by channels, which have a strong individuality of their own.

Even the smallest of these brooks is influenced by the tide, so that at the two periods of slack water there is no perceptible stream.

Yesterday afternoon, having an hour or so to spare at Minster, I examined slightly several of these streams and their banks. The contrast between them and the corresponding brooklets of Oxford, also a low-lying district, was very strongly marked.

In the first place, the willow, which forms so characteristic an ornament of the brooks and rivers of Oxford, is wholly absent. Most of the streamlets are entirely destitute of even a bush by which their course can be marked; so that when, as is often the case, a heavy white fog overhangs the entire district, looking from a distance as if the land had been sunk in an ocean of milk, no one who is not familiarly acquainted with every yard of ground could make his way over the fields without falling into the watery boundaries which surround them.

Some of them, however, are distinguished by hawthorns, which take the place of the willows, and thrive so luxuriantly that they may lay claim to the title of forest trees. Blackberries, too, are exuberant in their growth, and in many spots the hawthorn and blackberry on opposite sides of the brook have intertwined their branches across it and have completely hidden the water from sight. On these blackberries, the fruit of which was in its green state, the drone-flies and hawk-flies simply swarmed, telling the naturalist of their multitudinous successors, who at present are in the preliminary stages of their existence.

Among the blackberries the scarlet fruit of the woody nightshade (a first cousin of the potato) hung in tempting clusters, and I could not help wondering whether they would endanger the health of the young Minsterians.

In some places the common frog-bit had grown with such luxuriance that it had completely hidden the water, the leaves overlapping each other as if the overcrowded plants were trying to shoulder each other out of the way.

In most of these streamlets the conspicuous bur-reed (*Sparganium ramosum*) grew thickly, its singular fruit being here and there visible among the sword-like leaves. I cannot but think that the mediæval weapon called the "morning star" (or "morgen-ster") was derived from the globular, spiked fruit-cluster of the bur-reed.

A few of the streams were full of the fine plant which is popularly known by the name of bull-rush, or bulrush (*Typha latifolia*), but which ought by rights to be called the "cat's-tail" or "reed-mace." Of this plant it is said that a little girl, on seeing it growing, exclaimed that she never knew before that sausages grew on sticks. The teasel (*Dipsacus*) was abundant, as were also several of the true thistles.

In some places one of these streams becomes too deep for the bur-reed, and its surface is only diversified by the half-floating leaves of one or two aquatic plants.

On approaching one of these places, I find the water to be apparently without inmates. They had only been alarmed by my approach, which, as I had but little time to spare, was not as cautious as it ought to have been. However, I remained perfectly still, and presently a little fish appeared from below. It was soon followed by a second and a third, and before long a whole shoal of fish were floating almost on the surface, looking out for insects which had fallen into the water.

The day being hot, and with scarcely a breath of wind, the fish soon became quite bold. They did not move beyond the small spot in which they had appeared, but they all had their tails in slight movement, and their heads in one direction, thus showing that although the water appeared to be perfectly motionless, there must be a current of some sort, fish always lying with their heads up the stream, so as to allow the water to enter their mouths and pass over their gills.

If then these sluggish streams were unlike those of Oxford, where the ground is low, and nearly level, how utterly distinct must they be

from those of hilly and especially of rocky localities!

In the earlier part of the present year I was cursorily examining a brook in Cannock Chase, in Staffordshire. Unfortunately, the day was singularly inauspicious, as the sun was invisible, the atmosphere murky, and a fierce north-east wind was blowing, a wind which affects animals, etc., especially the insect races, even more severely than it does man. Even the birds remain under shelter as long as they can, and not an insect will show itself. Neither, in consequence, will the fish be "on the feed."

On a previous visit, we had been more fortunate, trout, crayfish, etc., testifying to the prolific character of the brook, which in one place is only four or five feet in width, and yet, within fifty yards, it has formed itself into a wide and treacherous marsh, which can only be crossed by jumping from one tussock of grass to another; and yet, again, it suddenly spreads out into a broad and shallow torrent, the water leaping and rippling over the stony bed. Scarcely a bush marks its course, and within a few yards it is quite invisible.

As we shall presently see, the brooks of the chalk downs of Wiltshire, and of the regular mixture of rock and level ground, which are characteristic of Derbyshire, have also their own separate individualities.

We shall, however, find many allusions to them in the course of the work, and we will therefore suppose ourselves to be approaching the bank of any brook that is but little disturbed by man. What will be likely to happen to us will be told in the following chapters.

CHAPTER II.

Life-history of the water-rat—No science can stand alone—What is a water-rat?—The voles of the land and water—Their remarkable teeth—The rodents and their incisor teeth—The tooth and the chisel—The skate "iron"—Chewing the cud—Teeth of the elephant—Feet of the water-vole—A false accusation—Water-voles in gardens—Winter stores—Cats and water-voles—Subterranean pioneering—Mental character of the water-vole—Standing fire—Its mode of eating.

PLOP!

A water-rat has taken alarm, and has leaped into the brook.

A common animal enough, but none the less worthy of notice because it is common. Indeed, it is in many respects a very remarkable creature, and we may think ourselves fortunate that we have the opportunity of studying its habits and structure.

There is much more in the animal than meets the eye, and we cannot examine its life-history without at the same time touching upon that of several other creatures. No science stands alone, neither does any animal, however insignificant it may appear to be; and we shall find that before we have done with the water-rat, we shall have had something to say of comparative anatomy, ornithology, ichthyology, entomology and botany, beside treating of the connection which exists between man and the lower animals, and the reciprocal influence of civilisation and animal life.

In the first place, let us define our animal. What is a water-rat, and where is its place in zoological systems of the present day? Its name in science is *Arvicola amphibius*. This title tells its own story.

Though popularly called a rat, the animal has no right to the name, although, like the true rat, it is a rodent, and much resembles the rat in size and in the length and colour of its fur. The likeness, however, extends no further.

The rats are long-nosed and sharp-snouted animals, whereas the water-rat has a short,

blunt nose. Then, the ears of the rats are large and stand out boldly from the head, while those of the water-rat are small, short, and rounded. Again, the tail of the rat is long and slender, while that of the water-rat is comparatively short. Place the two animals side by side, and you will wonder how anyone could mistake the one for the other.

The teeth, too, are quite different.

Instead of being white, like those of the rat, the incisor teeth are orange-yellow, like those of the beaver. Indeed, the water-rat possesses so many beaver-like characteristics, that it was ranked near the beaver in the systematic lists.

Now, however, the Voles, as these creatures ought rightly to be called, are thought to be of sufficient importance to be placed by themselves, and separated from the true beavers.

The voles constitute quite a large group of rodents, including several animals which are popularly ranked among the mice.

One very remarkable characteristic of the voles is the structure of their molar teeth.

Being rodents, they can have but two incisor teeth in each jaw, these teeth being rootless, and so set in their sockets that they are incessantly worn away in front, and as incessantly grow from the base, take the curved form of their sockets, and act much like shears which have the inestimable property of self-sharpening when blunted, and self-renewal when chipped or actually broken off by coming against any hard substance. Were the teeth to be without this power, the animal would run a great risk of dying from hunger, the injured tooth not being able either to do its own work, or to aid its companion of the opposite jaw. Either tooth alone would be as useless as a single blade of a pair of scissors.

There is another notable characteristic of these incisor teeth. If you will examine the incisors of any rodent, whether it be a rat, a mouse, a rabbit, or a beaver, you will see that the tips are "bevelled" off just like the edge of a chisel. This shape is absolutely necessary to keep the tooth in working order. How is this object to be attained?

In the solution of this problem we may see one of the many links which connect art and nature.

Should our readers know anything of carpentering, let them examine the structure of their chisels. They are not made wholly of hard steel, as in that case they would be liable to snap, just as does the blade of a foil when undue pressure is brought to bear upon it. Moreover, the operation of sharpening would be extremely difficult.

So the blade of the chisel is merely faced with a thin plate of hardened steel, the remainder being of softer material.

Now, it is not at all likely that the unknown inventor of the modern chisel was aware of the analogy between art and nature, and would probably have been very much surprised if anyone had stated that he had borrowed his idea from the incisor teeth of the water-rat.

Yet he might have done so, for these teeth are almost wholly formed of ordinary tooth matter, and are faced with a thin plate of hard enamel, which exactly corresponds with the hardened steel facing of a chisel.

Any of my readers who possess skates will find, on examination, that the greater part of the blade is, in reality, soft iron, the steel, which comes upon the ice, being scarcely a fifth of an inch in length. The hardened steel allows the blade to take the necessary edge, while the soft iron preserves the steel from snapping.

Should the skate have been neglected and allowed to become a little rusty, the line of demarcation between the steel and the iron can be distinctly seen. Similarly, in the

beaver and the water-rat, the orange-yellow colour of the enamel facing causes it to be easily distinguished from the rest of the tooth. In most of the rodents the enamel is white, and the line of demarcation is scarcely visible.

Now we have to treat of a question of mechanics.

If two substances of different degrees of hardness be subjected to the same amount of friction, it follows that the softer will be worn away long before the harder. It is owing to this principle that the edges of the rodent teeth preserve their chisel-like form. Being continually employed in nibbling, the softer backing of the teeth is rapidly worn away, while the hard plate of enamel upon the front of the tooth is but slightly worn, the result being the bevelled shape which is so characteristic of these teeth.

As all know, who have kept rabbits or white mice, the animals are always engaged in gnawing anything which will yield to their teeth, and unless the edges of their feeding troughs be protected by metal, will nibble them to pieces in a few days. Indeed, so strong is this instinct, that the health of the animals is greatly improved by putting pieces of wood into their cages, merely for the purpose of allowing them to exercise their chisel-edged teeth. Even when they have nothing to gnaw, the animals will move their jaws incessantly, just as if they were eating, a movement which gave rise to the idea that they chewed the cud.

It is worthy of remark that other animals, which, though not rodents, need to possess chisel-edged incisor teeth, have a similar habit. Such is the hippopotamus, and such is the hyrax, the remarkable rock-haunting animal, which in the authorised translation of the Scriptures is called the "coney," and which in the Revised Version is allowed in the margin to retain its Hebrew name, "shaphan."

The enamel also has an important part to play in the structure of the molar teeth. Each tooth is surrounded with the enamel plate, which is so intricately folded that the tooth looks as if it were made of a series of enamel triangles, each enclosing the tooth matter.

This structure is common to all the members of the group to which the water-rat belongs. It is the more remarkable because we find a somewhat similar structure in the molar teeth of the elephants, which, like the rodents, have the incisor teeth largely developed and widely separated from the molars.

There is nothing in the appearance of the water-rat which gives any indication of its aquatic habits.

For example, we naturally expect to find that the feet of swimming animals are webbed. The water-loving capybara of South America, the largest existing rodent, has its hoof-like toes partially united by webs, so that its aquatic habits might easily be inferred even by those who were unacquainted with the animal. Even the otter, which propels itself through the water mostly by means of its long and powerful tail, has the feet furnished with webs. So has the aquatic Yapock opossum of Australia, while the feet of the duck-bill are even more boldly webbed than those of the bird from which it takes its popular name. The water-shrews (whom we shall presently meet) are furnished with a fringe of stiff hair round the toes which answers the same purpose as the web.

But the structure of the water-rat gives no indication of its habits, so that no one who was unacquainted with the animal would even suspect its swimming and diving powers. Watch it as long as you like, and I do not believe that you will see it eating anything of an animal nature.

I mention this fact because it is often held up to blame as a mischievous animal, especi-

ally deserving the wrath of anglers by devouring the eggs and young of fish.

As is often the case in the life-history of animals as well as of men, the blame is laid on the wrong shoulders. If the destruction of fish be a crime, there are many criminals, the worst and most persistent of which are the fish themselves, which not only eat the eggs and young of other fish, but, Saturn-like, have not the least scruple in devouring their own offspring.

Scarcely less destructive in its own insidious way is the common house-rat, which eats everything which according to our ideas is edible, and a good many which we might think incapable of affording sustenance even to a rat. In the summer time it often abandons for a time the house, the farm, the barn, and seeks for a change of diet by the brook. These water-haunting creatures are naturally mistaken for the vegetable-feeding water-vole, and so the latter has to bear the blame of their misdoings.

There are lesser inhabitants of the brook which are injurious both to the eggs and young of fish. Among them are several of the larger water-beetles, some of which are so large and powerful that, when placed in an aquarium with golden carp, they have made havoc among the fish, always attacking them from below. Although they cannot kill and devour the fish at once, they inflict such serious injuries that the creature is sure to die shortly.

I do not mean to assert that the water-vole is never injurious to man. Civilisation disturbs for a time the balance of Nature, and when man ploughs or digs the ground which had previously been untouched by plough or spade, and sows the seeds of herbs and cereals in land which has previously produced nothing but wild plants, he must expect that the animals to whom the soil had been hitherto left will fail to understand that they can no more consider themselves as the owners, and will in consequence do some damage to the crops.

Moreover, even putting their food aside, their habits often render them obnoxious to civilised man. The mole, for example, useful as it really is in a field, does very great harm in a garden or lawn, although it eats none of the produce.

The water-vole, however, is doubly injurious when the field or garden happens to be near the water-side. It is a mighty burrower, driving its tunnels to great distances. Sometimes it manages to burrow into a kitchen-garden, and feeds quite impartially on the different crops. It has even been seen to venture to a considerable distance from water, crossing a large field, making its way into a garden, and carrying off several pods of the French bean.

In the winter time, when other food fails, the water-vole, like the hare and rabbit, will eat turnips, mangold-wurzel, the bark of young trees, and similar food. Its natural food, however, is to be found among the various aquatic plants, as I have often seen, and the harm which it does to the crops is so infinitesimally small when compared with the area of cultivated ground, that it is not worthy of notice.

Still, although the harm which it does to civilised man in the aggregate is but small, even its most friendly advocate cannot deny that there are cases where it has been extremely troublesome to the individual cultivator, especially if he be an amateur.

There are many hard men of business, who are obliged to spend the greater part of the day in their London offices, and who find their best relaxation in amateur gardening; those who grow vegetables, regarding their peas, beans, potatoes, and celery with as much affection as is felt by floriculturists for their roses or tulips.

Nothing is more annoying to such men than to find, when the toils of business are over, and they have settled themselves comfortably into their gardening suits, that some marauder has carried off the very vegetables on which they had prided themselves.

The water-vole has been detected in the act of climbing up a ladder which had been left standing against a plum tree, and attacking the fruit. Bunches of grapes on outdoor vines are sometimes nipped off the branches by the teeth of the water-vole, and the animal has been seen to climb beans and peas, split the pods, and devour the contents.

Although not a hibernating animal, it lays up a store of food in the autumn. Mr. Groom Napier has the following description of the contents of a water-rat's storehouse:—

"Early in the spring of 1855, I dug out the burrow of a water-vole, and was surprised to find at the further extremity a cavity of about a foot in diameter, containing a quantity of fragments of carrots and potatoes, sufficient to fill a peck measure. This was undoubtedly a part of its winter store of provisions. This food had been gathered from a large potato and carrot bed in the vicinity.

"On pointing out my discovery to the owner of the garden, he said that his losses had been very serious that winter owing to the ravages of these animals, and said that he had brought both dogs and cats down to the stream to hunt for them; but they were too wary to be often caught."

I do not think that the owner of the garden knew very much about the characters either of the cat or water-vole.

Every one who is practically acquainted with cats knows that it is next to impossible to point out an object to a cat as we can to a dog. She looks at your finger, but can never direct her gaze to the object at which you are pointing. In fact, I believe that pussy's eyes are not made for detecting objects at a distance.

If we throw a piece of biscuit to a dog, and he does not see where it has fallen, we can direct him by means of voice and finger. But, if a piece of meat should fall only a foot or two from a cat, all the pointing in the world will not enable her to discover it, and it is necessary to pick her up and put her nose close to the meat before she can find it.

So, even, if a water-vole should be seen by the master, the attention of the cat could not

be directed to it, her instinct teaching her to take prey in quite a different manner.

The dogs, supposing that they happened to be of the right breed, would have a better chance of securing the robber, providing that they intercepted its retreat to the water. But if the water-vole should succeed in gaining its burrow, or in plunging into the stream, I doubt whether any dog would be able to catch it.

Moreover, the water-vole is so clever in tunnelling, that when it drives its burrows into cultivated ground, it almost invariably conceals the entrance under a heap of stones, a wood pile, or some similar object.

How it is enabled to direct the course of its burrow we cannot even conjecture, except by attributing the faculty to that "most excellent gift" which we call by the convenient name of "instinct."

Man has no such power, but when he wishes to drive a tunnel in any given direction he is obliged to avail himself of levels, compasses, plumb-lines, and all the paraphernalia of the engineer. Yet, with nothing to direct it except instinct, the water-vole can, though working in darkness, drive its burrow in any direction and emerge from the ground exactly at the spot which it has selected.

The mole can do the same, and by means equally mysterious.

I may casually mention that the water-vole is one of the aquatic animals which, when zoological knowledge was not so universal as it is at the present day, were reckoned as fish, and might be eaten on fast days. I believe that in some parts of France this idea still prevails.

With all its wariness, the water-vole is a strangely nervous creature, being for a time almost paralysed by a sudden shock. This trait of character I discovered quite unexpectedly.

Many, many years ago, when I was a young lad, and consequently of a destructive nature, I possessed a pistol, of which I was rather proud. It certainly was an excellent weapon, and I thought myself tolerably certain of hitting a small apple at twelve yards distance.

One day, while walking along the bank of the Chervell River, I saw a water-vole on the opposite bank. The animal was sitting on a small stump close to the water's edge. Having, of course, the pistol with me, and wanting to

dissect a water-vole, I proceeded to aim at the animal. This was not so easy as it looked. A water-vole crouching upon a stump presents no point at which to aim, the brown fur of the animal and the brown surface of the old weather-beaten stump seeming to form a single object without any distinct outline; moreover, it is very difficult to calculate distances over water. However, I fired, and missed.

I naturally expected the animal to plunge into the river and escape. To my astonishment, it remained in the same position. Finding that it did not stir, I reloaded, and again fired and missed. Four times did I fire at that water-vole, and after the last shot the animal slowly crawled off the stump, slid into the river, and made off.

Now in those days revolvers and breech-loaders did not exist, so that the process of loading a pistol with ball was rather a long and complicated one.

First, the powder had to be carefully measured from the flask; then a circular patch of greased linen had to be laid on the muzzle of the weapon, and a ball laid on it and hammered into the barrel with a leaden or wooden mallet; then it had to be driven into its place with a ramrod (often requiring the aid of the mallet), and, lastly, there was a new cap to be fitted. Yet although so much time was occupied between the shots, the animal remained as motionless as a stuffed figure.

When I crossed the river and examined the stump I found all the four bullets close together just below the spot on which the animal had been sitting, and neither of them two inches from its body. Although the balls had missed the water-vole, they must have sharply jarred the stump.

I was afterwards informed that this semi-paralysis from sudden fear is a known characteristic of the animal. It seems to be shared by others of the same genus, as will be seen when we come to treat of the field mice.

In its mode of eating it much resembles the squirrels, sitting on its haunches and holding the food in its forepaws, as if they were hands. I am not aware that it even eats worms or insects, and it may be absolutely acquitted from any imputation of doing harm to any of the fish tribe.

(To be continued.)

"SHE COULDN'T BOIL A POTATO;"

OR,

THE IGNORANT HOUSEKEEPER, AND HOW SHE ACQUIRED KNOWLEDGE.

By DORA HOPE.



HE late Miss Ella!"

"When are you going to turn over that new leaf you spoke of, my daughter?"

"There's a little coffee left, but the bacon is quite cold."

These were the exclamations that greeted a tall bright girl, as she entered the breakfast room one morning.

"I am very sorry, papa. I really meant to be down in time, but I suppose I must have gone to sleep again after I was called." And being really vexed with herself for having so

soon broken her good resolutions, formed for the hundredth time the day before, Ella Hastings accepted the cold bacon meekly, and even turned a deaf ear to the withering sarcasms of her two schoolboy brothers, who were leisurely strapping together their books, and delaying their departure till the last moment.

"There is the postman coming up the garden; run and get the letters, Hughie."

A solemn-looking boy of six years old climbed down from his chair, in obedience to his father's request, and soon came back with a handful of letters, and settled himself patiently by his father's side to wait for the empty envelopes, which formed his share of the morning's correspondence.

An exclamation of surprise from Mr. Hastings caused his wife to look up inquiringly from the letter she had just opened,

and he handed her silently a telegram which had been forwarded, with other papers, from his office, where it had evidently been delivered late the previous evening. Kate, the eldest daughter, leaning over her mother's shoulder, read aloud the short notice:—

"Mrs. Wilson dangerously ill; letter follows."

Mrs. Wilson was Mr. Hastings' only remaining sister. His mother had died when he was almost an infant, and this "sister Mary" had slipped into her place as mother, teacher—everything, to her little brothers and sisters; never leaving them, till the father having died also, and her young charges being all old enough to settle in life for themselves, she had rewarded the faithful waiting of her old lover, and they had settled down together in a quiet village a few miles from the noisy town where his business lay. Her happy

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CHAPTER III

Enemies of the water-vole.—The heron.—The death-stroke.—Ways of the heron.—Watching for fish.—A hint to naturalists.—Observers in the New Forest.—Return to wild habits.—The fox, the cow, and the owl.—The heron and the eel.—The cormorant and the conger.—The heron's power of wing.—How the heron settles.—Its resting-place.—Power of the heron's beak.—Heronry in Wanstead Park.

THE water-vole has but few enemies whom it need fear, and one of them is now so scarce that the animal enjoys a practical immunity from it. This is the heron (*Ardea cinerea*), which has suffered great diminution of its numbers since the spread of agriculture.

Even now, however, when the brook is far away from the habitations of man, the heron may be detected by a sharp eye standing motionless in the stream, and looking out for prey. Being as still as if cut out of stone, neither fish nor water-vole sees it, and if the latter should happen to approach within striking distance, it will be instantly killed by a sharp stroke on the back of the head.

The throat of the heron looks too small to allow the bird to swallow any animal larger than a very small mouse; but it is so dilatable that the largest water-vole can be swallowed with perfect ease.

The bird, in fact, is not at all fastidious about its food, and will eat fish, frogs, toads, or water-voles with perfect impartiality. It has even been known to devour young water-hens, swimming out to their nest, and snatching up the unsuspecting brood. In fact, all is fish that comes to its beak.

If the reader should be fortunate enough to espy a heron while watching for prey, let him make the most of the opportunity.

Although the heron is a large bird, it is not easily seen. In the first place, there are few birds which present so many different aspects. When it stalks over the ground with erect bearing and alert gestures it seems as conspicuous a bird as can well be imagined. Still more conspicuous does it appear when flying, the ample wings spread, the head and neck stretched forwards, and the long legs extending backwards by way of balance.

But when it is on the look-out for the easily-startled fish it must remain absolutely still. So it stands as motionless as a stuffed bird, its long neck sunk and hidden among the feathers of the shoulders, and nothing but the glancing eye denoting that it is alive.

This quiescence must be imitated by the observer, should he wish to watch the proceedings of the bird, as the least movement will startle it. The reason why so many persons fail to observe the habits of animals, and then disbelieve those who have been more successful, is that they have never mastered the key to all observation, *i.e.*, refraining from the slightest motion. A movement of the hand or foot, or even a turn of the head is certain to give alarm; while many creatures are so wary that when watching them it is as well to droop the eyelids as much as possible, and not even to turn the eyes quickly, lest the reflection of the light from their surface should attract the attention of the watchful creature.

One of the worst results of detection is that when any animal is startled it conveys the alarm to all others that happen to be within sight or hearing. It is evident that all animals of the same species have a language of their own which they perfectly understand, though it is not likely that an animal belonging to one species can understand the language of another.

But there seems to be a sort of universal or *lingua-franca* language which is common to all the animals, whether they be beasts or birds, and one of the best known phrases is the cry of alarm, which is understood by all alike.

I need hardly say that it is almost absolutely necessary to be alone, as there is no object in two observers going together unless they can communicate with each other, and there is nothing which is so alarming to the beasts and birds as the sound of the human voice.

Yet there is a mode by which two persons who have learned to act in concert with each other can manage to observe in company. It was shown to me by an old African hunter, when I was staying with him in the New Forest.

In the forest, although even the snapping of a dry twig will give the alarm, neither bird nor beast seems to be disturbed by a whistle. We therefore drew up a code of whistles, and practised ourselves thoroughly in them.

Then, we went as quietly as we could to the chosen spot, and sat down facing each other, so that no creature could pass behind one of us without being detected by the other. We were both dressed in dark grey, and took the precaution of sitting with our backs against a tree or a bank, or any object which could perform the double duty of giving us something to lean against, and of breaking the outlines of the human form.

Our whistled code was as low as was possible consistent with being audible, and I do not think that during our many experiments we gave the alarm to a single creature.

When the observer is remaining without movement, scarcely an animal will notice him.

I remember that on one occasion my friend and I were sitting opposite each other, one on either side of a narrow forest path. The sun had set, but at that time of the year there is scarcely any real night, and objects could be easily seen in the half light.

Presently a fox came stealthily along the path. Now the cunning of the fox is proverbial, and neither of us thought that he would pass between us without detecting our presence. Yet, he did so, passing so close, that we could have touched him with a stick.

Shortly afterwards, a cow came along the same path, walking almost as noiselessly as the fox had done. It is a remarkable fact that domesticated animals, when allowed to wander at liberty in the New Forest, soon revert to the habits of their wild ancestors.

As the cow came along the path, neither of us could conjecture the owner of the stealthy footstep. We feared lest it might be that of poachers, in which case things would have gone hard with us, the poachers of the New Forest being a truculent and dangerous set of men, always provided with firearms and bludgeons, having scarcely the very slightest regard for the law, and almost out of reach of the police.

They would certainly have considered us as spies upon them, and as certainly would have attacked and half, if not quite killed us, we being unarmed.

But to our amusement as well as relief, the step was only that of a solitary cow, the animal lifting each foot high from the ground before she made her step, and putting it down as cautiously as she had raised it.

Then, a barn owl came drifting silently between us, looking in the dusk as large and white as if it had been the snowy owl itself.

Yet, neither the fox, nor the cow, nor the owl detected us, although passing within a few feet of us.

In the daytime the observer, however careful he may be, is always liable to detection by a stray magpie or crow.

The bird comes flying along overhead, its keen eyes directed downwards, on the look-out for the eggs of other birds. At first he may not notice the motionless and silent observer, but sooner or later he is sure to do so.

If it were not exasperating to have all one's precautions frustrated, the shriek of terrified astonishment with which the bird announces the unexpected presence of a human being would be exceedingly ludicrous. As it is, a feeling of wrath rather prevails over that of amusement, for at least an hour will elapse before the startled animals will have recovered from the magpie's alarm cry.

Supposing that we are stationed on the banks of the brook on a fine summer evening, while the long twilight endures, and have been fortunate enough to escape the notice of the magpie or other feathered spy, we may have the opportunity of watching the heron capture its prey.

The stroke of the beak is like lightning, and in a moment the bird is holding a fish transversely in its beak. The long, narrow bill scarcely seems capable of retaining the slippery prey; but if a heron's beak be examined carefully, it will be seen to possess a number of slight serrations upon the edges, which enable it to take a firm grasp of the fish.

Very little time is allowed the fish for struggling, for almost as soon as captured it is flung in the air, caught dexterously with its head downwards, and swallowed.

It is astonishing how large a fish will pass down the slender throat of a heron. As has been already mentioned, the water-vole is swallowed without difficulty. Now the water-vole measures between eight and nine inches in length from the nose to the root of the tail, and is a very thickset animal, so that it forms a large and inconvenient morsel.

It is seldom that the heron has, like the kingfisher, to beat its prey against a stone or any hard object before swallowing it, though when it catches a rather large eel it is obliged to avail itself of this device before it can get the wriggling and active fish into a suitable attitude. The eel has the strongest objection to going down the heron's throat, and has no idea of allowing its head to pass into the heron's beak. The eel, therefore, must be rendered insensible before it can be swallowed.

Generally it is enough to carry the refractory prey to the bank, hold it down with the foot, and peck it from one end to the other until it is motionless. Should the eel be too large to be held by the feet, it is rapidly battered against a stone, just as a large snail is treated by a thrush, and so rendered senseless.

If the feet of the heron be examined, a remarkable comb-like appendage may be seen on the inside of the claw of the hind foot.

What may be the precise office of this comb is not satisfactorily decided. Some ornithologists think that it is utilised in preening the plumage, I cannot, however, believe that it performs such an office. I have enjoyed exceptional opportunities for watching the proceedings of the heron when at liberty, as well as in captivity, but never saw it preen its feathers with its foot, nor have I heard of anyone who has actually witnessed the proceeding.

It is not always fair to judge from a dead bird what the living bird might have been able to do. But I have tried to comb the plumage

IN WANSTEAD PARK.



of a dead heron with its foot-comb, and have not succeeded.

Another suggestion is that the bird may use it when it holds prey under its feet, as has just been narrated. These suggestions, however, are nothing more than conjectures, but, as they have been the subject of much argument, I have thought it best to mention them.

Sometimes it has happened that the heron has miscalculated its powers, and seized a fish which was too large and powerful to be mastered. Anglers frequently capture fish which bear the marks of the heron's beak upon their bodies, and in such cases neither the fish nor the heron is any the worse for the struggle.

But when the unmanageable fish has been an eel, the result has, more than once, been disastrous for the bird. In Yarrell's work on the British birds, a case is recorded where a heron and eel were both found dead, the partially swallowed eel having twisted itself round the neck of the heron in its struggles.

A very similar incident occurred off the coast of Devonshire, the victim in this case being a cormorant. The bird had attacked a conger-eel, and had struck its hooked upper mandible completely through the lower jaw of the fish, the horny beak having entered under the chin of the eel.

The bird could not shake the fish off its beak, and the result was that both were found lying dead on the shore, the powerful conger-eel having coiled itself round the neck of the cormorant and strangled it. The stuffed skins of the bird and eel may be seen in the Truro Museum, preserved in the position in which they were found.

Having procured a sufficiency of prey, the heron will take flight for its home, which will probably be at a considerable distance from its fishing ground. Twenty or thirty miles are but an easy journey for the bird, which measures more than five feet across the expanded wings, and yet barely weighs three pounds. Indeed, in proportion to its bulk, it is believed to be the lightest bird known. The Rev. C. A. Johns states that he has seen the heron fishing at a spot fully fifty miles from any heronry.

The peculiar flight of the heron is graphically described in a letter published in the *Standard* newspaper, Sept. 25th, 1883.

"One summer evening I was under a wood by the Exe. The sun had set, and from over the wooded hill above bars of golden and rosy cloud stretched out across the sky. The rooks came slowly home to roost, disappearing over the wood, and at the same time the herons approached in exactly the opposite direction, flying from Devon into Somerset, and starting out to feed as the rooks returned home.

"The first heron sailed on steadily at a great height, uttering a loud 'caak, caak' at intervals. In a few minutes a second followed, and 'caak, caak' sounded again over the river valley.

"The third was flying at a less height, and as he came into sight over the line of the wood, he suddenly wheeled round, and holding his immense wings extended, dived, as a rook will, downwards through the air. He

twisted from side to side like anything spun round by the finger and thumb as he came down, rushing through the air head first.

"The sound of his great vanes pressing and dividing the air was distinctly audible. He looked unable to manage his descent, but at the right moment he recovered his balance, and rose a little up into a tree on the summit, drawing his long legs into the branches behind him.

"The fourth heron fetched a wide circle, and so descended into the wood. Two more passed on over the valley—together six herons in about a quarter of an hour. They intended, no doubt, to wait in the trees till it was dusky, and then to go down and fish in the wood. Herons are here called cranes, and heronries are craneries. (This confusion between the heron and the crane exists in most parts of Ireland.)

"A determined sportsman who used to eat every heron he could shoot, in revenge for their ravages among the trout, at last became suspicious, and, examining one, found in it the remains of a rat and of a toad, after which he did not eat any more herons. Another sportsman found a heron in the very act of gulping down a good sized trout, which stuck in the gullet. He shot the heron and got the trout, which was not at all injured, only marked at each side where the beak had cut it. The fish was secured and eaten."

I can corroborate the accuracy as well as the graphic wording of the above description.

When I was living at Belvedere, in Kent, I used nearly every evening to see herons flying northwards. I think that they were making for the Essex marshes. They always flew at a very great height, and might have escaped observation but for the loud, harsh croak which they uttered at intervals, and which has been so well described by the monosyllable "caak."

As to their mode of settling on a tree, I have often watched the herons of Walton Hall, where they were so tame that they would allow themselves to be approached quite closely. When settling, they lower themselves gently until their feet are upon the branch. They then keep up a slight flapping of the wings until they are fairly settled.

An idea is prevalent in many parts of England that when the heron sits on its nest, its long legs hang down on either side. Nothing can be more absurd. The heron can double up its legs as is usual among birds, and sits on its nest as easily as if it were a rook, or any other short-legged bird.

In many respects the heron much resembles the rook in its manner of nesting. The nest is placed in the topmost branches of a lofty tree, and is little more than a mere platform of small sticks. Being a larger bird than the rook, the heron requires a larger nest, and on an average the diameter of a nest is about three feet.

Like the rook, the heron is gregarious in its nesting, a solitary heron's nest being unknown. In their modes of feeding, however, the two birds utterly differ from each other, the heron

seeking its food alone, while the rook feeds in company, always placing a sentinel on some elevated spot for the purpose of giving alarm at the approach of danger.

The heron is curiously fastidious in its choice of a nesting-place, and, like the rook, prefers the neighbourhood of man, knowing instinctively when it will be protected by its human neighbours. Fortunately for the bird, the possession of a heronry is a matter of pride among landowners; so that even if the owner of a trout-stream happened also to possess a heronry, he would not think of destroying the herons because they ate his trout.

In captivity the heron can be tamed; but it is not to be recommended as a pet. It is apt to bestow all its affections on one individual, and to consider the rest of the human race as enemies, whose eyes ought to be pecked out.

I was for some time acquainted with such a bird, but took care to keep well out of reach of its terrible beak, which it would dart to an unexpected distance through the bars of its cage.

It formerly ran loose in a garden, and was almost slavishly affectionate to the gardener, rubbing itself against his legs like a pet cat, and trying in every way to attract his attention. He had even taught it a few simple tricks, and I have seen it take his hat off his head, and then offer it to him.

But just in proportion as it became friendly with the gardener it became cross-grained with the rest of the world, attacking everyone who came into the garden, and darting its beak at their eyes. Its last performance caused it to be placed in confinement.

An elderly gentleman had entered the garden on business, when the bird instantly assailed him. Knowing the habits of the heron, he very wisely flung himself on his face for the purpose of preserving his eyes, and shouted for help.

Meanwhile the heron, wishing to make the most of its opportunity, mounted upon his prostrate victim, and succeeded in inflicting several severe pecks upon his body and limbs before the gardener could come to the rescue.

The peck of a heron's beak is no trifle, the mandibles being closed, and the blow delivered with the full power of the long neck, so that each blow from the beak is something like the stab of a bayonet, and so strong and sharp is the beak that in some foreign lands it is converted into an effective spearhead.

Few people seem to be aware that a large and populous heronry exists in Wanstead Park, on the very outskirts of London.

At the end of summer, when the young birds are fledged, the heronry is nearly deserted, but during the early days of spring the heronry is well worth a visit. The great birds are all in full activity, as is demanded by the many wants of the young, and on the ground beneath may be seen fragments of the pale-blue eggs. On an average there are three young ones in each nest, so that the scene is very lively and interesting, until the foliage becomes so thick that it hides the birds and their nests.

(To be continued.)

THE ROMANCE OF THE BANK OF ENGLAND; OR, THE OLD LADY OF THREADNEEDLE STREET.

By EMMA BREWER.

CHAPTER II.

JUST for a little time I must leave my personal history to inquire how England managed to do without me so long, and what the circumstances were which at length rendered my existence imperative.

In the days following the Norman Conquest, the Jews, whose one pursuit in life was the commerce of money, were the compulsory bankers of the country.

They were subject to much cruelty and persecution, as you may see for yourselves in

your histories of the Kings of England. It is not to be denied that their demands for interest on money lent by them were most extravagant. In 1264 the rate of interest exceeded 40 per cent., and I believe that 500 Jews were slain by our London citizens

bodice and underskirt combined); February, polonaise, with waterfall back; March, new spring bodice; April, divided skirt and Bernhardt mantle, with sling sleeves; May, Early English bodice and yoke bodice for summer dress; June, dressing jacket

and Princess frock, with Normandy bonnet for a child of four years old; July, Princess of Wales's jacket, bodice, and waistcoat, for tailor-made gown; August, bodice with guimpe; September, mantle with stole ends; October, Pyjama, or night-dress

combination, with full back; November, new winter bodice; December, patterns of Norfolk blouses, one with a yoke, and *one with pleats* only; January, 1887, blouse-polonaise, with pleats at back and front.

THE BROOK AND ITS BANKS.

By THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

CHAPTER IV.

Another enemy of the water-vole—The pike—Pike in brooks—The Oxford giant pike—A sad failure—An ignominious end—The pike and the eel—The pike and the duck—Links in Nature—Cousins of the water-vole—The campagnol, or short-tailed field mouse—Damage which it works—Its natural enemies—the kestrel and the owls—How to detect and catch a campagnol—The kestrel—Its peculiar mode of flight—Altering the focus of the eye—The nest of the campagnol—Beans and the mouse—The humble-bee and wasp—More connecting links—Store chambers of the campagnol—Its bird-purveyors—The black-bird, thrush, and campagnol—The winter and summer nests—A beautiful specimen and remarkable locality—Mode of eating.

WE have not yet completed the life-history of the water-vole, which, as I remarked on page 34, involves that of several other creatures.

One of its two worst foes has just been described, and we now come to the second—*i.e.*, the PIKE, OR JACK (*Esox lucius*). N.B.—The latter name may perhaps recall to the reader the ancient family of the Lucys, of Charlote Hall, Warwickshire, so mercilessly satirised by Shakespeare. They bore upon their shield the "luce"—*i.e.*, the pike, the coat of arms being a good example of "canting" heraldry—*i.e.*, in which the blazonry of the shield contains a play upon the name of the bearer.

There is no more inveterate foe of the water-vole than the pike. In the stomach of a single pike were found the remains of three water-voles and some bird, which was probably a duck.

It might be imagined that a pike large enough to swallow a water-vole would not be likely to venture into a brook, and would restrict itself to the river where it would have plenty of room. But experience has shown that a very large pike will sometimes make its way into a very small brook, partly for the sake of food, but sometimes through sheer cunning, in the hope of evading its enemies.

By the time that a pike has attained the weight of twelve or fifteen pounds, he has had to face many and varied dangers, and escape from many foes.

While he is young and small his worst foes are those of his own species. Anglers know that there is scarcely any bait so attractive to an old pike as a small pike. All the earlier part of his life is spent in perpetual watchfulness, he having to be always on the look-out for prey by which he can still his insatiable hunger; while he has to be equally on guard lest a larger pike should satisfy its hunger with him.

No pike, therefore, can attain to a large size without developing a considerable amount of cunning, and anyone who sets himself the task of catching such a fish will find that he must employ all his resources of intellect, aided by experience, before he can delude the fish even into touching the bait. In spite of its large size, the fish manages to elude observation in a most puzzling manner, and it is no easy

matter to make sure of its position. An old fox or old rat is scarcely more cunning and full of devices than an old pike.

The largest pike that I ever saw at liberty was in a small tributary streamlet of the Cherwell river, near Oxford.

A pike of enormous dimensions had for some time been reported as having been seen in various parts of the Cherwell, the general rumours giving its weight as at least thirty pounds. All the anglers of the neighbourhood had tried to capture this mighty prize, but had failed. Contrary to the habit of most large pike, it did not seem to have established itself in any particular spot, but roamed about from place to place.

Now, the Cherwell itself is but a very small river, so that the locality of a large fish might appear easily discoverable. But it is a very "weedy" river, and its banks are edged with willows, whose long, red, plume-shaped roots hang into the water from the banks, and form admirable hiding-places for the fish.

One day I was trying my fortune at trolling in the Cherwell, with a six-inch gudgeon for bait, and, on coming to a tributary stream, walked along the bank until I could find a spot narrow enough to be jumped.

Coming to a deep-looking pool, I dropped in the bait, by way of not wasting time, and almost immediately felt the bait taken by a pike. Following the golden rule then, and perhaps now, in force among anglers, I sat down on the bank, watch in hand, in order to wait through the weary ten minutes prescribed by custom, and which almost seem to drag themselves out into as many centuries.

Barely half the time had elapsed when a huge head rose to the surface, and the bait was blown out, as it seemed, into the water, the head sinking with a swirl of water where it disappeared. On examining the rejected bait, which had naturally been seized cross-wise, I found that it was pierced from head to tail with the teeth of the pike.

I learned that the big fish was afterwards ignominiously taken with a net in one of these tributary brooks, so that its cunning was baffled at last. I also learned that the fish had repeatedly treated other anglers as it treated me, holding the bait for a short time in its mouth and then rejecting it.

So it is clear that the water-vole will by no means be safe from the pike when it is the inhabitant of the brook instead of the river.

Moreover, it does not need a very large pike to devour a full-grown water-vole. The pike can swallow an animal which seems quite disproportionate to its size. A young pike of barely five inches in length was seen swimming about with the tail of a gudgeon projecting from its mouth. The gudgeon was quite as long as its captor, and there is no doubt that if the fish had been let alone the pike would soon have digested the gudgeon sufficiently to swallow it entirely.

The late Frank Buckland mentions that a pike weighing eight pounds was caught in the River Itchen. After it was taken out of the water it disgorged a trout of a pound weight. This must have been a sore disappointment

for the captor, who would think himself defrauded of a pound weight in his angling record.

The reader will remember that a heron and a cormorant lost their lives by capturing an eel which was too large for them, and it is a remarkable fact that a pike has been known to suffer a similar fate. It can easily be understood that an eel, twisting itself about convulsively in the struggle for life, should coil itself round a bird's neck long enough to cause its death by strangulation; but it seems almost impossible that a pike, being a fish, and therefore breathing by gills, should be suffocated while in the water by an eel.

Yet in the Fisheries Exhibition of 1883 there were two very remarkable stuffed groups, illustrating the voracity of the pike. In one of them a pike weighing ten pounds had attacked an eel weighing only one pound less. Now, an eel of nine pounds weight is a very large one, lithe, active, and muscular as a snake, and by no means a despicable antagonist. The pike had begun to swallow the eel, but the latter in its struggles forced its way out of the mouth through the gills, and thence into the water beneath the right gill-cover. But it could go no farther, the teeth of the pike having almost met through its body.

The result was fatal to both. The body of the eel having been forced beneath the gill-cover, the gills could not perform their office, and so the pike was as effectually suffocated for want of breath as were the heron and the cormorant. The dead bodies of the pike and eel were found on the bank of the River Bure in October, 1882.

The second group consisted of a pike and a duck. The pike had attacked the duck as the bird was diving, and had tried to swallow it. It succeeded in getting the head, neck, and part of the breast down its throat; but the duck, in its struggles for life, had naturally spread its wings. These formed an insurmountable obstacle to the fish, and the result was that the duck was drowned and the pike suffocated, both having died for lack of respiration.

So the "plop" of the water-vole into the brook from the bank has not been to us the mere splash of a frightened animal into the stream. It has opened for us many trains of thought, and taken us into several sciences. It has shown us something of the links which connect it with man, birds, and fishes, and so has led us into ornithology and ichthyology. It has shown how the inventions of man have their prototypes in the animal kingdom. Comparative anatomy and physiology have also been shown to form portions of the life-history of the familiar animal, and have demonstrated the truth of the axiom enunciated on page 34, that no animal and no branch of science can stand alone.

LIKE other beings, the water-vole has its relatives, two of whom will come within the range of our subject. Being small creatures, they go by the popular name of mice, just as

their larger relative is popularly called a rat. These are the FIELD-VOLE and the BANK-VOLE, both of which we may expect to find on the banks of our brook, especially when the banks are clothed with shrubs. The former of these animals is a very old acquaintance of mine, and when I was a lad I could go into a field and make almost certain of catching a field-vole (*Arvicola agrestis*) within about ten minutes.

This little animal looks very much like a water-vole seen through the wrong end of an opera-glass, except that the fur is redder and the ears are longer in proportion to the size of

Fortunately for the owls, their nocturnal habits save them from the destruction which would have befallen them had they sought their food in the light of day.

If we wish to see this pretty little creature, we have only to watch carefully the field through which our brook runs, and we shall be almost certain to find it. But we must know where to look and how to look.

The favourite locality of the campagnol has already been mentioned; but the detection of the little animal requires some practice. A novice in the art may traverse a low-lying field, and hunt along the banks of the brook from daybreak to dewy eve, and never catch a glimpse of a campagnol. Another will go into the same field, and in a quarter of an hour will produce several specimens.

Those who wish to catch it must know its ways. It is not of the least use to hunt up and down the field in chase of the campagnol, and those who wish to see it must reverse the old aphorism about Mahomet and the mountain. They cannot go to the campagnol, for it will keep out of their way; but if they will wait patiently, the campagnol will come to them.

The secret for catching the campagnol is as follows:—

Go into any field which is bounded by a brook, and lie down, taking care that the sun faces you; otherwise your shadow will be thrown on the grass, rendering the detection of the animal extremely difficult.

When you have arranged yourself in an easy posture, keep your eyes on the ground, and try to look between the green blades, so as to see the colour of the soil. On a first trial you may probably wait until your patience is exhausted, and yet see nothing. But do not be disheartened, and try again, as nothing but practice will give the needful skill.

Only a small portion of ground can come under your observation as you recline on your arm, and a few minutes ought to make you acquainted with the colour of every inch of the soil. Presently you will become aware that a little patch of soil is redder than it was a minute or two ago. Bring your free hand down smartly on the spot, and you will find a campagnol in your grasp.

Immediately afterwards you will find that the campagnol has teeth, and knows how to use them. But if you understand the animal's ways, you will seize it without danger of being bitten, just as if you know the nettle's ways you can grasp it without danger of being stung.

Like its larger relative, the campagnol, when suddenly startled, loses its presence of mind, and remains for a moment or two without motion. During that moment of consternation, shift your grasp so that the body of the animal rests in the palm of the hand, while the finger and thumb seize the sides of the head, so that the creature cannot turn its head to bite. The knack is soon learned, though perhaps at the expense of a bite or two, and the shifting of the grasp becomes instinctive.

Want of practice soon causes the eyes to become slow to detect the creature which steals so silently among the grass-blades, and the ready knack of the fingers is equally apt to fail just when it is wanted. However, a little practice soon restores the keenness of sight and deftness of touch, and in a short time the campagnol will be unable to pass under the observer's eyes without detection, or to escape the grasp of his fingers without capture.

So stealthily does the campagnol glide among the grass stems, that the field may be swarming with them, and yet their presence will not even be suspected by man. This fact brings us to another illustration of the asser-

tion that the life-history of one animal always involves that of others.

The natural food of the KESTREL (*Tinnunculus alaudarius*) largely consists of the campagnol, so that where the one is seen the other will probably be at no great distance. High in air the kestrel hovers with quivering wings, its bright eyes directed downwards, and scanning the field below. Suddenly it drops down to the ground, rises with something in its claws, and flies away. It has seen and caught a field-vole, and is carrying it home to its young. From its custom of balancing itself in the air with its head to the wind, it is often known by the name of "windhover."

With what astonishing sight must not the kestrel be gifted to perform such a feat! It is difficult enough for a human being to watch a square yard of ground so carefully that a field-vole shall be seen as it glides among the grass. How wonderful, therefore, must be the powers of vision which enable the bird to watch a large field, to detect from that height the little, dusky animal, and pounce down upon it with unerring swoop!

How astonishing must be the optical mechanism of those eyes which at so great a distance from the prey can act like telescopes, and yet can alter their range so rapidly that in the few seconds which are consumed in making the stoop, they have accommodated themselves to an entirely different focus.

In his "At Last," C. Kingsley mentions that in passing through a tropical forest the traveller is frequently checked by some creeper which hangs in the path, and which is not seen because the eye cannot focus itself with sufficient rapidity. Yet the traveller is only proceeding at a walking pace, whereas the stoop of the kestrel on its prey is swift as the fall of a stone through the air, and in a second or two the eye has to accommodate itself from a range of many yards to that of a few inches.

The value of the kestrel in keeping down the numbers of the field-vole, and so aiding in preserving the balance of Nature, can hardly be over-estimated.

There have been cases where the field-voles had increased to such a degree that pitfalls had to be dug for their capture, and they had to be destroyed artificially, because the kestrels and other predacious birds and animals had been almost extirpated.

Other enemies to agriculture are also destroyed by the kestrel. Mr. Johns mentions an instance where the stomach of a kestrel was opened, and was found to contain, beside a field-vole, nearly eighty caterpillars, twenty-four beetles, and a leech!

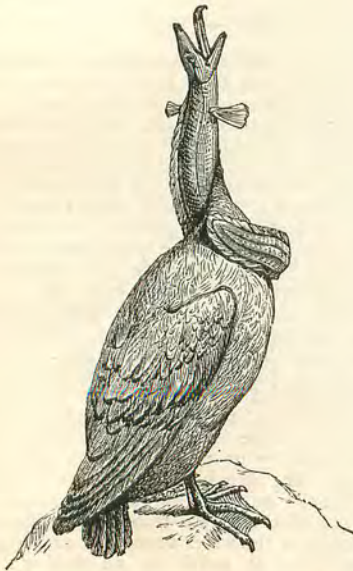
Now, we will return to our field-vole. Like the squirrel and several other rodents, it makes two nests, one for the winter and the other for the summer.

The winter nest is mostly made at some distance from water, is formed at the end of a burrow, and seldom reaches more than a few inches below the surface of the ground. It is to this winter nest that the poet Burns refers in his exquisite stanzas addressed to a mouse whose nest had been destroyed by his ploughshare, and beginning,

"Wee, sleekit, cow'rin', tim'rous beastie."

Such, indeed, is the fate of many a winter nest. Supposing, however, that the creature should be snapped up by the kestrel while out in search of food, the nest will be deserted, but it will not be wasted. There are always beings who are glad to find a ready-made burrow which will save them the trouble of excavating one for themselves. Among them are several species of wasp and humble-bee, most of whose nests are made in the deserted burrow of the campagnol.

Here, again, is an example of the manner in which the life-histories of dissimilar animals



A CORMORANT STRANGLED BY AN EEL.

the head. The tail is only about one-third as long as the body—a peculiarity which has earned for it the popular name of "short-tailed field-mouse." A more appropriate name for it is "campagnol."

Even in this country the campagnol is apt to be one of the worst foes of the agriculturist, especially at harvest and seed time.

Not only does it devour the ripe corn in the field, but it makes its way into ricks and barns, and eats large quantities of the gathered corn. Moreover, just after the seed-corn has been sown it digs the grains out of the ground, thus doing mischief which is often attributed to the sparrow and other small birds. In France, however, where not a kestrel, or, indeed, any unprotected bird, can be seen, the campagnol can carry out his depredations without hindrance, and consequently increases until it becomes an actual plague. In the Department of Aisne alone a few years ago the fields were honeycombed with the burrows of the animal, and the farmers spent some seventy thousand pounds in ridding their fields of the nuisance. First poison was laid down; but so many hares and rabbits were killed that another plan had to be tried. Stacks of hay and straw were then made, containing quantities of poisoned carrots, turnips, and beetroot. The agriculturists, therefore, had to pay heavily for doing that which the kestrel would have done to a great degree, if they had suffered it to live and carry out its appointed work in preserving the balance of Nature.

The owls, again, are determined enemies of the campagnol, more than half the food on which they and their young live being composed of these mischievous little animals.

are linked together. Few persons would think that there could be any connection between the wasp and the kestrel, and yet our walk along the banks of our brook has shown us that such is the case, and that the connecting link is the campagnol.

Like the water-vole, the campagnol lays up a store of winter provisions, not in its living-room, but in a chamber excavated for the purpose. The treasure-house sometimes contains a very miscellaneous store, the fruit of the hawthorn and wild rose being the staple.

Cherry-stones mostly form a large proportion of the stores, as many as three hundred having been found in a single chamber. The mode in which the campagnol obtains the cherry-stones would hardly be suspected except by those who are in the habit of watching the varied phases of animal life.

The chief purveyors of cherry-stones are the blackbird and thrush.

Both these birds are exceedingly destructive among the cherry crops, as I know from personal experience. My study overlooks a number of fine cherry-trees, one of them being so close to the house that by leaning out of the window I can touch the fruit with an ordinary walking-stick. As soon as the fruit ripens, the thrush and blackbird hold high festival, eating the cherries from the branches and feeding their young with the ripe fruit.

It is really amusing to watch the proceedings of the birds, especially the unmerciful manner in which the young birds peck their parents when they considered that they are not fed fast enough. Neither young nor parent is in the least afraid of me as I sit at the open window, so that I can see every movement.

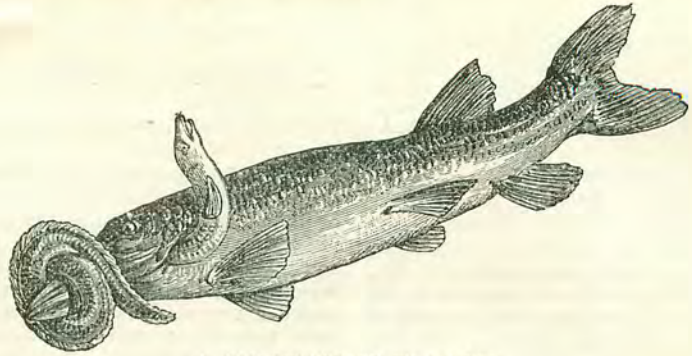
Sometimes the entire cherry is pulled off the branch, but when the fruit is very ripe the soft portion only is eaten, the stone still being attached to the stalk. In either case, the stone will be sure, sooner or later, to fall to the ground, whence it is picked up by the campagnol and added to its store for the coming winter.

Here, again, is a link connecting together the life-histories of the blackbird, thrush, and campagnol. Furthermore, it affords an example of the care that is taken that nothing on the earth shall be wasted.

Whenever a living being has no further use for anything which once was connected with its life-history, there is sure to be some other animal which wants it and is waiting for it.

We have already seen how the abandoned winter nest of the campagnol is utilised by the wasp or humble-bee, and we now see that when the blackbird and thrush have abandoned the cherry-stones as useless to them, there is the campagnol waiting for them and ready to carry them off to the store-chamber which it has previously prepared.

Beside the winter nest, there is the summer nest, which is primarily intended for the reception and nurture of the young. This, like the corresponding nest of the squirrel, is made of slight materials and loose structure, so that



A PIKE STRANGLED BY AN EEL.

the air is freely admitted. It is generally composed of grass blades, which have been torn in strips by the campagnol. It is globular in shape, and is mostly placed on the ground, amid concealing grass or herbage.

There is, however, before me a photograph of the nest of a campagnol, which was discovered in a very remarkable position, and made of very unusual materials. It was found in a garden store-house at Castle Carey, by the Rev. W. Smith-Tomkins, Vicar of Durstow. He kindly sent me a copy of the photograph, together with the following description—

"Bedford Villa,
"The Shrubbery,
"Weston-super-Mare.

"August 8th, 1886.

"This nest of the short-tailed field-mouse was found by me a few years ago on a heap of barley straw, which was used to cover a small store of potatoes. Its chief interest to the finder, in addition to its beauty, consists in this. It was all manufactured out of one kind of raw material, namely, the leaves of the barley straw, which the maker shred up into thin threads according to her taste, so as to suit the different parts of the structure. There was no other material available for use.

"The mouse had found its way into the storehouse through a hole under the wall. I am sorry to say that she was killed when found, and before the nest had been used for its proper purpose. Two or three weeks before I had looked over the place, and she had not commenced operations.

"On referring to 'Homes without Hands,' I find it stated by Mr. J. J. Briggs that he could never find an entrance to the interior (the nests being closed up, as you say is the case with the nest of the harvest mouse). I infer from this, that it is due to its incompleteness that the entrance in this case is open and visible, and that its structure is therefore so open to inspection."

With the description and photograph Mr. Tomkins sent a few portions of the nest, some of the barley leaves being of their original

width, and others split up into fibres as fine as ordinary sewing cotton. In a subsequent letter he states that the hole through which the campagnol made her entrance into the house opened into the stable yard of a neighbour.

Its mode of eating the provisions which its stores is rather remarkable. It would naturally be supposed that, as other beings (including man) do, it would eat the thick, soft, and sweet exterior of the "hip" or fruit of the wild rose, and reject the hard, small seeds, with their fluffy envelope. But it does just the contrary, eating the seeds and rejecting the exterior.

When in America in 1884, I saw a flock of pine grosbeaks busily feeding upon the berries of the mountain ash at Worcester. Very pretty they looked, the rosy plumage of the two or three males contrasting boldly with the dark, sombre green of the many females. I should not have noticed them but for their mode of feeding.

It was at the beginning of February—the very depth of a New England winter. I had to make my way up a rather steep hill, and over paths which, by reason of constant traffic over snow, were as slippery as ice. Many persons are in the habit of scattering sand or pulverised brick on the paths, and seeing, as I fondly thought, a few yards of the latter material, I gladly made my way towards it. To my disappointment—on that ground at least—I found that the red material was not brick, but the soft, external part of the mountain ash berry, the birds only eating the seeds, and allowing the rest of the fruit to fall to the ground.

Then, the campagnol has a remarkable way of eating the cherry stones.

When the squirrel eats a nut, it nibbles off a little piece of the sharp end, inserts the edges of its incisor teeth in wedge fashion, and splits the nut in two. The campagnol begins like the squirrel, but when it has bitten off the end of the cherry-stone, it does not split the shell asunder, but in some way of its own contrives to get the kernel out.

(To be continued.)





THE BROOK AND ITS BANKS.

BY THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

CHAPTER V.

The bank-vole—A long-tailed field mouse—Its varied diet—Insect-eating—Robbing a moth-hunter—Treacles and their visitors—The voles as climbers—The water-shrew—Signification of its name—Habits of the water-shrew—Its activity and grace in the water—Teeth of the shrews—Structure of its ears—Mode of swimming—The flattened body—Colour of the water-shrew—Its food—The shrew and the rat—An unfounded accusation—Burrow of the water-shrew—Superstitions regarding the shrews—The shrew ash—Land-shrews—The shrew-mouse—Distinctive structures—Mortality among shrews—Killing shrews with shovels—The pigmy shrew—Our smallest mammal.

AS might be expected from its name, the BANK-VOLE (*Arvicola glareolus*) is to be sought upon the banks of our brook. As its tail is nearly as long as that of the common mouse, it is often called the "long-tailed field mouse," and it may easily be distinguished from a true mouse which does inhabit the country by the shortness of its ears, the bluntness of its snout, and the white colour of its paws.

It has many of the habits of the campagnol, but its diet is more diversified, including insects, worms and snails, and it is accused of eating young birds.

A rather startling incident, showing its insect-eating proclivities, was witnessed by my son, Theodore Wood, some years ago.

In those days he was an enthusiastic lepidopterist, and was in the habit of going out at night "treacling" for moths. This process is simple in principle, though rather difficult in practice. Many moths are irresistibly attracted by the odour of treacle mixed with the newest and coarsest rum. The moth-hunter, therefore, mixes treacle and rum, and at night paints with the mixture the trunks of suitable trees. Attracted by the odour, the moths fly to the bait, swallow the sweet mixture greedily, and become so intoxicated that they either fall or can be picked off the tree with the fingers.

Now, the "treacler" has many enemies. Slugs of the most portentous dimensions descend from their hiding places in the tree, and absorb the treacle just as if they were so many hungry leeches fastening on a plump and thin-skinned patient. Toads sit in a row round the trunk of the tree, waiting to snap up any moth that falls. The bats soon learn the value of a treacled tree, and sweep rapidly by it, whipping off the pre-occupied moths as they pass by.

On one occasion my son caught sight of a

bank-vole, which had climbed up the tree and was taking its share of the spoil.

All the voles are admirable climbers, as indeed is necessary, in order to enable them to gather the corn and fruit of the hawthorn and wild rose. Their paws grasp the corn stems or tree twigs as if they were hands like those of the monkey, and they run about the slender branches of the hedges and shrubs that line the banks like monkeys among the trees of their native forests.

Like the campagnol, they make globular nests of grass, which may be found among the herbage of the bank by those who know where and how to look for them.

JUST as the ordinary farmer lumps together half-a-dozen species or so of small birds, under the comprehensive title of "sparrows," so do most people consider that every animal which labours under the misfortune of being small in dimensions, brown in colour, and having a tail appended to its body, must be either a rat or a mouse, according to its size.

No one can be familiar with the banks of any brook without being acquainted with the pretty little WATER-SHREWS, which, like their relatives of the land, are almost invariably considered as mice, although, as we shall presently see, they are not connected in any way with the creatures which they superficially resemble.

If the observer will pick out some spot where he can be tolerably screened, and where the water of the brook is clear and rather shallow, he will be very likely to come upon the water-shrew (*Crassopus fodiens*). Both of these names are very appropriate. The first, or generic, name is of Greek origin (as all generic names ought to be), and signifies "fringe-footed." The name is due to the fringe of stiff hairs with which the feet are edged. A similar fringe is found on the lower surface of the tail. As these fringes are white, they are very conspicuous. Their object will presently be seen.

The second, or specific, title is (as all specific titles ought to be) derived from the Latin, and refers to the habits of the species. It signifies a digger or burrower, and alludes to its custom of digging burrows in the banks of the brook in which it loves to disport itself, and where it obtains much of its food.

As with other creatures, absolute stillness and silence is required on the part of the observer before the water-shrew will even show itself. Though there may be plenty of the little animals within a few yards, not one will be visible. But in ten minutes or thereabouts

the silence will reassure them, and they will make their appearance on the bank.

I have seen them playing with each other on the bank of a rivulet which at that time was so dried up by want of rain that the water was scarcely a foot in width. They were almost within reach of my hand, and I could easily have killed one or two with a stick. But as I prefer watching the habits of animals to killing them, they continued their pretty and graceful evolutions undisturbed.

Being sociable little creatures, a single water-shrew is seldom seen, and, if the observer should detect one of the animals, he may be tolerably certain that it will presently be joined by others. They are as playful as kittens, and, in their way, quite as graceful, their lithe bodies and active limbs being able to assume as many varied attitudes as may be seen in a family of kittens at play.

They chase each other over the bank, pretend to fight fiercely, squeaking the while as if wounded to death, just as puppies will do when playing and making believe to be hurt. Then one will jump into the water, and dive, as if to escape, while one or two others will pop in after it, and chase it under water.

Indeed, on the occasion which I have just mentioned, the whole proceedings reminded me forcibly of the games in which the boy-swimmers of Oxford were wont to indulge for the best part of a summer's day.

One of our favourite games was for one to dive into the Cherwell (mostly from the top of a pollard willow), and then for the rest to dive after him, and try to catch him under water before he had swum a certain distance. We used to shriek in our sport quite as much, and as loudly in proportion to our size, as the water-shrew squeaks, and I cannot but think that if any being as much superior to man as man is to the shrew could have watched us, we should have amused him much in the same way that the shrew amuses us.

In his admirable work on the British mammals, Mr. Bell states that the water-shrew will dive into a shallow, rippling stream, and run over the stones, pushing its long snout under them, and turning them over, should they be small, for the sake of dislodging and capturing the fresh-water shrimp (*Gammarus*), and then carrying it off to the bank and eating it with an audible, crunching sound.

I have not personally observed the creature engaged in this sub-aquatic hunt, though I have often seen it dive, and have been near enough to note its singularly beautiful aspect as it wriggles its irregular way under the surface.

Air is largely entangled among the hairs of its body, the imprisoned bubbles looking just

like globules of shining silver. The water-spider, which is also a common though unsuspected inmate of the brook, is adorned in a similar manner when it dives.

No one can watch these pretty little creatures without being interested and amused. But amusement ought not to be our sole object in observing the inhabitants of a brook. Let us catch one of the animals and keep it long enough to examine it. There is little difficulty in capturing a water-shrew, as the little animals are so fearless when they think themselves unobserved that a small hand-net can easily be slipped over them in their gambols. We need not keep our captive long, and, after inspecting the characteristic fringe of the feet and tail, we will examine its head and jaws.

A mere glance at the head ought to tell us that it cannot be a mouse, no mouse having a long, pointed snout, which projects far beyond the lower jaw. On opening its mouth and examining its teeth, we not only see that it cannot be a mouse, but that it is not even a rodent. It is, in fact, much more nearly related to the hedgehog than to the mouse. All its teeth are sharply pointed, and the lower incisors project almost horizontally forwards. The animal must, therefore, be predacious in character, and a comparison with the structure of other animals shows that it belongs to the important though not very numerous group of the insectivora, or insect-eaters, of which the mole is the generally accepted type. There are, however, some systematic zoologists who hold that the shrews, and not the moles, ought to be the typical representatives of the insectivora. This, however, is a matter of opinion, and its discussion does not come within the scope of our present undertaking.

Before we release our captive, we will examine its ears.

These are small, as are those of all water-inhabiting mammals, but there is a peculiarity in their structure which is worthy of notice. They are furnished with three small valves, which, being made on the same principle as those of the heart, are closed by the pressure of the water as soon as the animal dives below the surface, and open by their own elasticity when it emerges.

Now, we will allow it to escape into the water, and take note of it as it swims away.

I have already casually referred to the irregular course which it pursues in swimming. This is due to the fact that the water-shrew drives itself along by alternate strokes with the fringed hind feet, so that its progress reminds the observer of that of a boat propelled by two unskilful rowers, who have not learned to keep time. Still, its pace is tolerably rapid, though it lacks the steady directness which characterises that of the water-vole.

Another remarkable point in its swimming is that the outstretched legs cause the skin of the flanks to be widened and flattened in a way that reminds the observer of the flying squirrel when passing through the air. Although in the water-shrew the skin is not nearly as much flattened as in the squirrel, it is expanded sufficiently to alter the shape of the creature in a notable manner.

Supposing the observer to be tolerably familiar with the terrestrial shrews, he must have been struck by the blackness of the fur of the back, and the contrasting whiteness of the under-surface. So strongly, indeed, is the contrast marked, that an exceptionally dark variety was long considered as a distinct species, and called the "oared shrew."

Like the insectivora in general, the water-shrew is not at all particular in its diet, providing it be of an animal nature. As most of us know, the hedgehog, although its normal food consists of insects, snails, and the like,

will feed on frogs, toads, mice, and even snakes and blindworms. So will the water-shrew, if it can be fortunate enough to find the dead bodies of any of these creatures, for it is not sufficiently powerful to kill them for itself.

In Mr. Bell's work, to which reference has already been made, there is an interesting notice of the carnivorous habits of the water-shrew.

An ordinary rat had been caught and killed in a steel trap, and upon the body of the rat was perched a little black creature, which proved on examination to be a water-shrew, which was trying to make a meal upon the rat. It had already bored a hole in the side of the rat, and was so absorbed in its task that it suffered itself to be touched with a stick without being alarmed.

This little animal does not restrict itself to the neighbourhood of water, but is often found at some distance inland. It has been accused, and I believe with justice, of devouring the eggs of river fish, a crime which, as I have already mentioned, is wrongly attributed to the water-vole.

Although we may see the water-shrew swim away and disappear below the surface of the water, we may watch in vain for its reappearance. As is done by the duckbill of Australia, the animal always makes several entrances to its burrow, one of them being on the side of the bank, below the surface of the water. It can, therefore, enter or leave the brook without being observed.

All the shrews, whether of the land or water, were at one time the objects of universal dread, and even the toad and blindworm could scarcely be more feared.

As one old writer remarks, in his sweeping condemnation of the animal, "It beareth a cruel minde, desiring to hurt anything, neither is there any creature that it loveth, or it loveth him, because it is feared of all."

It was held to be the special foe of cattle, biting their hoofs while in the stall and running over their bodies as they lay chewing the cud in the field. A cow over which a shrew had run was said to be "shrew-struck," and to fall straightway into a sort of consumption, accompanied with swellings of the skin.

The disease, being caused by the shrew, could only be cured by the shrew, the usual mode of treatment being to burn the animal alive and rub the cow with the ashes. As, however, a shrew might not always be at hand when a cow was taken ill, the ingenuity of our forefathers devised a plan of having essence of shrew always within reach.

A shrew was caught alive, and a hole bored into the trunk of an ash tree. The shrew, which must be still living, was put into the hole, the entrance to which was then closed with a wooden plug. As the body of the shrew decayed, its virtues were supposed to be absorbed into the tree, so that a branch of a "shrew ash," or even a few leaves, were supposed to be an effectual cure if laid upon the suffering animal.

The tail of a shrew, when burned and powdered, was considered as a certain remedy for the bite of a dog; only the tail must be cut from a living shrew.

I have already made casual mention of the shrews of the land.

Two species of land-shrews are recognised as inhabitants of England. One is the common SHREW, or SHREW-MOUSE (*Sorex vulgaris*), which for a long time was thought to be identical with the water-shrew. The fringed feet and tail, however, afford

sufficient indications that it is a distinct species.

Towards the end of autumn there seems to be quite a mortality among the shrews, their bodies being plentifully strewn about the roadways and paths across fields. Why this should be so no one can tell, though many conjectures have been offered, one absurd theory being that man and the shrew are so antagonistic to each other, that when a shrew tries to cross a pathway made and used by man it dies from sheer antipathy.

This fact was known to Pliny, and Topsell, the old writer who has already been quoted, is of opinion that when a shrew dies in a cart-rut, the finder should not fail to secure so valuable a prize.

"The shrew which by falling by chance into a cart road or track doth die upon the same, being burned and afterwards beaten or dissolved into dust, and mingled with goose-grease, being rubbed or anointed upon those who are troubled with the swelling coming by the cause of some inflammation, doth bring into them a wonderful and most admirable cure and remedy."

The same author mentions its predacious habits, and states that it is especially fond of the putrid flesh of the raven, the French using it as a bait, and killing numbers of shrews as they are feasting on the dead bird. He is especially careful to mention that the deluded shrews are killed with shovels.

The third species of British shrew is the PIGMY-SHREW (*Sorex pygmaeus*), which is even smaller than the harvest mouse, and is the smallest of all the British mammals.

I have mentioned the three species, because until quite recently much confusion reigned concerning them and their habits, and much difficulty has been found in disentangling them.

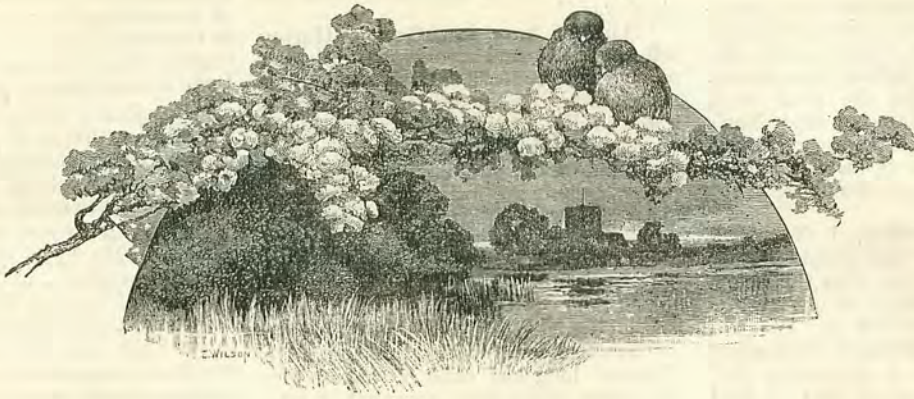
For example, no distinction had been recognised between the common shrew and the water-shrew, while the pigmy-shrew was thought to be the young of the common or erd-shrew, and an exceptionally large specimen of the water-shrew was supposed to be a separate species, and distinguished by the name of oared-shrew.

So, by means of carrying out our study of the water-shrew we have not only found much that is interesting and amusing, but have added something to our knowledge of animal physiology.

(To be continued.)



NEST OF THE CAMPAGNOL.



THE BROOK AND ITS BANKS.

BY THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

CHAPTER VI.



previous remarks on the life-history of the campagnol show how one creature is dependent upon another, and how, when the habitation of the campagnol is abandoned by its excavator, a tenant is sure to be found as soon as the dwelling is vacated.

Such is also the case with the burrow of the water-vole, should the animal fall a victim to the pike or heron, and a more fitting or picturesque tenant cannot be found.

This is the KINGFISHER (*Alcedo hispidus*), a bird which is far more plentiful than is generally suspected.

It may seem somewhat

strange that the most brilliantly coloured of our British birds should be able to pass its life and rear its young in the vicinity of human habitations, and yet that its existence should be unknown to the resident population.

Yet I have seen this to be the case, even the country people who lived within a few hundred yards of a Kingfisher's nest hardly being able to believe their eyes when I showed them a handful of the eggs.

To the frequenter of the Brook and its banks hardly any sight is more familiar than that which is so admirably described by Faber:—

"There came
Swift as a meteor's shining flame,
A kingfisher from out the brake,
And almost seemed to leave a wake
Of brilliant hues behind."

FABER: *The Cherwell.*

As the bird darts along its horizontal course just above the surface of the water, its flight is so swift that it looks just as if a blue streak had been drawn through the air.

Fortunately for us, the Kingfisher is one of the few brightly-coloured birds which lose none of their brilliance in flight.

Those who have watched the humming-birds when darting through the air with speed even more rapid than that of the Kingfisher, or hovering before some flower into which they are plunging their long tongues, say that they give scarcely any indications of their gemlike plumage, but look as sombre of hue as the brown humming-bird moth, which is so plentiful in the autumn.

But the Kingfisher looks, when on the wing, as bright, or, if anything, even brighter, than it does when at rest.

Possessed though it may be of the most vivid blues, greens, red, and white, these colours are so artistically blended that even those who know the bird intimately can seldom state the exact colouring of each part, but are obliged to give a general idea of it, and say that it is green above and red below.

I know the bird well enough, and have more than once described its colours; but even now I should not choose to write the details of its hues without reference to the bird itself, or some description which had been written by a competent observer.

No one afflicted in the least degree with colour-blindness, a malady which is far more common than is generally supposed (as is shown by the reports of examinations in colour which have to be passed by candidates for the army, navy, and appointments on the railways), would make anything of the description of a Kingfisher.

Without going into needlessly minute details, we may say that the head and back of the neck are deep green, relieved by a number of blue spots upon the tips of the feathers. The shoulders are dark green, and the rest of the back is verditer-green, the tail being dark blue. The wings are coloured like the head. When the bird is darting along on its arrowy flight, the eye cannot separate these colours, and, brilliant as is the tinted streak when the

sun is shining, it is impossible to say whether the hue be green or blue.

If we turn the bird over, and examine the under surface, we shall see that the throat is nearly white, and the remainder is ruddy chestnut. There is also a conspicuous white streak passing from the eyes to the back of the neck.

Though these colours are so remarkably arranged, the general effect is that of bluish-green upon the back and red below, and it is very strange to find so many people who must have seen the bird make the most extraordinary mistakes when they mention its colour. No one would expect that Mary Howitt, for example, who is essentially a poet of the country, would have written of the "scarlet plume" of the Kingfisher. I fancy that at the time she must have been thinking of the woodpecker.

Now let us try to watch the Kingfisher as we have watched the water-vole, the campagnol, and the water-shrew.

There is not the least difficulty in doing so, as the Kingfisher is, when understood, a bird which has but little fear of man, and, indeed, seems to prefer the neighbourhood of human habitations.

I have seen it darting over the surface of the water in the desolate "creeks" of the mouth of the Medway, and rather wondered to see it so far from human habitations. But, I afterwards learnt that upon some of the many islands which are formed by these creeks, and which, from the level of the water, appear to be totally deserted, there is a series of small settlements, only approachable by boats at high water, on account of the deep mud which surrounds their banks.

If, while sitting quietly on the bank of our brook, we catch a glimpse of the blue-green flash of a Kingfisher's back, and will remain where we are without moving, we shall be tolerably certain to see the bird again, and probably be able to track it to its nest, or at all events to its favourite fishing spot.

As its name implies, the bird lives almost entirely on fish, which it catches in a very ingenious manner.

Selecting some object which overhangs the water, it takes its perch upon it, and with its big beak sunken on its breast, awaits the approach of its prey.

Suddenly, it may be seen to drop from the perch into the water, and to emerge with a fish in its beak. Returning to the perch, it bangs the fish against it, throws it up in the

air, catches it with its head downwards, and swallows it.

When anyone sees for the first time the Kingfisher catching its prey, and has taken his ideas on the subject from illustrated books, he is always surprised at the manner in which the bird catches the fish.

Artists invariably represent the Kingfisher as darting at its prey with its head downwards, just as if it were a diver taking a "header" into the water. Whereas, the bird simply lets itself drop into the water. Then there is a great splashing, and presently the bird emerges with its prey.

It always has some favourite perch, so that when it is once seen in the act of fishing, it may be watched whenever the observer can spare an hour.

It might be imagined that on account of its brilliant hues, the Kingfisher must be very conspicuous on its fishing perch. This, however, is not the case. I have often passed a place where the bird was sitting, and have been startled by its sudden rising.

Brilliant as it may be, it is singularly inconspicuous. Though the statement may seem a paradox, all practical lepidopterists know that there is nothing so difficult of detection as a white moth on a black fence, and *vice versa*, and perhaps on the same principle, the brilliant colours of the Kingfisher are a safeguard to the bird.

I have already stated that just as a thrush has a favourite stone on which to break the shells of his snails, so the Kingfisher always has his favourite perch from which he watches for the fish first, and against which he can bang them into insensibility when caught. Seated on this perch, he really seems to feel that he is "monarch of all he surveys." Another passage from Faber's "Kingfisher" (containing a playful allusion to the bird's name) may be appropriately quoted here:

"Thou hast a fair dominion here, Sir King,
And yon tall stone beneath the alder stem,
Seems a meet throne for a gay crowned thing
That wears so well its tawny diadem."

It is to be wished that all poets had been equally observant, for they really seem to vie with each other in depicting the bird in so absurd a fashion that no one could recognise it.

Perhaps we need not be very much surprised when Cowper (essentially the poet of the town) describes the Kingfisher as catching its prey in the ocean, or when Savage, another poet of the town, ranks the Kingfisher among the songsters; but, it is more than startling when Shelley, of all poets, represents himself as having seen two Kingfishers clinging with their backs downwards to a branch, and *feeding upon its berries*.

Poetry and fact are as much at variance with each other regarding the nesting of the bird. Many of my readers will remember the graceful legend of Alcyonē, the daughter of Neptune and wife of Ceyx, who for love of her drowned husband plunged into the sea, and was changed into a Kingfisher, together with him. Since that time, the Kingfisher has always lived near water, and always with a single mate.

Around this legend many others were accreted, especially as regards the manner in which the bird makes its nest and rears its young.

It was thought to build on the sea-shore a very light and fragile nest, which, when finished, was launched upon the waves. As so fragile a structure would be shattered to pieces by the slightest storm, it was thought that from seven days before the winter solstice to seven days after it, the weather was perfectly calm. This period was known by

the name of "Halcyon days," a term which is frequently used by those who have no idea of its derivation.

When the bird had hatched its young and abandoned its nest, the mysterious nest itself (which, from the description was evidently the empty shell of the sea-urchin, surrounded with its multitudinous spines) was considered a very valuable medicine.

Those of my readers who would care to follow out the subject will find much quaint and interesting information in Pliny's Natural History, Book 10, and in Ovid's Metamorphoses, Book 2, "Ceyx et Alcyone in Aves."

The real nesting place of the Kingfisher is in a singularly prosaic locality, namely, in a hole in the ground, mostly, but not always, in the bank of the brook. Still more prosaically, the Kingfisher will always, if possible, take advantage, as I have already mentioned, of the deserted hole of a water-rat, so as to save itself the trouble of burrowing.

Within this burrow, and at no great distance from its mouth, the nest of the Kingfisher is made. The material is supplied by the bird itself, being nothing but the bones of the fish which it has eaten, and which have been ejected as is the custom with predacious birds. These bones are arranged into a circular shape, and upon them the eggs are laid. I have seen an assertion to the effect that the object of this bony platform, for it scarcely deserves the name of nest, is to keep the eggs from being swamped in case the river should rise after heavy rain. But, as the thickness of the nest is seldom more than an inch, and often much less, it could be no protection to the eggs in case of a flood, which might raise the level of the water several feet. It is simply intended as a platform on which the eggs and newly-hatched young may be kept from contact with the cold ground.

Those who care for making collections of birds' eggs always consider that a Kingfisher's nest is a prize. The bird is wonderfully prolific, hatching seven or eight young, and being capable of furnishing twice that number of eggs, if they be taken a few at a time. The colour of the eggs is almost invariably said to be glossy white. So it is in a cabinet, but not in the nest. When newly laid, the eggs are of a delicate pinky hue, the yolk being partly perceptible through the diaphanous shell. But when the eggs are "hard set" they are whitish-grey, and when "blown" for the cabinet they become white, like notepaper. I have, however, contrived a plan by which the lovely translucent pinkness can be perfectly restored. Here is the plan.

First, empty and thoroughly wash out the interior, not by a hole at each end, a practice which destroys the exquisite contour of the egg, but through a single hole in the middle of one side. This is very easily done. Get a piece of common glass tube from a chemist, about fourteen or eighteen inches in length. About three inches from one end hold it in the flame of a spirit lamp, if you have one, or, if not, in the flame of a gas burner. You must bring it very gradually to the flame, or it will break. When it is red hot, draw your hands apart steadily and rather slowly, and you will be able to draw out the tube in two pieces, each with a pointed end. Take the longer of the pieces, and break off the point at any spot which will leave an aperture sufficiently large to admit an ordinary darning needle. This we will call the "washing tube."

Now make in one side of the egg a hole just large enough to admit the point of the washing tube easily. For this purpose there is nothing like a sailmaker's needle, which is triangular and can be used as a drill by being twirled between the finger and thumb.

Next, with a long darning needle (which is

easier of management if the eye end be thrust into the handle of a camel's hair brush) break up the yolk entirely, and stir it up with the white. Now suck some water into the washing tube, introduce the end a very little way into the egg, and blow the water into the egg. This must be done very gently and steadily, and by degrees the entire contents will be washed out by the same hole. Put the egg aside until it is thoroughly dry, which will probably occupy several days.

Now take some white wax, melt it, and mix it very thoroughly with powdered lake or carmine. It should be several shades darker than the intended colour of the egg, as the shell will lessen the depth of hue. When it is well mixed, heat it nearly to boiling point, and heat also the egg and a washing tube. Now draw up some of the hot wax into the tube, and blow it into the egg. A very little wax—say the third of a saltspoonful—will be amply sufficient for one egg.

Next hold the egg over the spirit lamp or gas, or before a fire, and keep turning it between the fingers until the coloured wax is equally distributed over the inner surface of the egg. When you see that all streakiness has disappeared, withdraw it very carefully from the heat, and allow it to cool, taking care to keep turning it until the wax has set.

The effect is magical. The opaque, dead whiteness, which was as the pallor of a corpse compared with the glowing tints of the living being, will have disappeared, and in its place will be found the original pinkness, restored as it was before the egg was emptied of its coloured contents.

The same process will restore the colour of the eggs of the swallow tribe, wrens, etc., the ground hue being naturally a delicate pink, which degenerates into dead white when the eggs are emptied.

Now, if the reader should wish to prepare an object which will be an ornament to any museum, he can do as the late Mr. J. Gould did many years ago, and procure a perfect nest of the Kingfisher, with the eggs. Here is the plan which he employed, and which the reader can adopt.

By means of a stick measure the distance of the nest from the entrance of the burrow, and then cut down carefully upon it from above. Should there be any portion of a nest in the hole, remove it, so as to force the bird to begin afresh. Replace the sod carefully, and take precautions that it shall not be broken in by anyone inadvertently treading on the spot.

Watch the burrow, so as to be quite sure that the birds are still at work, and wait for at least three weeks. Then take with you an abundant supply of cotton wool, a small dark-coloured plate, and an ordinary butcher's knife, such as can be bought for sixpence. Now with the stick fill the whole of the burrow with cotton wool, and then remove the sod above the nest. When Mr. Gould did so, he found that he had secured the parent bird, as well as the eggs and nest. By means of the knife scrape away the earth under the nest, and gradually insert the plate. With judicious handling you will then have been able to remove the nest uninjured. Empty the eggs, and line them with coloured wax, as has already been described, replace them on (for we can hardly say in) the nest, cover them with a suitable glass, and you will have an object of much beauty and surpassing interest. It will be as well to place the eggs very carefully on their sides, so that the single hole through which they were "blown" shall not be visible, and also to fasten them to each other with a tiny drop of diamond cement or gum tragacanth, so that they shall not be shaken apart by any casual jar.

The chief obstacle to success lies in one word—

Boys.

Should the nest be made in any bank to which boys can have access, your operations cannot escape their prying eyes, and, even though they gain nothing, they will take a mischievous delight in thwarting you. So, unless the brook should run through your own grounds or through those of a friend, I do not recommend the attempt at procuring a perfect nest of the Kingfisher.

Now for a word as to the nature of the hole in which the Kingfisher makes its simple nest. Some observers have said that the bird always employs the deserted burrow of the water-rat, while others are as positive that it always makes its own burrow, one writer stating that he has watched the Kingfisher for thirty years, and has "never seen an instance of its taking up with the abode of its most deadly enemy, the water-rat."

As is often the case in Natural History, the Kingfisher here plays the part of the shield with the gold and silver sides. The bird can and does make its own burrow, but it also does avail itself of the deserted burrow of the water-rat. Why the water-vole, which, as we have already seen, feeds on vegetable substances and has been execrated by the riverside agriculturist for robbing his stores of beets, turnips, beans, grapes, etc., should be termed the most deadly enemy of the Kingfisher, is more than I can understand.

Here again is an example of the wonderful manner in which the life-history of one animal is linked with that of another. We have seen how the swoop of the kestrel upon the fieldmouse gives a home to the humble bee, and we now see how the stroke of the heron's beak upon the water-rat's head assists the Kingfisher in preparing a dwelling-place for her young.

It is scarcely necessary to mention that the material of the nest must necessarily depend upon the nature of the food. Although a bird which inhabits the bank of an inland brook will find an abundant supply of fish, and

therefore will form its nest wholly of their bones; another bird, which lives under different conditions, is obliged to accommodate itself to them. Thus, when the Kingfisher inhabits the banks of tidal rivers, the "shells" of shrimps are found to be mixed with the fish-bones. I have no doubt that if we were to open the burrows of the Kingfishers which I have so often seen among the creeks of the Medway, we should find that the nest was constructed almost entirely of the remains of shrimps and other small crustacea.

We have not yet quite finished with the Kingfisher, concerning which there still survives a superstition quite as remarkable as that which once existed respecting the "halcyon days" and the wave-borne nest. When the bird is killed and stuffed, its skin is supposed to possess the power of denoting the direction of the wind. I have several times seen in rustic cottages the stuffed skin of a Kingfisher suspended from a rafter by a thread fastened to the point of its beak, and, on inquiry as to its object, have been told that the breast always pointed in the direction of the wind.

Some centuries ago a similar custom prevailed, except that the bird was stuffed with extended wings, and suspended by the middle of its back. Its beak was then supposed to point to the wind. Dryden, for example, alludes to this superstition in his "Hind and the Panther."

"And here his corpse, unblessed, is hanging still,
To shew the change of winds with his prophetic bill."

Many such passages might be quoted; but I will content myself with one from Shakspeare. In *King Lear* time-servers are described as men who

"Turn their halcyon beaks
With every gale and vary of their masters."

The Kingfisher is one of the birds which, as far as is known, sings only upon the wing. Perhaps some of us might not be likely to call the sharp, quick cry of the bird by the name of song. But we must not judge other creatures by ourselves, and the short scream of the flying Kingfisher may be as sweet a melody to its mate within her burrow as is the song of the soaring skylark to his spouse upon her nest amid the grass.

I have never been fortunate enough to see the brood of young Kingfishers sitting near the nest, and hungrily piping for their food. But those who have done so have always been delighted with the sight, and I only hope that my readers may watch the Kingfisher in its haunts with better success in this respect than has hitherto fallen to my lot.

I cannot take leave of the Kingfisher without an allusion to the diminution of its numbers, which is caused by the fashion of using the stuffed skin as an article of feminine adornment.

The humming-birds suffer greatly from the demand for their skins. I have before me a figure drawn from the specification of a fashionable milliner for a lady's evening dress. It is trimmed with long rows of stuffed humming-birds, and there are even several humming-birds on her fan. This is bad enough. But the skins are those of the male birds only, the females being too dull of colour to be used as ornaments. Consequently, none of the skins are those of mother birds, whose young are left to die of hunger. But as the plumage of the female Kingfisher is quite as beautiful as that of her mate, a Kingfisher's skin on a lady's dress, or in her hat, may well be the representative of seven or eight young birds which have been starved to death.

(To be continued.)

TINNED MEATS: THEIR VALUE TO HOUSEKEEPERS.

By A. G. PAYNE, Author of "Common-sense Cookery," "Choice Dishes at Small Cost," "The Housekeeper's Guide," &c.

PART IV.

THE subject of tinned meats is a much larger one than many persons will suppose. Indeed, there are probably few grocers whose business it is to trade in tinned provisions who are aware of the vast variety of meats, and by meat we include fish, that can be obtained in tins. For instance, suppose you were to go to your ordinary grocer and ask him if he has some tinned tripe, tinned whitebait, and some tinned sage and onions to oblige you with, as you happen to be out of these articles, the man will probably stare, and in his innermost thoughts will either accuse you of intoxication or insanity. Still, these goods are to be obtained in London, and can be obtained, should any grocer take the trouble to apply to some very large provision merchants who deal in tinned goods in a wholesale manner. The reason why these goods are never met with at ordinary grocers in this country is that they are almost entirely made for the purpose of exportation. It would be quite possible to be asked out to dinner in some central part of India, and to find the table supplied with fresh filleted soles and whitebait, the former of which had been caught off Dover and the latter off Blackwall. I will, however, enlighten you on the subject by giving you a list of the various articles

which can be obtained in tins, about which you have probably never heard except in their—so to speak—natural state. The following can all be obtained in tins, but, as I have said before, are usually kept for exportation to foreign countries, though they can be obtained in this country if they are ordered specially through any ordinary grocer. Of course you have all heard of fresh salmon in tins. To this you may now add fresh trout, fried eels, stewed eels, fresh lobster, Blackwall whitebait, fresh cod, fresh eod roes, fresh haddock and mackerel, as well as filleted and fried soles, and fresh turbot. Among the vegetables which will probably be unknown to exist in tins to most of our readers; we may mention beetroot, tinned onions, carrots plain, and also carrots with gravy, parsnips, and turnips, as well as sage and onions.

Under the head of beef we can obtain in one pound and two pound tins the following variety: beef à la mode, boiled beef, boiled beef and vegetables, brisket of beef, corned round of beef, minced collops, ox cheek, ox cheek with vegetables. Also, in addition to ordinary tinned roast beef and spiced beef, with which you are mostly acquainted, you can get in tins stewed beef, stewed kidneys, stewed rump steak, as well as fresh tripe, and tripe with onions.

Under the heading of mutton, in addition to the ordinary Australian mutton, we can have boiled mutton with vegetables, haricot mutton, hashed mutton, Irish stew, lamb and green peas, and, strange to say, we can have tinned mutton chops, and, I almost shudder as I mention it, we can have Scotch haggis in tins.

We are often told that tinned goods are specially useful for long voyages. We will suppose a rough day in the tropics and a seasick passenger. Imagine the steward proposing under these circumstances a tinned Scotch haggis! The idea is too horrible!

Under the heading of veal we can have in tins boiled veal as well as boiled veal with vegetables, calf's head with ham; veal minced, roast and stewed with green peas; veal collops, and veal cutlets. Hams are also tinned whole, and in the remotest parts of India York hams can be served, varying in weight from ten to fourteen pounds, whole, either cooked or uncooked, thanks to this wonderful invention. I have simply run through a list of goods that can be obtained in tins, though at the same time I would remind you that in this country, practically speaking, most of them are no use, as they can be obtained cheaper and better in their natural state. Still, we must remember that, as I origi-

THE BROOK AND ITS BANKS.

By THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

CHAPTER VII.

Hedera-dash—A Wiltshire "burnie"—Bandusia—The Cataracts—An unexpected discovery—The DIPPER, or WATER OUSEL—Nesting of the Dipper—A "cool grot and mossy cell"—Eggs of the Dipper—General habits of the bird—Its mode of feeding—The FRESH-WATER SHRIMP—Its marine relatives—Its mode of life—The Dipper in the North—A game-keeper's indictment—Various names of the Dipper—Its structure no clue to its habits—Song of the Dipper.

NOT very far from the Shrivensham station, in Wiltshire, there is a tiny brooklet, or, as Burns would call it, a "burnie," on the banks of which I have many a time watched the water rat, the wagtails, the kingfisher, and the graceful antics of the water shrew.

* Though small, and sometimes after a prolonged drought, reduced in places to less than a yard in width, it never is quite dried up, as is the case with more pretentious streams at no great distance. In one place it runs under a road which skirts the lower portion of a hill, and then plunges down some five feet, so as to form a waterfall on a small scale. Then, it rushes down a steep incline over stones of considerable size, and after twenty yards or so makes another plunge of two feet or so, and then flows on tranquilly over comparatively level ground. Ivy and moss grew profusely along the banks, almost concealing the first of the two waterfalls. It was a singularly picturesque spot, and I made a very rough and, unfortunately, hasty sketch of it, which is now before me.

We called the place by a variety of names.

The more classical among us called it "Bandusia," in allusion to Horace's exquisite and untranslatable ode. It is true that no ilex was there, nor even holly, though there were oaks which might take its place. There were plenty of the "hollowed stones."

—"unde loquaces.
Lymphæ desiliunt tunc."

Some, in whom the niceties of the Latin tongue were imperfectly developed, called it by the name of Hedera-dash, an expressive, though hybrid term.

Then, the two little waterfalls were dignified in allusion to the Nile, with the name of the "First and Second Cataracts." However, the name of "Hedera-dash," like the equally hybrid but convenient word, "bicycle," prevailed above the others, Bandusia falling into undeserved disuse; while the First and Second Cataracts were seldom named, the single word Hedera-dash being used collectively for the whole of the spot as far as the smooth water.

One afternoon, while feeling under the ivy fringe that shaded the first cataract, I came on a soft, rounded cushion of peculiarly smooth moss, and presently discovered a small round hole in it. On inserting my finger, a bird suddenly dashed out into my face, startling me exceedingly, and almost making me lose my footing. There could be but one bird which would make such a nest in such a situation, and I knew, without needing to see it, that I had accidentally discovered the nest of a "DIPPER" or "WATER OUSEL" (*Cinclus aquaticus*).

In accordance with the usual custom of the Dipper, the bird had covered its domed nest with fine moss, and had arranged its position so that it should be always wet with the spray of the waterfall, and should be kept as fresh and green as if it had originally grown there.

The nest of the dipper, indeed, really seems as if it had inspired the poet with the familiar words:

"Here in cool grot and mossy cell
We rural fays and fairies dwell."

In the nest were several white eggs, of which we took one or two, leaving one as a nest egg which would encourage the mother



THE WATER OUSEL.

bird to complete her full number of five before she began to sit.

I afterwards found another Dipper's nest near the Swindon Reservoir, but at a much greater distance from the water than is usually the case with the nest of this bird.

Let those who are fortunate enough to meet with a Dipper watch it carefully. It cannot well be mistaken for any other bird, looking, as it does, very much like a thrush without its tail. As it finds its food chiefly in swiftly rippling brooks, it mostly inhabits the more northern parts of England and Scotland, where the country is hilly, and consequently the brooks run swiftly over their stony bed.

It is not an easy bird to watch, its sober plumage of brown above and white below rendering it peculiarly inconspicuous.

Moreover, it has a way of slipping into the water in a quiet fashion, and when there, behaves in a manner entirely different from

that of the kingfisher. The latter bird watches for a fish from above, "flops" into the water, and immediately returns to its perch, being in the water only a few seconds, and never chasing its prey below the surface. Whereas the Dipper prefers to run, or jump into the water, forcing itself below the surface, and working its way up the stream by the united use of its feet and wings, its plumage being studded with little air bubbles, like those of the water-shrew and water-spider. As it goes along, it searches diligently for small aquatic insects and molluscs, turning over the smaller stones, so as to dislodge any living creatures that may be hiding under them. Among the animals which constitute its rather miscellaneous diet are water snails, small fish, and especially the many species of beetles that inhabit the water, either in their perfect or larval states. The bird also seizes upon the "caddis worms" which crawl on the bed of the stream, but in order to get at the white grubs, it is obliged to carry the caddis together with its case to shore, and then to pull the tough case to pieces.

A staple article of its diet is the so-called "FRESH-WATER SHRIMP" (*Gammarus pulex*), a not very distant relative of the Sand-hopper, whose lively gambols on the seashore are so familiar to all who have walked along the sands at the edge of the receding tide.

It is sometimes called the Fresh-water Screw, because, when taken out of the water and laid on the ground, it cannot leap like the sandhopper, or even crawl on its legs. All it can do is to lie on its side, and kick itself round and round, leaving a corkscrew-like line of water on the ground. Several allied species are common on the seashore, and when laid on the sand, trace similar patterns on it, instead of jumping about and then burrowing under the sand, as is done by the sandhopper. The Fresh-water Shrimp is one of the inhabitants of the brook, whose very existence is often unsuspected, although there is scarcely a square foot of the brook's bed which does not contain one or more of these interesting crustacea.

The Fresh-water Shrimp has a singular mode of obtaining its food. It wriggles its way under stones, searching about until it is assured that no more food is to be obtained. Then it emerges from beneath the stone, and allows itself to be carried for a foot or two down the stream. Then it arrests its progress, and with a peculiar jerking movement, forces it way up the stream again until it has found another stone under which it may renew its search for food.

Just above Erith there is a little stream which once had a place in history.

Springing from a "holy well" at Lessness Heath, it ran swiftly down the spur of Shooter's Hill, at the extremity of which is situated Erith Church, and then spread and deepened until it formed the "Eare-Hythe," or "Old Harbour," in which the celebrated "Great Harry" used to lie at anchor.

It is now narrowed to a tiny brooklet, which crosses a footpath between Erith and Belvedere. A small bridge is now built over it, but for some years after I came to live in the neighbourhood, it was only crossed by a

single plank not more than a few inches above the surface of the water. Hundreds of pedestrians crossed the brook daily, and yet I never spoke to one who had noticed that the Fresh-water Shrimp absolutely swarmed in the shallow, rippling brooklet over which they had been accustomed to pass for years.

As to the Caddis worms, which have been casually mentioned, their remarkable life-history will presently be described.

The Dipper has often been denounced as feeding on the eggs of trout, salmon, and other valuable river fishes, and, in consequence, it is placed on the list of the many creatures which the gamekeeper classes under the very comprehensive title of "vermin," and shoots whenever he sees them.

This is especially the case in Scotland, where the salmon is jealously protected. But, although many of these birds have been dissected during the spawning season, nothing has been found in their digestive system except insects, molluscs, and fresh-water shrimps.

In Scotland the Dipper is one of the commonest birds that can be found in the neighbourhood of water. It goes by various names, one being the "Water-crow," or sometimes

the "Water-pyot," while in many places it is actually known as the "kingfisher!" The Dipper is notable for being one of the few birds whose appearance belies their character. There is literally nothing in its general appearance, or in any detail of its external or internal structure, which gives the least indication of its aquatic habits.

When a bird seeks for its food beneath the surface of the water, we naturally expect that its feet will be webbed, and the plumage close and compact, like that of the ducks, geese, penguins, and other diving birds. Yet, there is nothing either in the feet or feathers to distinguish the Dipper from any of the land-frequenting thrushes.

Apparent anomalies of a similar kind are to be found both in the animal and vegetable kingdoms, as we shall see in the course of this work. I may, however, mention here that the common cormorant affords an example of an anomaly of an opposite kind. The webbed feet of the water birds are especially made for propelling their owners through the water, and are little suited for locomotion on land, while they seem to be utterly unfit for perching on branches. But, although the cor-

morant has webbed feet, and is as awkward a walker as any duck, goose, or swan, it yet has the power of perching on branches, a remarkable fact which has been noticed by Pliny, and has been introduced into "Paradise Lost" by Milton. Describing Satan's entrance into Eden, the poet has the following passage:—

"Thence up he flew, and on the tree of Life,
The middle tree, and highest that there grew,
Sat like a cormorant; yet no true life
Thereby regained, but sat, devising death."

Another remarkable point about the Dipper is, that it is a singing bird,—the only instance, as far as I know, of an aquatic bird possessing the power of song. Though tolerably familiar with the Dipper, I have never been fortunate enough to hear it sing. Its notes are not loud, but are bright and lively, and are mostly to be heard in the early morning. It sings when perched, mostly choosing a stone near the water, and accompanying the song with various lively gestures.

(To be continued.)

VARIETIES.

THE QUEEN'S KINDLY WAYS.

"A wonderful good woman to her servants is the Queen." Such was the remark of the wife of one of the lodgekeepers in Windsor Forest to one who was lately talking with her. She had been a servant in the royal establishment, and was now comfortably provided for. "The Queen came several times to see my husband when he was down with rheumatic fever at Osborne," continued the lodgekeeper; "and the princesses often brought him oranges and jellies with their own hands." Many others have had cause to say, "A wonderful good woman to her servants is the Queen." In the "Queen's Journal in the Highlands," both in the text and in footnotes, there are many kindly references to those in her service, even when in very humble situations.

When she was at Holyrood Palace in Edinburgh in 1885, Her Majesty drove to Dalkeith, the home of the Buccleugh family, the heir of which, the Earl of Dalkeith, had recently lost his life by a sad accident. She took a wreath to lay on his tomb, and also on that of the good Duke of Buccleugh, whom she had long known. But, some years before, she had paid the same tribute of affectionate remembrance at the grave of a young Italian dressing-maid who had died in her service. She was buried

at Rosebank Cemetery, and the Queen had caused a chaste and simple monument to be erected over the grave. To this she drove from Holyrood, and it was an incident of affecting interest to see the Queen of England paying the heart's homage at the tomb of a humble domestic."—*From Dr. Macaulay's "Victoria R.I., Her Life and Reign."*

TO OUR EDITOR.

I am a cat: Miss Jetty Vogel's cat;
What think you, gentle editor, of that?
With fox-like tail, and tufted paw and ear;
With mane and ruff when wintry days are here.

A Persian cat of somewhat mixed descent;
Argent and azure in my 'scutcheon blent.
Argent my coat, my optics azure are;
Sure charms like these condone the adverse bar!

Azure mine eyes; at least, one eye is blue,
The other greenish-gallery in hue.

But what of that? Two blue eyes they aver

Make pussies deaf when linked with snowy fur.

And now each mouse beneath the floor I hear,

Each gentle epithet delights mine ear;

And when each month the G.O.P. is read,
With joy I hear the editor hath said
That Persian cats require the tenderest care,

With sympathy, soft bed, and dainty fare,
I purr approval; nor can I complain
Of aught shortcoming in domestic reign.

For twice five years the household joy and pride,

My fads respected and my wants supplied.

Warm'd is my saucer, lest the milk be chill,

Fish, poultry, veal, my little platter fill.

My sole complaint when on Bank Holiday
With drum and fife the band pursues its way;

Distraught with fear, I up the chimney fly,
Emerging, what a sorry wretch am I,

Till, rubbed with flour, my coat regains its hue—

This wrinkle owe we, gentle sir, to you.

I fain would come and visit you in town,
At Paternoster Row to light me down,

But cannot, for my too majestic weight
Exceeds the parcel post's extended rate;

So send three hairs, plucked to suggest the rest,

Where beats my heart within my snowy breast.

ANSWERS TO CORRESPONDENTS.

MISCELLANEOUS.

JANET.—We advise you to join the Young Women's Christian Association or the Girls' Friendly Society, which have reading-rooms, homes, and restaurants in London. The secretary of the former is Miss Mary Weitbrecht, 17, Old Cavendish-street, Oxford-street, W., and the secretary of the latter is Miss Wright, 3, Victoria Mansions, Victoria-street, Westminster, S.W.

AMY ROBERT.—It is not proper to ride out alone with any man to whom you are not engaged, excepting a very near relative.

A. B. C.—Your verses are not written according to the rules of metrical composition.

JENNIE.—Whistling is not well-bred, either practised by man or woman. But in absolute privacy at home many things may be permitted, and this among them. At the same time we meet with certain rare instances in which it has been raised to a really beautiful art, and then it is sanctioned even in society as a curious accomplishment.

MISS NAPPER.—We have given a long series of articles

on the principles of good breeding and the various details in which it should be exemplified, in every circumstance and position of life, as well as on etiquette as it obtains in the highest circles of society. They began in vol. i., with the "Art of Letter-writing," and are some of them headed "Duties." Five of them appeared in vol. ii., six in vol. iii., three in vol. iv., four in vol. v., six in vol. vi., etc. The whole series has not appeared in the magazine nor in separate form as yet.

MABBIE.—Your letter is most discreditable to you in every way. At sixteen you are only in the position of a schoolgirl, and have no claim whatever to do as you like. Your stepmother must be obeyed and respected, and your father should insist on it. It would be wise to send you to school.

AMY B. AND IVY.—The 1st and 2nd vols. of the "G.O.P." are entirely out of print, and so likewise are all the indexes, excepting for vols. vi. and vii., and none of these will be reprinted. But chance volumes and indexes may be obtained at booksellers' shops and stalls. Write to our publisher, Mr. Tarn, for the 3rd volume.

INQUISITIVE.—We suppose that the landscapes represented on the advertisement placards of the Ozokerit candles must be of some place either in Moldavia or Wallachia, as the mineral (*hydro-carbon*) is found in those countries. Its suitability for the purpose of distillation to produce a substance available for candle-making, was discovered and introduced towards the end of the year 1871.

ADA (AND OTHERS).—Sodor (from *Sodor-eyes*, "South Islands," i.e., the *Æbrides* or *Hebrides*) as distinguished from the Orkneys, or "North Islands." In the year 1113, the Southern and Western Islands were united to the Isle of Man, having been previously made an Episcopal Diocese (in 1098) by Magnus, King of Norway. But the Isle of Man is said to have had its own distinct Episcopal See since about the year 360. We have given this answer before.

AN INVALID.—Dr. Jäger's address is 4, Prince's-street, Cavendish-square, W. They would send you all particulars as to the several dimensions and thicknesses of their hygienic undergarments. We cannot advertise prices.



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PRICE ONE PENNY.

THE BROOK AND ITS BANKS.

By THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

CHAPTER VIII.

SHOULD the reader be investigating one of the stilly flowing Brooks about the beginning of Spring, and take up his post of observation near any part where it widens into a sort of pool, is edged with reeds or bulrushes, and is sheltered by overhanging branches, he will probably see one of the most entertaining birds that are to be found in the water.



This is the LITTLE GREBE, more popularly called the DABCHICK (*Podiceps minor*). Formerly it was known by the appropriate and expressive name of "Didapper," i.e., Dive-dapper, a title which is used by Shakspeare,

"Like a didapper peering through a wave,
Who, being looked on, ducks as quickly in."

Pope also mentions the bird, but in terms

so absurdly at issue with its habits, that I fancy that he derived all his knowledge of it from the passage which has just been quoted. Even though he did live on the banks of the Thames, he could never have seen the bird, or he would not have written such lines as these:—

"As when a Dab-chick waddles through the copse,
On feet and wings, and flies, and wades,
and hops,"

Pope, however, was a Londoner, pure and simple, and had no eyes but for the inhabitants of streets.

The bird is by no means easy of approach, and those who are able to watch it must have made much progress in the arts of silent approach and motionless observation, as already described. Supposing the reader to have gained such a post as has been mentioned, and is silently scanning the dark pool, suddenly there pops up like a cork a little dark bird, which restlessly paddles hither and thither with a quick, jerky movement, and as suddenly vanishes, like a coin from a juggler's hand. After a long interval, up it pops again, swims about for a short time, and again dives, not even raising a splash.

So instantaneously can it dive, and so keen is its eyesight, that Captain Mayne Reid mentions that when as a boy he was shooting Dabchicks with an old fashioned flint-gun, it was necessary to mask the pan with a piece of paper (much to the detriment of the aim), the bird diving at the flash, and being safely under water before the shot could reach it.

When below the surface it swims, or rather flies, with astonishing velocity, the wings being used as much as the feet, just as I have seen the guillemots act when under water. The bird is much more at home in the water than on land, and if it did find itself in a copse, might perhaps waddle in its attempts to reach the water, wherein would be its true refuge, but its legs are much too short for wading, and it can no more hop than a sparrow can dive. Pope seems to have been taken by the sound of the name, to have known that the bird had something to do with water, and then to have evolved the Dabchick out of his inner consciousness.

The feet of the Dabchick, as is the case with all the Grebes, afford a remarkable compromise between the feet of the terrestrial and aquatic birds. In most of the water birds all the toes are joined by a broad web, as in the familiar examples of the ducks and geese. But, in the Grebes, each toe is separate, three of them having a web at each side, so as to give to the toe the appearance of a leaf.

I have mentioned the spring as being the best time of year for watching the Dabchick. This is because at the approach of summer it mostly leaves the brook and takes to rivers, lakes, and similar waters, where it can hardly be seen at all except with the aid of a glass, and where its movements beneath the surface are wholly out of ken.

On the banks of such waters the Dabchick makes its nest, so that the wanderer by the Brook will have little if any chance of seeing it. Even if he should visit the lake or river, he would not be likely to recognise the nest, even if he should see it. For it does not look like a nest. To all appearance it is nothing but a dirty heap of half decaying reeds, loosely tumbled together as if left by the retreating waters after a flood. So exact is the resemblance, that even experienced ornithologists have been deceived by it, and have passed by the nest without suspecting its real character.

The fact is, that the unsightly looking, and unpleasant smelling heap, is not the nest at all. The real nest lies beneath the reeds, which are intentionally placed there by the

bird for the purpose of hiding the eggs. They have a singular effect on the eggs which they conceal.

When first laid the eggs are pure white, but in a very short time they become stained by the damp reeds which are laid over them, and darken into brown, mottled more or less with yellow. A newly-laid egg of the Dabchick which still retains its whiteness, is extremely rare, inasmuch as no process at present known can discharge the stains and restore the egg to its original whiteness.

It has been thought by some ornithologists that the Dabchick does not sit upon her eggs, but merely covers them so as to hide them, and then leaves them to be hatched by the joint influences of the sun's rays and the heat evolved from the decaying reeds.

This theory is, however, contradicted by those who are intimately acquainted with the bird, and who say that it is sufficiently wary to detect a foe at least half a mile, so that the two birds would have plenty of time to cover their nest with the reeds which were already prepared, and then to slip away silently through the water after their wont. Perhaps some of my readers may be enabled to settle this disputed question.

Like many other birds, the Dabchick has two different suits of clothes, one for the summer and the other for the winter, the former being much the handsomer of the two.

YET another aquatic bird which does not betray in its structure any indication of its mode of life.

In the same still, reed-fringed portions of slowly flowing brooks which shelter the dabchick, the WATER-HEN or MOOR-HEN (*Gallinula chloropus*) may almost certainly be seen. Like that bird, it prefers wider waters, such as rivers and lakes, for nesting purposes, the Brook scarcely affording sufficient shelter, but at other times of the year the brook affords such abundant stores of food, that the bird abandons the river and returns to the brook.

Watching the Water-hen is a very different business from surprising the dabchick in its haunts, as the bird is not nearly so suspicious, neither does it possess the astonishing powers of diving that distinguish the dabchick.

Still, it is a wary bird, and affords good practice to the lover of Nature in watching animal life without alarming the creature that is under investigation. When, however, its wiles, of which it has not many, are learned, it is easily watched by those who will take a little trouble.

In the Isis, Cherwell, and their many tributary brooks the Water-hen abounds, and as most of my boyhood and early manhood were passed in Oxford, I had many opportunities of tracing the life-history of the bird.

Like many other creatures, the Water-hen knows instinctively when it is detected. When its sharp ears are alarmed by an unguarded footstep, or, still worse, by the voice of an intruder upon its haunts, its first idea is to slip aside unseen. So it paddles silently to the nearest bank, glides under the shadow of the overhanging foliage, where its dark plumage can hardly be distinguished, and steals off until it thinks itself in safety.

Sometimes, when the cover is insufficient for this manoeuvre, it dives to some distance, always making for some floating foliage or growing water plant, and then rising very gently under shelter of the leaves, only permitting its beak to appear above the surface, so as to allow it to breathe.

In order to retain itself securely in this position, and yet to avoid betraying its locality by the slightest movement, it grasps with its long toes the stems of the water plants, and so is able to baffle the keenest eye.

A trained water dog may detect it and drive it from its refuge, but I presume that our ob-

ject is to watch the bird and not to frighten it, and we shall attain our purpose by patient waiting. If, when the Water-hen dives, we do not stir, but content ourselves with keeping a close watch on the surrounding objects, we shall presently be rewarded by seeing it rise slowly and cautiously to the surface, glancing suspiciously in all directions, and then, having assured itself that no foe is near, it will swim about as freely as ever.

Should an intruder come suddenly on the bird while it is swimming, it seldom dives, but darts off horizontally on the wing, flying with unexpected speed just above the surface, and mostly allowing its feet to trail in the water. A most startling effect is produced by this sudden flight, and more than once I have seen gunners so disconcerted by the bird starting up under their eyes that they have allowed it to get out of shot before they recovered from their surprise.

Like the kingfisher, the Water-hen lays seven or eight eggs, but takes so little trouble to conceal them that I really wonder how the bird continues to maintain its place in the country.

For nesting purposes it seldom remains near the brook, but betakes itself to rivers, and preferably to lakes or very large ponds well fringed with vegetation. Still, I have found many of the nests on the banks of the swiftly-flowing river Dove, so beloved by trout-fishers, and so celebrated for its frequent mention in Walton's "Angler."

As to the nest, it hardly deserves the name, being nothing more than a quantity of sticks, reeds, and leaves put together without the least attempt at art. In, or rather on, this nest, which is little more than a platform with a slight hollow in it, the bird lays a great number of eggs, yellowish brown in colour, and spotted slightly with reddish brown. Six or seven is the usual number, but I have more than once taken eight eggs from a single nest. The bird always has two broods in one year, and sometimes brings up a third, if the weather be propitious—a fact which may account for its numbers.

When the young are hatched, they are quaint little beings, looking like round balls of dark down, rather than birds. As soon as they leave the egg-shell they tumble themselves into the water, and are at once as much at home as if they had been swimming for years.

Sometimes the nest is made too far from the water for the newly-hatched young to traverse. They can swim well enough when once in the water, but their limbs are not as yet capable of bearing them over land. The long toes of the parent are now used for another purpose, the bird picking up its feeble offspring with them and carrying them to the water. She will sometimes even carry her eggs in the same manner. The bird has been seen in the act of carrying two young at the same time, one grasped in each foot.

She is rather capricious as a nest builder, and, like the wren, will occasionally make more than one nest before she is satisfied. Even after the nest has been completed and some of the eggs laid, she has been known to build another nest at some distance, and then transfer the eggs with her feet.

After heavy and continuous rain, the rivers are apt to rise so high that the nest would be swamped and the eggs destroyed. The Water-hen, however, has an instinctive prevision of a flood, and increases the thickness of the nest so as to keep the eggs out of the water. The same remarkable instinct has been noticed in the swan. While engaged in the task of adding to the nest, the birds divide the task between them, one remaining by the nest and acting as architect, while the other brings materials.

The all-useful toes of the bird serve yet

another purpose. Though so good a swimmer and diver, the Water-hen does not possess webbed feet. The extremely long toes, however, afford so much resistance to the water that the web would only add to the weight of the feet without sensibly increasing their swimming powers.

Though so wary a bird, the Water-hen, like many other creatures, soon finds out its friends, and will voluntarily seek the habitations of man.

Some years ago, one of my friends had a house in Sussex, the garden running down to the edge of a brook. Poultry of various kind were kept there, and among them was a pair of Water-hens which came to be fed as regularly as any of the inhabitants of the poultry yard. They began by striking up an acquaintance with the ducks in the water, and then by degrees accompanied them on land. I have seen them running about on the lawn in front of the house as much at their ease as any of the other birds.

THERE are two other aquatic birds which are often confounded with the Water-hen. One of these is the COOT (*Fulica Atrata*), which in size, shape, and general habits resembles the water-hen almost as much as the crow resembles the rook.

Strange to say, the characteristic by which the birds can be distinguished is the same in both cases, namely, the colour of the base of the beak. In the water-hen there is a large dark red patch at the base of the beak, while in the Coot the corresponding patch is white, and very conspicuous, especially if the sun be shining on the bird, just as the white base of the beak distinguishes the rook.

The Coot is not so often seen in brooks as the water-hen, and I do not know of any instance of its nesting in such a locality. Moreover, the water-hen remains in the same locality throughout the year, while the Coot is one of the partially migrating birds, haunting the brooks, rivers, and lakes during the warm weather, but betaking itself to the mouths of tidal rivers as soon as the cold weather comes on, knowing instinctively that it will find plenty of food among the young flat-fish, shrimps, and other inhabitants of estuaries.

As to the nest of the Coot, though I have examined many of them, I never found one which could be approached without wading or the assistance of a boat. I have tried both plans, and prefer the boat.

No one who studies even a tiny brook must be averse to wading when occasion demands, but the wading which is required in reaching a Coot's nest is of the most unpleasant character. The nest is always placed at some distance from the shore, and is mostly based on a foundation of growing reeds or sedges. I have found many of them on small tussocks just rising out of the water, crowned with rushes, and surrounded by sedge.

Now, the bed of the large and shallow pond where the nests are placed is necessarily of a muddy nature, and wading through mud is by no means an agreeable process. Mud is always slippery, and always studded with bits of sticks, stones, the shells of fresh-water mussels, water snails, etc., etc., on which it is not pleasant to tread with bare feet.

Then, you never know from one step what is likely to happen at the next step. You may

come upon a patch of comparatively firm ground, or you may slide down into a hole a couple of feet in depth, in which latter case you will to a certainty measure your length in the water, either on your face or on your back as the case may be, and will find no slight difficulty in getting up again.

If you take a boat, a punt is the best for the purpose. It only draws an inch or two of water, a valuable property in the shallow waters which the Coot frequents, and it is so heavy that its weight will force a path through the sedges, which, when growing thickly, form a wonderfully strong barrier. I have more than once vainly attempted to drive a skiff through a sedge bank. The sedges seem at first to yield, but they suddenly recoil, and then drive the boat back again, in a most exasperating manner.

The nest of the Coot is very similar in appearance to that of the water-hen, but is of rather stronger make. It is simply laid on the reeds or sedges, and is not attached to them in any way, so that if the water should suddenly rise, the nest floats away with the bird still sitting on it.

In the defence of its nest the Coot displays great courage, as is shown by Mr Alex. Duncan in the "Naturalist's World" of Oct., 1884.

"On the 27th of February this year, a pair of Coots inhabiting the rushes at our garden foot laid the foundation of their nest. They kept building it for a day or two, when I noticed one morning that the nest had disappeared. Not knowing what had occurred, I imagined that the birds had sunk it so as to form a strong foundation on which to build the superstructure. On the morning following that on which the nest had disappeared, a new foundation or layer of reeds was laid on the top of the old one, and the birds were busy during the whole of that day in enlarging and adding to the layer. Visiting the spot again the next morning, I saw that the nest had again disappeared, and that the birds, especially the male, were in a high state of excitement.

"They did not attempt to build any more on the old site, but began in another place, and I was surprised to see that the first bundle of reeds which they placed in position shared the same fate as those of the first nest. But next day the riddle was solved in an amusing way—to me at least—but not to the subjects of the joke.

"Standing on the newly laid down reeds was one of the tame swans kept for the ornamentation of the loch, and seemingly coolly choosing the site of the Coots' nest for its own occupation. It was bending down and breaking off all the reeds within its reach, and laying them crosswise, evidently just commencing to build its own nest. Of course this was the reason of the Coots' nest disappearing so often, as the weight of so large a bird as a swan was more than sufficient to sink it out of sight.

"But the best part of the affair is yet to come. The Coots all the while had been rushing about very excitedly in an aimless way, seemingly not knowing what to do. However, things had evidently come to a climax, for one of them, mounting the swan's back with a rush, began a most furious pecking and pulling about its upper regions, while its mate boldly charged it up in front in good style, forcing the swan to cease its labours

and defend itself. This it could not do very well, hampered as it was by the surrounding reeds, and by the dexterity of its small and nimble antagonists. It is needless to say that the Coots came off victorious, driving the large enemy ignominiously away—minus its dignity and a lot of feathers, which latter floated in the air like smoke after a battle—for a Coot, when roused, will fight with great pertinacity. The male of the pair I am writing about is a noted warrior in the tribe, thoroughly punishing all that venture near its chosen domain or mate.

"They were never molested again by the swans, one lesson being enough. But I am sorry to say that the nest, when it contained three eggs, was rifled, and the Coots began and finished another nest in deeper water, where it was secure from the egg-hunter, and where they successfully reared their brood."

I have already mentioned that when the two birds are swimming, the white patch on the base of the beak is a distinguishing mark of the Coot. When they are on land they can be easily distinguished by means of the legs. The feet of the Coot are grey, with a tinge of green, while those of the water-hen are dark olive green, gaining for the bird its specific name of *chloropus*, or green-footed. Then the Coot has part of the tibia orange yellow, while the corresponding portion of the water-hen is scarlet.

Even the shape of the foot differs. The toes of the Coot are shorter than those of the water-hen, and are slightly fringed with web on the sides, while those of the water-hen are entirely without web.

THE last of the three similar aquatic birds is the WATER RAIL (*Rallus aquaticus*), a bird which, like its first cousin in the cornrake, is tolerably plentiful but seldom seen.

Like that bird, it has an invincible repugnance to using its wings, and even when tracked up by dogs can hardly be induced to take to the air. It winds in and out of the foliage just as the cornrake does among the stems of corn, and when at last compelled to take flight, it only rises just high enough to clear the bushes, and flies quickly and horizontally with dangling legs, just as has been mentioned of the water-hen. Almost the only chance of seeing one of these wary birds is by sitting still and patiently waiting under cover of a bush near the water's edge.

It can at once be distinguished by its peculiar stooping attitude and its short unwebbed toes. The mode of walking, too, is rather peculiar, the little white-tipped tail being jerked upwards at each step, in a manner which much reminds the spectator of the action of a rabbit when running.

In his work on "The Birds of Ireland," Mr. Thompson mentions a case which shows that the Water Rail is, in spite of its shy habits when at liberty, even more capable of domestication than the water-hen.

He saw in a gunsmith's window at Belfast, a Water Rail running about in the window, and picking off the flies from the glass. It resented any interference, and when a hand was placed near it, struck fiercely at it with beak and feet. It seemed so thoroughly at home that Mr. Thompson was quite surprised when he found that it had only been captured on the previous day.

(To be continued.)



ferent thoughts I had left this very room but a few hours ago! How trivial all my little vanities and how small all my ideas seemed! What a small pivot they revolved upon! I had confidently expected to find Mr. Warren as little changed as I was myself. I found instead a transformed being—a man with a course of life marked out for him, but as yet dimly, and, oblivious of all else, he is straining his vision to try and discern whither it leads. How it could be shaped into practicable, useful, and glorious ends! Mr. Warren was no dreamer in its strictest sense. If he dreamed, it was but that, like Simon Tappetit advised, his dreams should be put into a realisable shape when he had shaken himself free of their fairy gossamer.

I could not at that time have put all this into words. Like a dumb animal that looks at you and cannot express itself, I was conscious of all this in some mysterious way, and the only form it took was a vague but intense longing—a longing to share in these wonderful ideas of his, to be admitted into his confidence, to try and help him to make clear much that remained obscure to him. Instead of this, so evident had been my pettiness and ignorance, that he had had to descend forcibly to the level of my intelligence.

I divested myself of my cherry-coloured bows. How could I have thought so much about them? How had I allowed my mind to become stunted by dwelling only upon little things? I looked inwardly at myself. My stock of know-

ledge was pitifully small. I had been "finished," it is true; but I began to realise that it is when one is "finished," that one's education really begins.

I was in this heavy-hearted mood when I seemed to remember something which till then had been forgotten. How often forgotten, how often remembered in the trials and perplexities of life!

I knelt down and buried my head in my hands for some time, and a feeling of calm quiet and trust gradually began to steal over me, so that it was not a very tearful face which lay on my pillow shortly afterwards.

And soon a restful sleep sought my weary lids, and shut out all troubles and trials for the time being.

(To be continued.)

THE BROOK AND ITS BANKS.

BY THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

CHAPTER IX.



THAT Brook is complete without its WAGTAILS, those graceful, lively, and prettily coloured little birds which are to be seen wherever a few inches of water exist?

Brook, river, lake, or pond are all the resorts of the Wagtails, whose food is mostly found at the edge of the water. Five species are known to inhabit England. The commonest of them is the PIED WAGTAIL, sometimes known as the DISHWASHER (*Motacilla Yarrallii*). In France the Wagtails go by the popular name of "Lavandieres," or Washerwomen, in allusion to the Continental custom of washing linen at the bank of a stream. In general shape, though not in colour, the Wagtail looks very much like a magpie seen through the wrong end of an opera glass, its long tail being very conspicuous.

The bird seems absolutely incapable of keeping its tail quiet, and immediately on alighting from the wing, or when tripping over the ground in pursuit of insects, flirts its long tail up and down with a peculiar jerking movement that can be recognised at a considerable distance. Why this bird should wag its tail up and down, while the duck wags its tail sideways, no one can conjecture.

Its flight is as peculiar as its walk, the wings being so short that at every stroke it sinks down towards the ground, so as to describe a series of deep curves as it flies.

It seems to be a most restless little bird, running here and there, picking right and left, and flitting about with ceaseless activity. Roads that happen to run near water are favourite resorts of the Wagtail, as there the bird can find plenty of the little insects on which it lives. Now and then it seems to borrow some of the habits of the flycatcher, perching on a stone and leaping into the air after the insects as they fly past it.

If you look closely among the banks of the brook, you will probably come upon the nest of the Wagtail. It is carefully hidden, and you may have some trouble in finding it. The bird is not very particular as to the exact

locality in which it places the nest, sometimes making it among the long grass, sometimes putting it among stones, and often placing it in a hole of an old wall. It is made of withered grass, fibrous roots and leaves, and is lined with various kinds of hair. Altogether it is a careless sort of nest, and displays none of the trim neatness which distinguishes that of the dipper. Indeed, it is hardly superior to that of the campagnol.

In one respect, however, it is more interesting than the dipper's nest. The eggs of the Wagtail are greyish white, speckled with brown. But among them may sometimes be seen an egg of much the same size, but of a dark grey, thickly mottled with reddish brown. This is the egg of the CUCKOO (*Cuculus canorus*), that very remarkable bird which, instead of building her own nest and rearing her own young, lays her eggs here and there in the nests of other birds, leaving to them the task of rearing them.

The oddest point in the life-history of the Cuckoo is the great discrepancy between the size of the Cuckoo and that of its egg. The Cuckoo is about as large as the kestrel, and, indeed, has often been mistaken for a hawk; yet its egg is no larger than that of a sparrow, the object of the very small size being to enable the Cuckoo to place its eggs in the nests of the various little birds which are chosen for this purpose. Birds seem to have but little sense of colour; for one of the birds whose nest is most frequently chosen by the Cuckoo is the hedge sparrow, whose eggs are blue and quite unlike those of the Cuckoo.

How the Cuckoo contrives to place her eggs in so small a nest was not known until lately. Now it has been ascertained that the Cuckoo first lays her egg on the ground, and then takes it in her mouth and lays it gently in the nest of the foster-parent.

The egg being so small, the young Cuckoo when first hatched is no larger than the young wagtail, redbreast, or hedge-sparrow; but, like the crocodile, which grows to a length of sixteen feet or so, and is hatched from an egg scarcely larger than that of a Muscovy duck, the Cuckoo grows with wonderful rapidity, so that there is not room in the nest for itself and the rest of the young.

Finding itself crowded, the Cuckoo deliberately pushes its foster-brethren out of the nest, and soon grows so large that there is

scarcely room enough in the nest even for itself. That it should be able to perform such a feat at so tender an age seems so unlikely that for a long time no one would believe it to be possible. However, it has often been watched, and the fact has repeatedly been proved. In the *Field* newspaper of July 28, 1883, the following communication appeared:—

"A Water-wagtail has lately built her nest in a flower-box at my window. She began to build about June 17, and on the 25th I saw a Cuckoo fly in and lay an egg in the newly-finished nest. On each of the four following mornings the Water-wagtail laid an egg, and two I took out of the nest. She began at once to sit on the three remaining eggs, and on the 11th and 12th of July they were all hatched.

"When two days old the Cuckoo turned one of the Water-wagtails out of the nest, and on our replacing it he turned them both out. The Water-wagtail continued to feed the young Cuckoo with great care, and one day she brought him a yellow butterfly. She chopped it up with her beak, but the Cuckoo would not swallow it until he had the whole of the butterfly in his mouth.—F. H., Hasfield Ledbury."

It is a remarkable fact that this habit of laying eggs in the nests of other birds belongs only to the Cuckoos of the Old World, those of America making their own nests and looking after their own eggs as respectable birds might be expected to do.

Mr. H. Bowdler Sharpe, the well-known ornithologist, explains our Cuckoo's habits in a very simple and interesting manner. Some little time before these lines were written he delivered a lecture at the Midland Institute, Birmingham. He stated that "from his own experience he believed that there were at least five males to every female Cuckoo that visited this country. The audience would therefore see that there were four unfortunate male Cuckoos who could not find a wife, and the consequence was that the female bird was continually chased by every one of the males, each requesting her to marry him and build a nest.

"In America there were not so many male birds in excess of the female, and the consequence was that the Cuckoos in that country built their own nests. The American Cuckoos did not lay their eggs and hatch them all at



once, as most English birds did, but would lay them at intervals, leaving the young birds first hatched to hatch the remainder."

Cuckoos' eggs, although they are rather prized by collectors, are much more common than is generally supposed, as may be imagined from the fact that they have been found in the nests of at least ninety species of birds. My eldest son once took two Cuckoos' eggs out of the nest of the same hedge-sparrow, the second having been laid two days after the first. I have also heard of two Cuckoos' eggs having been placed simultaneously in one nest. These were probably laid by two separate birds. I believe that many of the Cuckoos' eggs which are found are mistaken for those of the sparrow, and are, therefore, destroyed.

Again, I have noticed that in some years these eggs are tolerably plentiful, while in others scarcely an egg is to be found.

Watching the proceedings of the young Cuckoo and its foster-parents is a most interesting task, but one which is very difficult of accomplishment. The nest must, as has already been mentioned with regard to the king-fisher, be in your own domains, where mischievous boys will not be allowed to meddle with it. Even when we are fortunate enough to possess a spot where the birds can be protected and where a Cuckoo has laid its egg, there is still another enemy which is nearly as formidable as a boy, and that is the cat. Pussy is a charming animal, and I am very fond of her; but she is a determined bird-hunter, and nothing delights her more than getting hold of a nest of young birds.

Whenever the egg of the Cuckoo is found, it should be carefully protected, as the bird does inestimable service to agriculture.

Coming to this country in the spring, when the leaves are green and tender, it feeds almost wholly on caterpillars, especially the great hairy larvæ of the tiger-moth, which are so familiar under the title of "woolly bears." It also eats the larvæ of the vapourer-moth, which does such damage to fruit-trees, and whose clothing of stiff, bristly hairs, arranged in bundles, is an effectual protection against any bird except the Cuckoo. So if you should be fortunate enough to have a brook running through your own grounds and to find the nest of a Wagtail, or, indeed, of any small bird, you should keep a careful watch, in hopes that a Cuckoo may deposit an egg in the nest.

The mention of watching the nest brings me to another point. Ever observe Captain Cuttle's golden rule—

"WHEN FOUND, MAKE A NOTE ON."

Never be without your note-book and pencil, and never omit to note down even the most trivial incident. The day is tolerably sure to come when that little incident will prove to be of inestimable value, and may, perhaps, be the means of settling some disputed point in Natural History.

The value of your note-book will be doubled if you can draw, however rudely, the object which you are describing. You may probably be ignorant of its name, so that the incident will have no scientific value; but the sketch, together with the description, will enable an expert to identify the object, and so to make your notes a valuable contribution to science.

The habit of invariably sketching everything which you notice will be of the greatest personal service to you. It is comparatively easy to make a sketch of a tree or a flower, about which you can take as much time as you

like; but when you have to sketch a living creature, and especially when you wish to represent it in action, you must acquire the art of seizing the salient points and transferring them at once to paper, leaving details to be filled in afterwards.

If you happen to have seen the rough sketches which were taken by the artists of the illustrated journals upon the field of battle, you will understand the value of this art, which can only be acquired by constant practice.

SHOULD the brook be one of those which are favourable to the sedge and reed, there is another bird whose nest may mostly be found, and who is often obliged to play the part of foster-parent to the Cuckoo. This is the pretty though soberly-coloured bird known by the name of SEDGE WARBLER (*Sylvia phragmitis*). It is quite a little bird, only measuring five inches in total length. Its colour is simply brown of one or two shades above, buff on the breast and abdomen, and white on the throat. These sombre colours, together with its retiring and shy habits, render it invisible to the casual passenger, while those who are familiar with its ways have no difficulty in observing it.

While I was at Oxford, and in the habit of spending much of my "Long Vacation" on or in the river, I became quite familiar with the Sedge Warbler. In many places the reeds and sedges grew so luxuriantly that I often used to drive the boat among them until it was nearly hidden by the dense foliage, and there, myself hidden, was able to watch many a denizen of the water and the bank.

Among this herbage the Sedge Warbler was usually to be found, though less seen than heard. It mostly kept itself within shelter of

the reeds, seldom even showing itself above their tips. When there was a blank space, the Sedge Warbler would occasionally flit across it for a moment in its peculiarly restless manner, and immediately disappear among the sedge-blades. It is very liberal of its little twittering, guttural song, especially towards evening.

Although the Cuckoo manages to find the nest of this bird, human eyes have some difficulty in detecting it, as it is always well sheltered, and often placed in situations where it can only be approached by wading. A favourite position for this nest is a spot on the bank where it is overshadowed by a bush above and sheltered by reeds or sedges below. The eggs are pale brownish-yellow, mottled with dark brown, and are sufficiently like those of the Cuckoo to excuse the bird for failing to detect them.

ANOTHER most interesting bird may be found in similar localities. This is the REED WARBLER (*Salicaria arundinacea*), sometimes called the Reed Wren. In colour this bird somewhat resembles the sedge warbler, but may be distinguished by the redder hue of its back and the white streak over the eye.

Like the preceding bird, the Reed Warbler is by no means uncommon, though seldom seen except by those who know where and how to look for it. Following the same tactics as the coot, it makes its nest at some distance from the land, and places it in the thickest clusters of reeds, where it can with difficulty be seen, and where, even when detected, it can scarcely be approached, even in a boat.

The bird gathers together three or four of the strongest and tallest reeds, and weaves its beautiful nest upon them, always placing it at a considerable height above the water.

Now the reed is proverbially flexible, and bows unharmed before the storm which tears the branches off the elm and uproots the oak. What then is to become of the eggs and young of the Reed Warbler?

If you walk by the brookside on a stormy day, you may see the reeds all bending before the wind until their tips nearly touch the surface of the water. Among them will probably be several nests of the Reed Warbler, and yet not an egg or a young bird will be flung into the water. This object is attained by the peculiar structure of the nest, which, instead of being cup-shaped, as is the case with most of the warblers' nests, is exceedingly deep in proportion to its width, so that even in the severest gale, when the reeds are flung about like so many whips by the force of the tempest, the contents of the nest are retained within it.

(To be continued.)

VARIETIES.

WINNING WAYS.—Nothing is ever lost by being pleasant and agreeable. You ask for two pounds of steak—no more no less. One butcher growls that he can't cut off just two pounds, and you leave him thoroughly vexed. At the next stall the man of meat hears your request with unruffled visage, cuts off a pound and a half, throws it into the scale and out again in double quick time, rolls it up neatly and says, with a sweet smile, "Just two pounds, ma'am."

PLEASURE OR DUTY.

No, Jane, I cannot come to-day;

The mother needs me here at home.
Go with our schoolmates out to play,
And tell them, dear, I cannot come.

The household labour all day long,
Too much for her, belongs to me;
For mother is not now so strong
As, years ago, she used to be.

You're going up St. Dunstan's Hill,
The path we have so often tried—
Past the old weather-beaten mill,
And through the coppice by its side?

Among the bracken, while you're there,
Such lovely wild flowers you will see;
You'll find enough for all, so spare
One handful to bring back for me.

The sunshine's glorious and bright!
You'll all enjoy it while you roam;
'Twill give me just as much delight
In shining on my work at home.

—Ximena.

A CHEAP SEWING MACHINE.

A needle, if one consults a dictionary, is described as a small instrument for sewing. It may also, to suit a particular purpose, be termed a sewing machine, and an unprincipled American who adopted the latter description of it had undoubtedly a purpose of his own to serve. He was in want of money, and appears to have been fully aware that there are plenty of foolish people in the world who only require a trap to be set to fall readily into it.

His plan was an extremely simple one. He put an advertisement in one or two largely circulating American papers, stating that any person desirous of possessing an excellently-conditioned sewing machine would have the same forwarded for the sum of one shilling, sent to the advertiser in postage stamps.

The success of this ingenious little scheme for raising money was greater than the inventor of it had any right to anticipate, for one gathers from the American papers that "XXX" received numbers of answers to his advertisement with the required shilling. In return for this sum he conscientiously sent to each address what, from his point of view, was a well-conditioned sewing machine—to wit, a drill-eyed needle of superior quality.

A "B" AND A BULL'S FOOT.—Not to know a "B" from a bull's foot is a phrase implying that a person is very illiterate or very ignorant. The term "bull's foot" seems to have been chosen merely for the alliteration, as broomstick and battledore in the similar phrases, she does not know a B from a broomstick or from a battledore.

LOVE.

Love is like a lamb, and Love is like a lion;
Fly from Love, he fights; fight, then does he fly on;

Love is all on fire, and yet is ever freezing;
Love is much in winning, yet is more in leezing;

Love is ever sick, and yet is never dying;
Love is ever true, and yet is ever lying;
Love does doat in liking, and is mad in loathing;

Love, indeed, is everything; yet, indeed, is nothing.

Thomas Middleton.

A CURIOUS EPITAPH.

The following curious epitaph is from St. Benet's Churchyard, Paul's Wharf, London:
"Here lies one More, and no more than he,
One More and no more! how can that be?
Why, one More and no more may well lie here alone;
But here lies one More, and that's more than one."

IN PRAISE OF MUSIC.—A divine origin has been attributed to music on account of its originality, its universally beneficial tendency, and its innocence, even when cultivated to excess. No other art or science has so cheered the spirits of man, and so relieved a wearied mind as music. As to beneficial operation it leaves all other arts at a distance. Justly did a Greek author say, "Music is a great and a lasting pleasure to all who have learnt it and know anything about it."

Chappell.

EVENSONG.

THROUGH glowing curtains of the west
The sun sinks in the sea;
The gloaming dims the mountain's breast,
And deepens on the lea;
Slow hushing breezes sing of rest
In sweet, low songs to me.

The heavens are bright with stars that rise
And fleck the stainless blue,
Unmeasured miles of radiant skies
Their lights roll into view;
Kind angels look with watchful eyes
Their sweet, kind looks on me.

God is around me and above,
His infinite peace my rest;
Light as the wings of brooding dove
Sleep folds me on his breast,
With dreams that whisper words of love
In sweet, low tones to me.

I close my eyes on toil and care,
My heart from sorrow free,
For rest is here and heaven is there,
Maybe awaiting me;
Love weaves a song of praise from prayer,
And sings her song to me.

J. HUIE.

THE BROOK AND ITS BANKS.

By THE REV. J. G. WOOD, M.A., Author of "The Handy Natural History."

CHAPTER X.

Now let us find some spot where the surface of the brook is smooth, where it is well sheltered from the wind by bushes or luxuriant herbage, where the sun can shine into the stream, and where we can lie on the bank so as to bring our eyes close to the surface of the water.

Now let us look steadfastly into the water, and try to penetrate its depths. For the first few minutes we shall probably see nothing, and may be inclined to think that there is nothing to be seen. This, however, is a mistake, the fact being that human eyes require some little training before they become fitted for water-gazing. So do not be disheartened, but continue to gaze.

Before long you will first see one living creature traversing the depths. Then another will come into view, and another, and another, until at last the water, which at first seemed quite empty, will be seen to be absolutely teeming with life.

Which creature shall we take first?

The answer to this question depends very much on the time of year. Let us suppose, then, that we are in the spring-time, say about the middle of April, and that the weather has been warm and auspicious to animal life.

Here I must mention that, however closely we may watch the creatures in the brook, we must mostly remove them out of it if we wish, as we ought to do, to study them minutely. For this purpose we shall want a net, and had better make it for ourselves. The flimsy affairs which are recommended in the shops are simply "made to sell," and are practically useless.

The handle of your net should be at least five feet in length, made of the best ash, and not less than five-eighths of an inch in thickness. In using the net you are sure to include a quantity of heavy weeds, mud, etc., among your captures, and a slighter net will break with the strain.

Next, get a blacksmith to make a ring of iron, nine inches in diameter, about as thick as an ordinary brass stair-rod, and weld it firmly to an iron socket about four inches in depth, and just large enough to allow the end of the handle to be forced into it. Two holes should be made in the socket, one within half an inch from the mouth of the socket, and the other about three inches from the first. These are for the reception of screws, and it will be as well not to have them in the same line, so as to avoid the danger of splitting the wood. Give the iron portions two or three coats of "Brunswick Black" to protect them from rust.

The net itself should be made of "mosquito net," and ten inches in depth. It must not be pointed, but very carefully rounded at the bottom, as otherwise you will find great difficulty in taking out the creatures which you may capture, and which, as you will find, have a persistent way of crawling into the smallest crevice that will receive them.

The net should not be sewn directly on the ring, as it would soon be worn to pieces by the friction to which it must be subjected. The best plan is to fit a strip of very stout canvas upon the ring, and then sew the net to the canvas. If the brook should be at a distance from your house, you will find the net rather troublesome to carry, beside drawing upon you the rather obtrusive attentions of an unsympathetic public. Hence the recommendation to fasten the net to the handle by screws. Before you start, you can remove the net from the handle, and so can carry

both without attracting much notice. Small "thumb-screws" are the most convenient for this purpose, as they can be removed and replaced without the use of a screw-driver. A still more convenient form is the "folding-ring" net, which can be obtained from any of the dealers. It has the advantage of folding into a compass so small that it can be put in the pocket when withdrawn from the net. It is not, however, so strong as the simple ring and socket; and should one of the hinges be broken, it must be sent back to the maker for repair, whereas any village blacksmith can make or mend a ring and socket.

Of course you must take with you a vessel in which to place your captures. The tins which are made for the express purpose are the best; but, in any case, it is necessary that the vessel shall be quite dark, as the inhabitants of the brook are not only quarrelsome, but carnivorous, and in many cases cannibals, so that they are sure to fight if they can see, and in many cases will eat each other.

Some little art is required in the right use of the net. You may see two persons hunting the same brook, and using the same net; and

them in your collecting can, because they would make the rest of the inmates as dirty as themselves. You must wash them thoroughly before attempting to examine them; and for this purpose, all you have to do is to dip the net repeatedly into the water, holding it up and letting the water drain from it. When the water which runs away is quite clear you may begin to investigate the contents.

In the search, always use your fingers, which were made before forceps, and in this task are much more useful, the sense of touch often detecting creatures which had eluded the sense of sight. You must not mind getting your hands dirty. There is plenty of water about, and you can wash them as often as you like. Moreover, the mud of a brook is equal to the best soap for its cleansing properties, and costs nothing.

Another axiom.

Nothing that you can catch in a net can hurt you, so that you may handle them all impartially, without fear. Some of them, it is true, have rather a formidable aspect, and look very much as if they could sting. But set your mind at rest. No inhabitant of the fresh water can sting, and none of them can bite hard enough even to injure a young girl.

Take every creature which you do not know, "handle him as if you loved him," according to Izaak Walton's receipt, and put him—or her—or it—as the case may be, into your collecting can, to be examined hereafter. If you should already be acquainted with your captive, follow Dogberry's advice, very slightly altered, "take a note of him, and let him go." Never kill any being unless its death may be serviceable to man, and if you do not need any of your captives, make a note of that creature, and throw it back into its native stream.

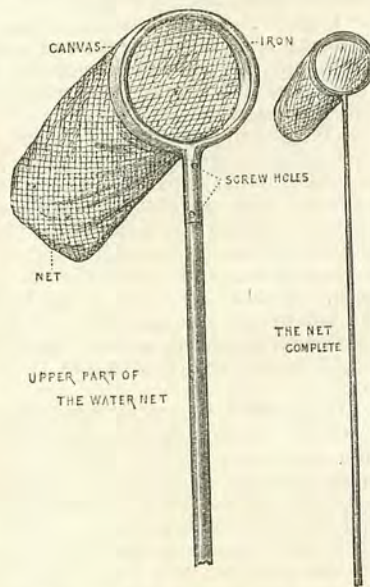
At home you should be provided with a number of vessels, half filled with water, to which you can transfer your captives. You can hardly have too many of these vessels, which you may call "aquaria" or "vivaria," if you like, as many creatures must be kept alone. Place no reliance on the picturesque groups which are so often figured, and which represent dragon-flies, butterflies, water-beetles, frogs, newts, and other miscellaneous beings all gathered together into a sort of "happy family." Your policy must be of a totally different character, and must be one of isolation.

It may be said, and often is said, "I only follow Nature, and gather together in my vivarium the identical creatures which are gathered together by Nature in the brook and on its banks." This argument is plausible but not sound. The conditions are not the same. No aquarium or vivarium, or a combination of both, called learnedly by the name of "aquavivarium," can fulfil the same conditions as are found in the brook.

In the first place, space is limited, whereas that of a brook is, in comparison, illimitable. Then, the various creatures are deprived of their natural food and shelter, two very important elements in animal life. Again, the water is small in quantity, whereas in the brook the water is incessantly renewed, and is always more or less in motion.

Having washed your "catch" thoroughly, you can proceed to examine it in detail.

THERE is one creature which you are tolerably certain to find everywhere. I might almost have written the word "absolutely" instead of "tolerably," but one result of experience is to teach the danger of employing



yet, while one captures specimens by the hundred, another will find nothing. If you plunge your net into the water with a splash, snatch it out with a jerk, and plunge it in again with another splash, you will frighten away all the animals instead of enclosing them in the net.

You cannot be too gentle while brook-hunting. When you have marked down a spot which you think will be tolerably promising, slip the net very gently into the water at some distance from the spot, and coax it, so to speak, towards the required locality, so as not to alarm the inhabitants. Then draw it firmly and steadily through the water, turning it, and drawing it backwards and forwards several times.

On lifting it out you will probably find it partly choked with evil-smelling mud, among which a number of indefinite living forms are seen writhing and twisting, or, as our American friends say, "squirming" like a handful of earthworms or a basketful of live eels.

You cannot examine them while they are covered with this mud, neither can you place

such sweeping terms. At all events, I have been a practical brook-hunter for some fifty years, and never met a brook the waters of which did not swarm with the larva, or grub, of the WHIRLIGIG, or WHIRLWIG BEETLE (*Gyrinus*), to which a casual allusion was made in the opening chapter.

Everyone who has walked by the side of any brook must have been amused and interested by these restless little beetles. They are gregarious in their ways, and you will scarcely ever see a solitary specimen. They are wonderfully hardy, and even in the winter time, when most insects, except themselves, are either dead or hibernating, the Whirligigs are lively as ever, provided that they can find a sheltered piece of water, no matter how small it may be.

Viewing these beetles as they openly skim the water in their peculiarly conspicuous manner, one naturally feels some surprise as to the cause of their immunity from destruction. Below them, under the surface of the water, are shoals of hungry fish, ready to snap up any insect that may fall into the water. Yet no fish ever is known to allay its hunger with the whirligig beetle.

There are plenty of hungry birds which might easily snap it up from the surface of the water, or pounce on it as it flies through the air on its long and beautiful wings. Yet no bird, when dissected, has ever been known to have the remains of the whirligig beetle in its crop.

It owes its safety to two peculiarities. In the first place, the shining armour in which it is clad is so thick and so hard that there is but little room for the soft tissues which render an insect worth eating. In the next place, it is endowed with an odour which may either not be perceptible to itself, or even actually pleasing, but which, to all other beings, is singularly repulsive, so that neither fish nor bird will eat it.

As we shall be able to examine this beetle in all its stages of life, we will first take its larva as it appears in the net.

No one could even conjecture from the appearance of the larva what sort of insect it represented, and there is as much difference between the larval and perfect forms of the Whirligig as there is between the caterpillar and the butterfly.

The larva is a long-bodied grub, with six little slender legs; soft skinned, with the exception of the head and the three segments, or body-rings, which represent the future thorax; feeding on decaying substances, sluggish in its movements, and breathing by means of forked, external gills, which look like a row of white feathery forks along each side of the body. When taken out of the water it looks a most ungainly creature, the gills clinging to the sides, and entirely altering its appearance.

The best mode of making it show itself to the best advantage is to place it in a tall narrow glass jar filled with water.

In order to breathe, the creature must have its gills continually washed with fresh supplies of water. In the running brook there is no need for the larva to use any exertion when breathing, but when placed in the still water of the jar it must either exert itself or die. Its mode of supplying itself with oxygen is very simple. Its body is as flexible as that of an eel, and in swimming is used in the same manner, namely, a kind of serpentine undulation, which carries it swiftly through the water.

Having thus wriggled itself to the surface of the water, it spreads out its gills and sinks slowly, so as to bring its outstretched gills in contact with as much water as possible. While floating slowly downwards it is a singularly graceful being, the white translucent gills having a beautiful effect as the light shines through them, and presenting a wonder-

ful contrast to the mean and draggled aspect which they present when the larva is removed from the water.

After attaining its full growth, the larva ascends the stem of some aquatic plant, and comes to a halt when it has crawled a few inches above the surface of the water. Having attained a suitable spot, it spins an oval cocoon around its body, so that it loses all appearance of an insect, and looks like a lump of mud that has accidentally stuck upon the leaf. Within this cocoon it undergoes its development into the perfect state, and then issues from its cover in the form with which we are so familiar.

Here I must call the attention of the reader to two points, namely, the Growth and the Respiration, about both of which much misapprehension prevails.

When I stated that the Whirligig attained its full growth in the larval state, I did so intentionally. The whole of the growing is accomplished during the larval state, and when once the insect has passed out of the larval condition it grows no more. Most people think that a little fly is a young one, and that, if it should live long enough, it will become a large fly. In point of fact, the fly will grow no more. It did all its growing when it was larva, or maggot, and when it had attained its full growth it weighed much more than it weighs as a fly.

INSECTS NEVER GROW.

It is just thirty years since I made this statement in similar type, so as to attract attention, and yet I am in the continual receipt of letters calling my attention to the statement, and doubting whether it can be true. Sometimes I receive a box containing four or five humble bees, together with a letter couched in such terms as these—

"Sir,

"You say in your 'Common Objects of the Country' that insects never grow. *It is not true!* I took these humble bees out of one nest, showing them in different stages of growth."

Or, I receive a box containing a number of cockroaches, all of different sizes, together with a letter—

"Sir,

"You say in your 'Common Objects of the Country' (page 70) that insects never grow. You do not understand what you are writing about. Sir, did you never see black beetles in your life. As you seem not to have seen them I send you a lot which I caught myself in my kitchen, and they are all of different sizes. Insects do grow, and you are quite wrong. I hope that you will publish this when you write again about insects."

"Yours indignantly, A. B."

I can assure the reader that these are genuine letters, and that they are fair samples of my usual correspondence on this subject. I have no doubt that other entomologists are persecuted after a similar fashion. The mistakes of both these correspondents were due to their ignorance of the insects of which they wrote.

As to the humble-bees, they, like the hive bees, ants, and wasps belong to the social hymenoptera, in which the females are so modified that there appear almost to be three sexes. First come the males, which are known in the hive bee as "drones." Then come the fully-developed females, which are called "queens," and lastly come the partly developed females, which are called "workers." Now, the queens are always the largest of the three; then come the males, and the workers, who constitute the bulk of the community, are the smallest of all. The ants have a further subdivision among the workers, the largest being the soldiers, and the smallest the labourers.

But, when once they have passed out of their larval state, no matter whether they be

males, females, or workers, they grow no more. One of the most striking examples of this fact is to be found in the *Termites*, which belong to another order of insects, and in which the queen is many hundred times larger than the worker. Although she does not really grow, she appears to do so on account of the great elasticity of the skin of the abdomen, which stretches as if it were made of india-rubber, so as to accommodate the vast quantities of eggs which she daily supplies for the purpose of keeping up the population of the nest.

As to the cockroaches, the mistake was of a different character.

They belong to the same order as the crickets and grasshoppers, namely, the Orthoptera, or straight-winged insects, which retain very much the same shape throughout their different stages of existence. The Lepidoptera, *i.e.*, the butterflies and moths, present a totally different appearance in their three stages, so that no one can doubt whether the creature be a caterpillar (or larva); a chrysalis (or pupa), or a butterfly. But, when the Orthoptera are first hatched from the egg, they look much like the perfect insects, the chief distinction being that they have no wings. The same mode of growth belongs to the locusts, the wingless larvae of which are called at the Cape by the expressive name of "voet-gangers," or foot-goers, and are even more destructive than in the winged state.

Now we will revert to our Whirligig beetle, and give a few lines to the Respiration of insects. This is a most interesting portion of their life history. I have mentioned that the larva of the Whirligig beetle breathes in water by means of gills, as is the case with the larvae of many insects. But all insects breathe atmospheric air, doing so, not by lungs as we do, but by means of a most complicated network of air-tubes, which divide, and subdivide, and ramify throughout the entire body, even extending through the antennae, the legs, and the wings. The wings, indeed, are not modified limbs, as in the bats and birds, but are prolongations and extensions of the air-tubes, so that the insect is, in fact, a living lung endowed with limbs.

The mode by which these tubes are used is most remarkable.

When the vertebrate animals breathe they produce a vacuum in the chest by expanding the ribs (or, as is the case with the frogs, toads and newts, by expanding the hyoid bones of the base of the tongue). But the insects have no bones, and, therefore, must have some other mode of producing the needful vacuum. This is the way in which the insects breathe.

The body is composed of a number of half-rings, set in this  fashion, and having the space between them filled in with a very elastic membrane, so that the upper and lower halves of the body can be separated from each other. In this membrane are certain oblong holes, called "spiracles," which admit air to the tubes. When the insect expands its body, by separating the upper and lower halves, it causes a vacuum, so that the air rushes into the tubes through the spiracles. Then it is expelled by means of the muscles which contract the body, and thus the act of respiration is accomplished.

The popular ideas on this subject were well expressed by an advertisement of a certain fly-pon which appeared a few years ago.

According to the advertisement, no sooner did a fly put its nose near the poison than it fell down dead from merely smelling it. Now, insects have no noses, nor does air enter the system through any part of the head.

See, then, what a wonderful change has taken place in the insect, which, while a larva, breathed water by means of gills, and, when a perfect insect, breathes atmospheric air by

means of a system of tubes. We shall frequently have to refer to the respiration of the inhabitants of the brook.

Now, take a Whirligig out of the water, and examine it closely.

Here I may mention that no student of nature is complete without a magnifying glass, the ordinary pocket lens being amply sufficient for field purposes. Of course, if you have a microscope at home, so much the better, but this treatise deals exclusively with field work, and, so, all that the wanderer by the brook will require is the little lens with two or three glasses, which can be carried in the pocket.

With this lens examine the Whirligig, and first look at its legs.

The first pair are long and slender, while the second and third pairs are very short and flattened, so as to convert them into paddles. Here I must observe that however the legs of insects seem to differ from each other, they all possess the same joints, though those joints may be modified in accordance with the task which they have to perform. Few persons would think, when viewing these legs of the Whirligig, that the long front legs and the short, flattened intermediate and third pairs are formed of exactly the same joints.

Insects are divided into three distinct portions. First comes the Head, which carries the organs of sense; next comes the Thorax, which carries the organs of locomotion; and lastly comes the Abdomen, which contains the vital organs.

First, taking the Head, we see that it comprises the external jaws, or "mandibles," the inner jaws, or "maxillæ," together with the antennæ, "horns," or "feelers," as they are sometimes called, and the peculiar appendages which are called "palpi," or lesser feelers.

The eyes are "compound," i.e., composed of many lenses, varying in number from eight or ten on each side to as many thousands. The well-known Scarlet Admiral butterfly has about fifteen thousand lenses on each side, every lens having its own branch of the optic nerve.

Next comes the Thorax, which is subdivided into three parts, namely, the "prothorax," the "mesothorax," and the "metathorax." Each has its peculiar office. The prothorax (or front of the thorax) has nothing to do except carry the first pair of legs. The mesothorax (or middle of the thorax) has a more complicated duty. The upper portion carries the first pair of wings (which in the beetles are never used for flight, but are thickened into "elytra," or wing-cases, under which the flying wings are packed when not in use). The lower portion contains the middle or intermediate pair of

legs, and half of the sockets for the last pair. The metathorax (or last portion of the thorax) contains in its upper part the second pair of wings, and in its lower part the other half of the sockets of the intermediate legs, and the third or last pair of legs. No matter how much they may be modified, these structures are the same in all insects. Lastly we come to the abdomen, in which the rings, of which every insect's body is composed, are seen more clearly than on any other portion of the body. On each side of the abdomen may be seen the oval spiracles or breathing-holes, which have already been mentioned. In order to prevent dust or other foreign substances from getting into the spiracles, their openings are guarded by stiff bristles, which cross each other and allow the air to pass, although they exclude dust. Now we will examine the structure of the leg, taking one of the hind legs as our type. Next the body of the insect is the "coxa," usually quite a little joint. Then comes the "trochanter," a small and exceedingly variable joint. Then comes the "femur," or thigh, which is usually, though not always, the largest joint of the limb. Next comes the "tibia," or shank; and last of all is a row of five small joints, called the "tarsus," or foot, the last joint being furnished with two claws.

In order to impress these details more firmly on your mind, take the legs of several different insects, and work out the joints in each. Now look again at the legs of the Whirligig, and ask yourself why the legs should be so different in character. The answer is simple enough. The beetles do not keep up their incessant scurry over the water for mere play; they are engaged in very earnest work, i.e., searching for food. They feed on small insects, especially those which fall into the water or are blown into it by the wind. They also feed on the smaller aquatic insects, the two hinder pairs of legs acting as paddles, by which they are driven through the water, and the front pair of legs helping them to seize their tiny prey. It is rather amusing to watch a group of these beetles, and to trace the course of any one of them. It is a most bewildering task, any one of them on whom you happen to fix dodging in and out among its comrades, and reminding the observer of the Irishman's pig, which ran about so fast that no one could count it. Moreover, the insects have a habit of diving as suddenly as the dachshick itself; so that to keep count only of a dozen or so is next to impossible.

Now turn your attention to the head, and look at the eyes. You may be surprised to see that to all appearances it has four sets of compound eyes, instead of two. If, however, you

were to dissect the beetle, you would find that there are really only two eyes, but that each of them is divided into two sets by a thick horny partition, one set being always submerged as the beetle swims on the surface of the water, and the other set being above the water. The reason for this remarkable variation in structure is that the insect requires to see objects which are either above or below the water. Now, as we all must know, if there should be the slightest ripple on the surface of the water, every object beneath the surface is rendered invisible. Fishermen who are obliged to look out for fish, such as the cod, which live at some depth, have invented a simple instrument, called a "water telescope," by which the effect of the wind upon the surface of the water is neutralised. It is nothing but a metal or wooden tube, at one end of which a piece of plate glass is fixed, so as to prevent water from entering the tube. When the day is windy, so that the men can see nothing below the surface, they push the glazed end of the tube under water, and then, by applying the eye to the other end, they can distinguish objects as plainly as if the weather were perfectly calm. If you like, you can have a water telescope made at the cost of a few shillings. If the tube be of wood, it may be about three feet in length, and shaped like a hollow obelisk, with one end much larger than the other. The glass is inserted into the large end, and it will be as well to have a heavy band of lead fastened round the large end, as otherwise you will find that to keep the instrument immersed will cause so much exertion that it will be impossible to obtain a steady view of the creatures below the surface. Should you prefer a metal tube, it should be made in the form of a cone, so as to give a wide range of vision. It is a delightful and fascinating instrument; but it has one drawback. It is necessarily heavy, and its conveyance is not easy. However, those who study nature must make up their minds to expect inconveniences, and to put up with them without grumbling.

I hope that the reader will not fail to have observed that the Whirligig beetle shows how man might have learned the use of the paddle and the water telescope, the insect employing them both for the same object—namely, the capture of prey in the water. I do not say that man did borrow either of these implements from the insect. It is not likely that he did anything of the kind; but it is evident that he might have done so, and that the Whirligig had used the paddle and the water telescope for ages before man discovered them.

(To be continued.)

ANSWERS TO CORRESPONDENTS.

MISCELLANEOUS.

CROSBY.—If not too far to send your patient, the "Female Convalescent Home" for London and Brighton, at Crescent-house, Marine-parade, Brighton, would probably suit her. The terms are 8s. a week, paid in advance, to Mrs. Marshman, 4, Ladbroke-square, W. If you write to her for particulars, you will find that there is a "free fund," enabling them to receive orphans or widows for a fortnight, without charge; and likewise a fund to pay for travelling expenses, at least between London and Brighton, third class.

INVALID.—If sea air be desirable for you, as well as surgical aid and nursing, you could not do better than go to the "Home for Invalid and Convalescent Gentlewomen," 67, Dyke-road, Brighton. The weekly payments vary according to the room occupied, i.e., from 15s. to £2 2s. Address the Lady Superintendent, Miss T. Draper. The home can accommodate twelve ladies.

E. R. B.—The composition is very creditable to you, but it is not suitable for our pages. Many thanks for it.

EDUCATIONAL.

AN INQUIRER.—The whole subject of work for girls was gone into in vol. v., under the title of "Work for All."

MAY.—Suitable women of any class only would be taken as probationers; the applicants must go in person, between ten and twelve on Tuesday and Friday, to see the matron at St. Thomas's Hospital.

L. E. A.—We recommend you to join either the "Young Women's Christian Association" or the "Girls' Friendly Society," and obtain advice and help in the matter of improving your education. They would direct you to cheap lodgings or a home, and if they did not arrange for teaching you themselves, you could attend classes in various parts of London; as for example, "The College for Working Women," 7, Fitzroy-street, Fitzroy-square, W., of which the hon. secretary is Miss Frances Martin. The address of the "Girls' Friendly Society" is 3, Victoria Mansions, Victoria-street, Westminster, S.W., and of the "Young Women's Christian Association" 17, Old Cavendish-street, W.; secretary, Miss Weitbrecht.

HOUSEKEEPING.

SWEET NINETEEN.—1. We should certainly advise you to put the sofa blanket away during the hot weather, if not in use. 2. White coral should be put to soak in water till the dirt is taken off, then water may be poured into the interstices from a height, so as to wash off the remaining dirt.

TIBBIE.—The Society for the Employment of Women, 22, Berners-street, W., has a registry for waitresses, and also for professed cooks, able to send up a large dinner or supper. No one is registered as the former who has not held a good situation as parlour-maid before her marriage and been well recommended by her mistress. The fee for a waitress is 5s. to 7s. 6d. with fare to and fro. She can carve as well as wait, and in the slack season some are glad of temporary engagements in London or the country.

AN APPRECIATIVE READER.—The butter should be made in a mould. The wooden moulds can be purchased at any shop for the sale of wood turning.

ECILA.—Stains of tea may be taken out with a little glycerine.