



PROCEEDINGS

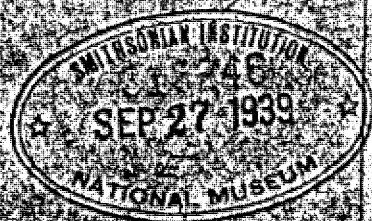
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# NOTES ON A BRUSH-TONGUED MOSQUITO.

By **W. R. COLLEDGE.**

*Presidential Address, read before the Royal Society of  
Queensland, 25th February, 1911.*

Ladies and Gentlemen,—

You have heard from the Report that the year has been unfruitful. Our late Premier was reported to have asked if the Royal Society was alive. The best answer to that will be the substantial volume of the proceedings which will soon issue from the press. It will be found more bulky than some of its predecessors. This is partly the result of kind contributors, the efforts of our very energetic Secretary, supplemented by members of the Council. But if the half of those who have been appealed to had responded in the affirmative, the result would have been a still more bulky volume as the evidence of our existence.

Only those who have sought to secure such work as desired by the Royal Society know the difficulty that exists in obtaining original contributions. A trouble that is not peculiar to our State; for I note in the last report that old-established Microscopic Society of London, the "Quekett Club" (of which our Bacteriologist, Mr. and, is a member), that they complain of the same difficulty; and regretfully say that if more original papers were not forthcoming, then the usefulness of their valuable Magazine will be much curtailed. This is somewhat surprising, considering that the age is one of intense activity. There has never been as much scientific work done, in the same time, in any previous age, as in the present. All over the world, more men are occupied, who possess wider knowledge and more finished equipment than they ever had before. New fields of work are continually opening

up; many of these are occupied; the work is being done, but a great deal of it does not seem to come to the Societies which exist for its furtherance and development. We are sometimes tempted to ask are these bodies getting out of touch, or sympathy, with their mission, so that the workers do not receive from them a warm hand grip, and an encouraging word, and for want of them, keep aloof. That at least is not the case with the Society here. Its Council are only too glad to welcome all work that bears on it the stamp of originality. We have suffered somewhat from our inability to present, what we do get, in a better illustrated form. In bygone days a Government grant enabled us to secure engravings to illustrate adequately some of the subjects read at our meetings. But when, in darker times than these, the knife of retrenchment ruthlessly lopped off that source of revenue, and we had to depend only on members' subscriptions, then as honest men, making the Society pay its way, we did our best to keep the flag flying, but could not afford expensive engravings for the illustration of papers, and on that account some work done in this State is said to have gone to others who were able to furnish them in a superior style. That has told against us, and other States have gained credit for work which otherwise might have appeared in our pages. But we believe that better times are coming. The establishment of the University in Queensland; the gathering of the most gifted of our youth from all parts of the land must give an impetus to scientific work.

The presence of Professors and teachers, who having won laurels in other lands, and now make this fair city their home, cannot but have a powerful uplifting force. Their sympathies must be with us. And as, amid their onerous duties, some at least occasionally will be able to grace this platform, they will give the Royal Society a deeper inspiration, and make it a mightier force than has ever been before.

To-night I wish to bring before you some interesting features of one of the species of mosquitoes found in our neighbourhood. Certain kinds of these insects are known to carry very serious diseases, and the whole family are

arded with suspicion. But the one I refer to is of a blameless character, and probably the whole of the group to which it belongs are likewise harmless to humankind. They belong to the genus *Megarrhina* (R. Desvoidy), and are distinguished from others by their generally large size, brilliant coloration, peculiar shape of proboscis, and the possession of a caudal fan. Tropical and subtropical regions are their homes. Giles in his book enumerates fifteen species. They have been found in the Argentine, Brazil, Sikkim and Central Asia, Java, Batavia, Island of Formosa. Alfred Wallace notes them from Singapore, the Celebes Islands, New Guinea and Queensland. So far only one of the species has been reported from this State. They range from Thursday Island, Port Denison. Mr. Tryon found them on Percy Island, Dr. Bancroft at Caboolture; and I have got larva from North Pine and Milton.

Sufficient material to make complete dissections of parts of the body have not been available, but the little I have done is both interesting and instructive. This particular species was called *Megarrhina speciosa*, but Theobald, the authority at the British Museum on Diptera, has rechristened it *Toxorynchites speciosa*, that it is now known by that name.

On the 8th March, 1910, Dr. Parry (whose recent case we greatly lament) brought down to me a living male specimen caught ten miles from Brisbane. This was the first living one I had seen. The next night it deposited on the water in its prison house a few eggs. These were laid, not in a raft like the house mosquito, but separately on the water. They are oval, measuring the 50th of an inch in length by the 42nd in breadth. The micropyle is at the centre of one end, and the shell splits centrally through its long axis for the emergence of the larva. The eggs are pale in colour, do not darken by exposure to the air, like some species, and the surface is finely granular. In two days they hatched, and the larva, pale and transparent, lay on the surface of the water. I thought their appearance and absence of motion that they had cast off skins, until on touching one with the point of a needle, it gave a twitch, and I found that they were newly born larva of this particular species.

The larva of many species are characteristic, so that

they can be recognised by anyone who has studied their peculiarities. In the *Toxorynchites speciosa* the head is small, rectangular in shape, with a short unjointed palp projecting from either cheek. The thorax is about twice the length and breadth of the head. Three sets of short feathered balancing hairs spring from stout conical papilla on the sides. These bend towards the head. On the abdominal segments are similar papilla bearing much longer tufts of bristles. The terminal segment in the new born larva is longer and carries four very long seta, which are replaced in the next moult by a different form of appendage. In three or four days the colour becomes yellow. I found to my sorrow they were cannibalistic in practice.

I placed in clean water so that there should be no insects to do them hurt. But they preyed on one another, and it became a question of the survival of the fittest. On returning from business at night, I found only two alive, one seriously injured. He had received a bite through the chest which severed one of the main tracheal tubes and notwithstanding careful nursing he died in three days.

The survivor was much more robust, and as the effect of his orgies, grew so as to require a new suit of clothes for he moulted on the fourth day. This did not make any alteration in his appearance excepting in the tail appendages. In some species the difference is much marked, so that before and after the moult they look like two different species. Here the only change was in size and the tail fan. On the fifth day, granules of dark pigment began to appear, turning the general colour reddish brown, though the abdomen remained much paler. I regularly fed it on the larva of other mosquitoes, which it seized in characteristic style. First it displayed an aspect of perfect indifference to their presence. Not a muscle moved nor a balancing hair turned. It might be a floating splinter of wood for any sign of life. The other larva might swim round and almost touch it, but there was no sign of anxiety to cultivate a closer acquaintance. Thus all fear they might at first have at their presence subsided. By-and-bye, however, it would slip up with a slow motion, watching intently with the head sloping downwards, the tail being attached to the surface film. Remaining motionless, it measured the strike

instance. If not quite near enough, then there was no muscular motion of the front part of the body, but the three last segments of the abdomen were quietly telescoped into each other, then outthrust, thus bringing him a little nearer. This generally took some time. And as ordinary larva are of an active nature they frequently moved to another place. But, with indomitable patience, the same process was repeated, again and again. Until at last the chance came, there was a flash from the seemingly inanimate body, and the larva struggled in his grip. Seized sometimes by the middle, occasionally by one of the palps on the head, there was no escape from those relentless jaws. Gradually it was drawn in, chewed bit by bit, until all the pieces were extracted. Skin and crushed organs were then thrown aside, and in an hour or two the same process was repeated, and so several larva were disposed of every day. It did not entirely confine itself to mosquito larva, for one moth accidentally singing its wings at the lamp fell on the water of its preserve. Like a trout at a fly it rose, seized and dragged it down. I regularly fed it with mosquito larva obtained from various sources for the succeeding months, but the cooler weather retarded its development, and it was not until the 27th of August that it threw off larval skin and entered into the pupa stage. Then it was 24 weeks old.

The pupa, or next stage of the insect, is distinguished from others of the family by its comparative size. They are veritable giants. Mr. D. O'Connor showed me one which had been sent to him as a curiosity some months ago. They are heavily built, chocolate brown in colour, and chiefly spend their time lying on the surface of the water. The cephalothorax is at first triangular in side view, but as the insect develops within, the lower portion grows as the third segment of the abdomen.

On the nape is a large tuft of palmate hairs, which, by taking hold of the surface film, helps to steady its body on the surface of the water.

It now breathes from the head, instead of the tail, as in the larval state, and the two spiracles or breathing organs are placed one on each side of the head. They are the same dark chocolate colour as the body, but the dorsal surface is golden, contrasting beautifully with the darker background.

The connecting membrane of the segments, as in the case of the larva, is of a pale and flexible character. At the end is the telson or swimming appendage, composed of two broad fans. These diverge from each other more decidedly than they do in the pupa of other species with which I am acquainted. A stout rib passes down the centre of each leaf, and they are studded with minute hairs. The pupa stage continued for fifteen days; the perfect insect emerged on September 8th; the period from egg-laying to perfect insect, being six months. This is probably much longer than it would have been in a natural state. In artificial conditions, mosquitoes require a much longer time to pass through their life changes than if they were placed in natural conditions. But this is the only instance where I have been able to breed from the egg to the perfect insect.

The adult insect is the largest and most handsome of all the species. The body measures three-quarters of an inch in length, and when the legs are extended from the sides, they cover a space of an inch and a half. So that it is a veritable giant in its tribe.

Not only is it distinguished for size, but likewise for beauty. The black eyes are bordered by silvery scales. The proboscis, palpi, and antennæ, have blue and gold reflections. The pleura, or sides of the chest, are plated with flat gold scales with a pale lustre. The legs are dark brown, ornamented with scattered scales of silver and gold. While from the terminal segment of the body extends a miniature peacock's tail, termed the caudal fan; it is black with patches of gold. Thus, though our prejudices are strongly against the order, yet we cannot deny that this species possesses beauty.

One thing that strikes us is the shape of the proboscis. In most mosquitoes this organ is straight or slightly curved. This is an exception. The first half—a stout conical portion—projects straight from the head, but at the middle it bends abruptly downwards, tapering at the same time like the lash of a whip.

An engineer, or a mechanic, examining that instrument would say that it was not meant for thrusting into flesh. It would be absurd to make a bayonet for a soldier with a curve in it like that. The hypodermic needle

surgeon must be made straight for its special purpose. If it were given a curvature, such as we have there, it could bend or break at the first thrust.

These considerations led me to dissect the organ with a good deal of interest, and I was rewarded by an interesting discovery, which, so far as I know, has not been noticed before. We are familiar with the statement that the female mosquito has neatly packed in her proboscis an armoury of six lancets. Some of these have minute teeth on their tips for deepening and enlarging the cut.

In the *Toxorhynchites*, however, I found all the lancets, except two, much degenerated, seemingly comparatively useless for thrusting into flesh. Two, however, were well developed. One, the largest, is a hollow channel, open at its upper side, and bent to the curve of the proboscis, and represents the organ through which the blood is pumped in the biting species. The other was a long slender tube which near its end expanded into a long club-like swelling being covered with fine hairs, growing inward and curving outwardly as they approached the tip, so that you have a long curved channel, and lying inside a long handled brush, not very unlike, in miniature, to that long brush called a "turk's head," used by housewives in clearing cobwebs from the corners of a room. This formation is quite unusual in the mosquito, and is analagous to some of the insects, whose chief food is the nectar of flowers and juices of fruit. The tongue of the honey bee is a ringed flexible organ, capable of considerable retraction and extension, and its food is lapped up in this way, the other mouth organs forming a tube through which the juices ascend by the action of the tongue. In the Mining Bee (which bores holes in the ground for the deposition of its eggs), you have a tongue which is clothed with hairs in the same way as this mosquito.

The bee's tongue is not so long as this mosquito's proboscis, and the drooping shape certainly points to the fact that it is intended *not for piercing flesh*, but dipping into the nectaries of flowers and juices of fruits.

Another point of confirmation is that the flabella, or bristles of the proboscis, are clothed on the inside also with hairs of a similar character, which by capillary attraction would tend to suck up and retain floral juices, near

the tip of the channel of the larger lancet. In the head of the insect is found the pump, or aoesophagial bulb, by which blood is drawn in other kinds of mosquitoes from their victims, but its size and muscular force might be insufficient to raise denser fluids, such as nectar, without the help of the hairy expansion on the end of the representative of the lancet. The probability is, therefore, this species, and most likely the group, are purely vegetable feeders, obtaining their food in *apis modo*, and are therefore harmless to man.

The cornea of the eye is of a denser structure than usual. The halteres are small in size, pale yellow; near the base on the anterior side, there is a triangular space filled with oval cells, united at their longer axis; above this near the knob, is a stiff oval ring protecting a softer membrane which divides into two elongated lobes by a deep central fissure, the rim being bordered by minute hairs. These organs are richly supplied with nerves, and are doubtless organs of some special sense not yet understood. There are strong grounds for thinking that insects have senses differing widely from those possessed by man.

The terminal segment of the male body terminates in two slender hooks, and they are tipped by a straight moveable rod arising out of a shallow trench.

I take the following description of the male insect from Skuse:—Antennæ brown, a little more than half the length of the palpi; basal joint black, with horizontal reflections; second joint more than twice the length of the third, ornamented with some beautifully iridescent scales, the whorl of very long hairs situated about one-third from the apex. Head covered with brilliant margaritaceous scales, chiefly reflecting green; in a certain light appearing brown, with a bright pale greenish line round the hind border of the eyes. Proboscis somewhat longer than the palpi, deep metallic blue, with a purplish reflection before the bend, brown beyond. Palpi deep metallic blue, with purplish reflections, the third joint ringed with golden yellow at the apex, and the fourth joint with a broad ring of the same beyond the middle. Thorax brown, lateral margins and prothorax densely covered with greenish scales, the latter with long brown hairs; hind margin and scutellum richly adorned with brilliant

lucent scales, and long brown hairs; pleura with a red brown stripe from the origin of the wings to the scale prothoracic projection, below this densely covered with silvery scales; metanotum brown naked. Halteres, pure yellow. Abdomen about twice the length of but lower than the thorax, flat, deep metallic blue, except first segment, the latter green with a yellow patch each side; fifth segment shows some golden yellow laterally, sixth and eighth segments ornamented with strong tuft of golden hair laterally, the seventh with black tufts; all the segments slightly bordered with golden hairs laterally; the first to the third and fifth to seventh golden yellow beneath with a metallic blue longitudinal stripe down the centre; fourth entirely metallic blue, and terminal one brilliant pale green. Coxæ clothed with silvery scales. Femora and tibiæ metallic violet, the tibiae golden yellow beneath. In the intermediate and posterior legs, the first joint of the tarsi white except at the base, the second also except at the apex; the rest metallic blue. Wings longer than the abdomen, with a pale yellowish tint anteriorly and along the fifth longitudinal vein pale brown, cilia pale and short, weak reflections. Axillary vein joining the costa almost opposite, but somewhat beyond the posterior branch of the fifth longitudinal; costal cross vein distinct, situated about midway between the origin of the anterior branch of the fifth longitudinal vein, and the origin of the second longitudinal; of the latter very small, the tips of the branches slightly anteriorly; supernumerary cross-vein equal in length to the middle cross vein; posterior cross-vein more than the length of the latter, rather sinuose, tip of the anterior branch of the fifth longitudinal vein joining the middle cross vein opposite the middle of the second posterior cell, a prominent wing fold running close to the posterior branch of the fifth longitudinal for the whole of its length, another on the anterior side in the anal cell.

The question arises, as we are anxious to destroy various kinds of mosquitoes, and there are unquestionable difficulties in the way, would it not be a wise thing to study this particular insect for that purpose? It is not only a mosquito possessing cannibalistic habits. There are many in our neighbourhood which in their larval state

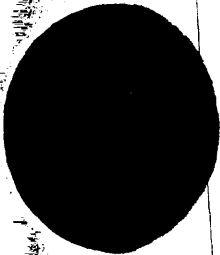
are unmitigated cannibals. One of these is *Culex Tigripes* a number of these bred in a tub in the yard attached to my place of business last year. I have a slide here of one which has killed one of the yellow fever mosquitoes larva.

The Scotch Grey larva also kill all those within reach. But both of these are also blood suckers, so that they only kill to leave the ground clearer for their own depredations. But in the *Toxorychites* we believe we have a vegetarian, which does no harm to any human being, and is at the same time a deadly foe to the young of other kinds of the genus. It can be hired on very reasonable terms. Its working hours are not limited, and it is very unlikely ever to go on strike. It works in the very places where it is needed. All the specimens of larva I have seen have been got in old tanks about human habitations, just the working ground where it is of greatest use. So that we have in it an ally, which, if used, may be the means of greatly reducing the numbers of those which are not only a nuisance, but a danger to the health of the community. No attempt has ever been made in any country to use them for this purpose, so that Queensland might have the honour of leading the van in the contest.

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1.—*TOXORYNCHITES SPECIOSA*,  $\times 3\frac{1}{2}$ .



*TOXORYNCHITES SPECIOSA* EGG,  
 $\times 70$ .



3.—*TOXORYNCHITES SPECIOSA*, PROBOSCIS TIP  
WITH BRUSH LANCET  $\times 91$ .

