THE STINGING CATERPILLAR.
(EUPROCTIS ICILIA)

BY

MAJOR R. W. G. HINGSTON.

(With 5 text figures.)

Fabre, in his narrative of the Arbutus Caterpillar, tells of the dread which the villagers have of it. The wood-cutters, the faggot-binders, the brushwood-gatherers all join in the same tale that the caterpillar attacks with great severity, so much so that they spend a night in torment, tossing as if on live coals. The great observer seems a little doubtful of their talk. 'Do they exaggerate,' he asks. He frequently handles the caterpillars himself. He puts them on the tenderest parts of his body, but he never suffers the slightest inconvenience. He applies them to the delicate skin of his child. The result is the merest superficial irritation, nothing of the torment which the wood-cutters describe.

Here, then we have a little problem. Are these caterpillars really terrible tormentors, or have they been falsely accused? Let us turn to one of our Indian species and examine the actual facts.

One evening in July, while walking in my garden, I happen to come across a cluster of caterpillars belonging to this so-called urticating or stinging group. Science tells us that their technical name is *Euproctis icilia*, Stoll. I find them on the bark of a Phalsa tree. They are quite inconspicuous, though clothed in long hairs, a mottled grey and brown covering which blends well with the underlying bark. They are worth investigation for two reasons; one, to observe their manner of development, and the other to test the problem before us. Are they venomously armed or not?

DEVELOPMENT

First, we consider their mode of development. I imprison the cluster in a glass-covered box. The caterpillars, being large, soon pupate, and in two weeks I have the adult moths. They are quiet creatures, seem as content as did the caterpillars with their prison, and make no attempt to fight through the glass. They seek no food for they have no feeding mouth-parts. All they want to do is to sit still and wait for the one event of life. This takes place a day or two after their emergence. I find them then in the act of mating, a prolonged affair, lasting many hours, with no show of enthusiasm about it, and followed, soon after separation, by a profuse discharge of eggs.

These are laid in a cluster on some suitable support. When the business is over, they make a yellow heap wrapped in a quantity of minute hairs. The source of these hairs is very interesting. They

are stripped by the mother from the tip of her abdomen. There she possesses a specialized tuft from which she manages to pluck the wrap. The hairs are yellow, thin and delicate. Round the eggs they form a downy vestment, and so carefully is this covering made that not only do the hairs enclose the cluster but they also spread into its interstices and form a separate capsule for each egg. There is no viscid material in the cluster. All the eggs are kept together by the interweaving of individual hairs. Each egg in the composite mass possesses its individual nest. The eggs are not arranged in any special manner. In one place the cluster is a flat layer, in another an irregular heap. When divested of the wrappings, the eggs are almost colourless. Small hard spheres with a smooth, delicately pitted surface, they glisten with a faint lustre like a heap of tiny beads.

The eggs hatch on the sixth day. The new-born caterpillar is, of course, minute. Four hours after birth it measures one-seventh of an inch. It is pale in colour, with a brown head and a number of dark spots on its back. Its whole body bristles with hairs, not just a sprinkling as in many young caterpillars, but well developed radiating tufts springing from its back and sides. Its body shows a few faint markings. Behind the head is a brown patch with a yellow spot on each side of it. There is also a yellow blotch on the tail, and two raised brown spots on the back which later will support specialized hairs.

When first born, the caterpillars are very active. They begin life by making explorations, climbing over the heap from which they have escaped, thrusting their heads into the fluffy mass, scattering the hairs in all directions, rooting into the interstices of the hairy capsule in order to get at the egg-shells inside. This is their first attempt at feeding, a combined effort of the whole family to engulf the egg-shells from which they emerged. Succeeding in this, their instincts change and they commence to nibble at a leaf. Of course their first efforts are very feeble. All they do is to tear off the finest layer of epidermis, leaving behind some yellow specks showing where this cuticle has been eaten away.

The next morning I find the family more scattered. The hairy heap has been dug out, the egg-shells have gone, nothing but a scattering of fluff remains. The caterpillars are all over the leaf. Their colour has grown a little darker and their body markings are more distinct. The problem arises, how are we to feed them ? The cluster I had found was on the trunk of a Phalsa tree, so first I try them with Phalsa leaves. But these will not suit their particular taste, nor will leaves of the Imli, the Ber, the Rose, all of which grow in the vicinity of where the original cluster was found. I feel sure that the family will die of starvation, when by mere chance, in these gastronomic testings, I happen to give them a sprig of Babul, *Acacia arabica*. This evidently suits their taste. They soon climb on it, get in between the leaves, attack their edges, excavate them semicircularly, and end by stripping them completely from the stalk. Thus is the family saved from starvation ; and, no doubt, under the natural conditions, this acacia is their accustomed food.

By the third day they are quarter of an inch long. Their bristles are already showing signs of specialization. Each is no longer a plain straight hair. It has changed into a central acute pointed shaft with an encircling armoury of spines. This is the foundation of that delicate machinery which becomes of such importance at a later date. On this day or the next the skin is shed. A rent occurs behind the head, and the caterpillar, little changed in appearance, comes out in a fresh coat. Every fragment of the integument is changed, even the delicate microscopic barbules have their thin coverings renewed. Later we shall see how complex are these hairs, and will realize how perfect is the act of desquamation which permits these hairs, without the breaking of a barbule, being drawn from their intricate sheaths.

The sixth day shows the caterpillar a little larger. It now begins the dropping dodge, falling, when disturbed, on an invisible thread and swinging suspended from its leaf. Also it is getting more attractive in appearance; its pigment is collecting into longitudinal streaks and its early coat of tufted bristles is changing into silky hairs. With undulating movements it crawls about the foliage, having only two objects of any importance, feeding and casting its skin. A dangerous feature is the development of cannibalism. One by one the members of the family disappear. Some happen to be smaller, more undeveloped than others, and these less fortunate individuals are devoured by the monsters that grow at their expense. The loss of life in this way becomes really serious. On the forty-fifth day only four survive out of the family of twenty-six.

The seventh week finds them fully developed. They are brown in colour, mottled with grey, about one and a half inches long. A fringe of long hairs decorates each side. From the back projects a similar armoury, but the hairs are there shorter and thicker and are ornamented with snow-white spots. As is usual in this family, *Lymantriidæ*, the caterpillar possesses some specialized hair-tufts. In this species there is a double pair on the back at the junction of the front and middle thirds of its body; also another similar pair just a little in front of its tail.

Now we come to the pupal change. The caterpillar gets into the nearest debris, spins about its body an open network, nothing very

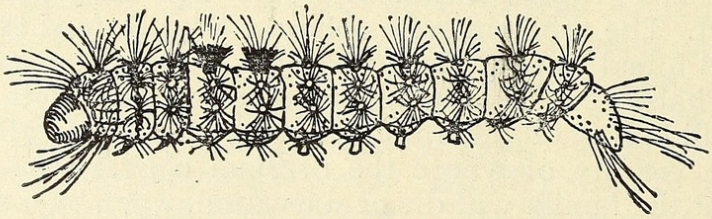

FIG. 1. Catterpillar clothed in Urticating Hairs.
Use.—Urticating.

skilful about it, just a mere reticulation of threads. Safely inside, it undergoes a shrinkage. Its hairs drop off and leave a bare skin which soon hardens into a kind of case. It this way it lies dormant for about two weeks. Then the case bursts, and out comes a small

and fluffy moth. The apparition is a little surprising, the moth is such an insignificant production compared with the caterpillar that gave it birth.

Urtication

If the reader has persisted through these tedious details, it may, perhaps, be worth his while to examine the caterpillar's poison-discharge. I recall a day when, ignorant of this insect, I happen to take one in my hand. Being interested in the defences put up by these creatures, I drop it in the midst of a swarm of ants in order to see how it wards them off. Nothing worth mention happens in the swarm, but soon I begin to feel an itching. It commences on the neck, just a slight irritation, nothing more than a mosquito-bite. I scratch it. The discomfort increases. The tingling spreads round the neck and down along the front of the chest. Then the forearms begin to smart. Clearly this is no local irritation, but something with a wider effect.

I examine the tingling patch. An intense erythema is rapidly developing. The skin is bright red and beginning to swell. There is a central inflamed spot and round it a crop of angry points. Fresh crops appear in different places. Soon the whole chest and abdomen are involved. New eruptions develop on the legs and back, and soon the whole body burns madly with one incessant itch. It becomes impossible to refrain from tearing at it, though this, of course, intensifies the torture and drives the poison still deeper into the flesh. I am almost beside myself with rage and irritation. Fortunately there is a river handy. Throwing off my clothes, I rush into the water. Some relief is given, only a little, for the painful burning still continues and at times the itching grows intense. Almost every part of the body is involved. The hands and face have escaped from the thickness of their skin, and for some reason the middle of the back is immune. The original red patches have grown into lumps, painful whitish wheals.

In half an hour the main intensity of the inflammation lessens. I dread to put on my clothes again. They must certainly be infected with the poison hairs, and the torment will commence anew. However, there is no alternative. On they go, and I rush for home. The distance is no more than half a mile, but I have not gone a hundred yards when the mad irritation breaks out afresh. Scratching and tearing at it, I again throw off my clothes and plunge into a cold bath. This again provides some temporary alleviation. Methylated spirit gives the final remedy. I rub it thoroughly all over my body, and in fifteen minutes the irritation subsides.

One could scarcely believe that a single caterpillar would be capable of causing such unendurable discomfort. How subtle must be the venom, and how marvellous is the creature's capacity of spreading its poison far and wide! An attempt to relieve it only scatters it farther until the whole body gets involved. I keep up the application of spirit to the patches. Yet, in spite of it, the urticaria persists for days. Patches of redness remain in the skin. Fresh outbursts of irritation develop and require more spirit to

keep them down. Even after four days of treatment, it is necessary to apply the spirit at night. How does this simple remedy act? I suppose by neutralizing or destroying some poison. How, otherwise, could it give such immediate relief? The torment, in the absence of this remedy, would be terrible. Then could the wood-cutters truly state that they passed their nights 'tossing and turning as though on a bed of live coals'.

Surely we have here a magnificent defence. A poison which will drive a man to madness must be of value against many foes. But I foresee what might be thought to be a serious objection. The poison is distinctly delayed in its action, therefore the caterpillar will have been destroyed by its enemy long before the enemy will feel painful effects. How then can the painful effects of the poison in any way protect the caterpillar? Only, I take it, through its educating influence. Only by birds and other enemies learning through experience, in the same way as do the wood-cutters, that these creatures are dangerous to touch. Birds, without doubt, do learn in this way, and the highest authorities could be quoted to show that the whole principle of warning devices depends on the enemy's capacity to learn. A bird is not afraid of a warning colour through any instinctive fear of the warning, but just because it has learnt its lesson as a child learns to dread the fire. I think it is exactly the same in the case of these urticating caterpillars. They escape because their enemies have learnt what they are.

Thus we see a succession of processes. First comes the extraction of the hair, then the breaking of the hair into spines, then the entering of the spines into the skin, then the liberation of some subtle poison followed by an inflamed patch. The fingers are then brought to the infected spot. Some spines stick to them. The spines are carried by the fingers to other parts of the body. New foci of inflammation are started. These again are scratched. More and more foci are formed in the same way until in the end the whole body is involved. Thus we see in what a simple mechanical manner can the poison of a small caterpillar produce such a widespread effect.

The possession of poison-hairs is fairly widespread amongst caterpillars. For some strange reason, it seems to be confined to the caterpillars of moths. At least, I know of no butterfly larva armed in this elaborate way. The LYMANTRIIDÆ, LASIOCAMPIDÆ, EUPTEROTIDÆ, LIMACODIDÆ, ARCTIIDÆ, are the chief families of Indian moths whose caterpillars have evolved the poison hair.

PURPOSE OF THE SIMPLE HAIR

We have seen the purpose of the poison hair. But this is a highly specialized contrivance. What about that far more common structure, the plain, simple, ordinary hair in which such myriads of caterpillars are clothed? What is its function? Why should such a crowd of caterpillars go in for the silky dress?

Different suggestions have been put forward. I shall mention them only briefly, and leave to the end the personal views which I have come to from observation in the field.

1. *Use as a breakfall.*—This suggestion I believe to be quite fantastic. It is that the caterpillar's hairy coat saves it from injury should it happen to fall. The coat of hairs projecting from it makes a kind of springy garment which lessens the shock when it strikes the earth. Certainly hairy caterpillars do fall to ground. Many kinds, when alarmed, roll themselves into a coil and allow themselves to drop from a twig or leaf. But they cannot need this specialized buffer, for think of the numbers of naked caterpillars which habitually drop to earth and never come to any harm. It is not a bump that a caterpillar fears, but a stab from the ovipositor of a parasite or a pinch in the beak of a bird.

2. *Use as a slip-away device.*—A number of hairy caterpillars, when alarmed, roll themselves up into close-wound coils. This attitude is said to protect them by preventing birds from getting a grip. A caterpillar, for instance, of the Great Tiger Moth, when rolled up, is not easy to take hold of. The covering of hairs makes it slip through the fingers, and it may be that for the same reason it will slip from the beak of a bird. In that fine old work of Kirby and Spence we are told that the larva of *Anthrenus musorum*, a destructive beetle that gets into cabinets, is covered with numbers of diverging hairs which cause it to glide from between the fingers as if it were lubricated with oil.

Thus it may be in some special instances, though I have little faith in the idea, that the hairs may function as a slip-away device.

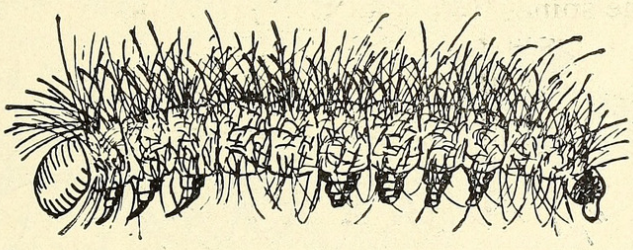

FIG. 2. Caterpillar clothed all over in simple hairs.
Use.—*a*. Distastefulness to lizards and birds.
b. Defence against ants.
c. Defence against parasites.

3. *Use by being distasteful to birds* (*Fig. 2*).—This view brings us to surer ground. It is a fairly well-established fact that birds and lizards do not like hairy caterpillars. The hairs, no doubt, are mechanically unpleasant to them. Also it is obvious to common observation that many kinds of hairy caterpillars travel quite fearlessly in the open, careless of any attack from birds. Nevertheless it is well known that cuckoos will eat quantities of hairy caterpillars. They seem to have some capacity for dealing with the problem which is not possessed by other kinds of birds. The little point would be worth investigation. Does the cuckoo digest the hairs, or does it vomit them forth again as birds of prey do feathers and bones?

4. *Use as a decoy* (*Fig.* 3).—Certain caterpillars have their hairs collected into tufts, conspicuous projecting brushes which imme-

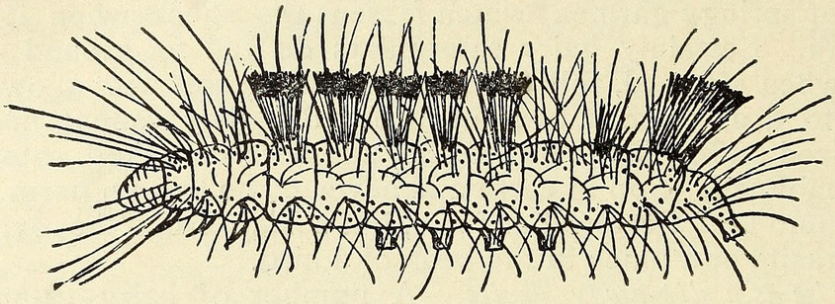

FIG. 3. Caterpillar with conspicuous loose tufts.
Use.—To decoy birds and lizards from caterpillar's body.

diately attract the eye. In these instances it is suggested by Professor Poulton that the tuft is a kind of decoy. A bird or lizard, making a grab at the caterpillar, will seize hold of the conspicuous tuft. The hairs, which, in such cases, are loosely attached, will come out as soon as they are grabbed. And the bird will get not a luscious caterpillar, but a mouthful of irritating hairs. The chief thing about this explanation is that it has been proved by means of experiment. Professor Poulton gave these caterpillars to a lizard in a cage. They did grab the tufts and the hairs came out. Also the lizards were discomfited and refused to repeat the attack.

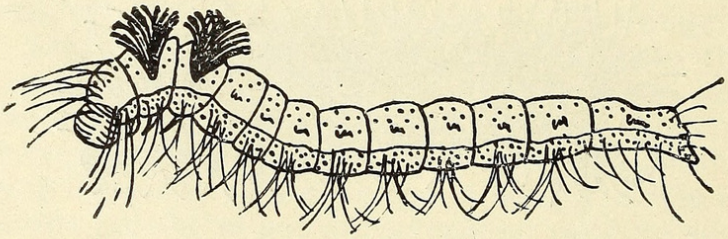

FIG. 4. Caterpillar suddenly protruding brushes.
Use.—To intimidate bird or lizard.

5. *Use as a frightening device* (*Fig.* 4).—Caterpillars belonging to the Lasiocampid family best illustrate this peculiar use. On their backs, a short distance behind the head, are two transverse slits. When the caterpillar is touched these slits open and there is suddenly thrust out from them a black brush of velvet hairs. It is an abrupt and astonishing performance. One would think that the skin had burst asunder to let out these conspicuous brushes. Their extrusion is so unexpected that one is just a little frightened at the apparition and feels that with this creature one had better not interfere. For a little while the tufts remain protruding ; then they are slowly drawn back and hidden once more within the slit.

The sudden protrusion of these dorsal brushes is clearly for the purpose of causing alarm. It is a device having the same object as the assumption of a face apparition by the puss caterpillar, or the

snake-like appearance by the caterpillars of some Sphingidæ; a sudden unexpected frightening manœuvre to intimidate a lizard or an insectivorous bird.

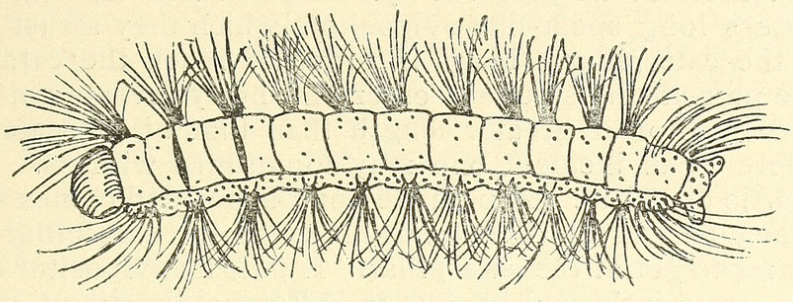

FIG. 5. Caterpillar fenced round with fringe of hairs.
Use.—To keep off ants or prowling parasites.

6. *Use as a protection against ants* (*Fig. 5.*)—Ants are amongst the most serious enemies of caterpillars, at least on the plains of India. Naked caterpillars are completely at their mercy, but the hairy ones are practially immune. Indeed we may advance the general rule that if a caterpillar happens to be naked, then it has some special protective device. It goes in for colour assimilation or alarming attitudes, or snake-like resemblance, or offensive discharges, or horn-like protuberances which it lashes about. But when the caterpillar is covered with hairs, it discards the use of these extravagances. Its hairs are protection enough.

Now see how this works with the ants. The caterpillar of *Thiacidas postica* is very suitable for investigation. It is common, clothed in long hairs, and feeds on the Ber which is frequented by black ants. These ants, *Camponotus compressus*, are particularly fond of caterpillars. They destroy hairless ones wherever they find them, but they never touch the hairy *Thiacidas*. The caterpillar has no special capacity for resistance. When disturbed, all it does is to roll into a coil and allow itself to drop to ground. Its immunity from the ants depends on its hair. I place one at the entrance to an ants' nest. But the ants will not touch it. They approach it, threaten it with wide-open jaws; obviously they would like to pitch it aside, but they fear the shield of hairs. Occasionally a worker may take hold of a hair, but the hairs happen to be only loosely attached, and all that happens is that the hair comes out. As a rule, the slightest touch of a hair is sufficient to repel an ant. One thing is perfectly clear. The garment of hairs gives complete immunity. The ants will not dare to penetrate the defence in order to get at the caterpillar's skin. In the end the caterpillar crawls away unharmed leaving behind it a tumult of ants.

An experiment will convince anyone who doubts. I pluck one of these caterpillars bare, a quite simple operation, since the hairs are loosely fixed and come out with a gentle tug. To the ants I give this stripped larva. It is as active as ever and runs about, apparently none the worse for the loss of its coat. But now it is completely at the mercy of the ants. They fall on it, grip it, seize it on all sides and drag it into the nest. Thus I feel sure that,

at any rate in India, one of the chief uses of the caterpillar's hair is to guard it from the swarms of ants.

7. *Use as a defence against parasites.*—The most dangerous of all caterpillar-enemies are parasitic hymenoptera and diptera. These foes possess long spear-like ovipositors which they thrust into the body of the caterpillar. Now, in order to reach the caterpillar's body, the parasite must either enter the hairy investment or else have an ovipositor of greater length than that of the caterpillar's hair. Here is an incident one may sometimes witness. A hairy caterpillar is on a leaf. A parasite approaches and comes close up to the hairy barrier which extends all round the caterpillar's body. It then tries to get at the caterpillar. It puts its ovipositor between the hairs, then feels and pushes in different directions. trying to reach the caterpillar's skin. It will not itself enter the barrier. Like the ants, it dreads the touch of a hair. Its success depends on whether its ovipositor is long enough to reach the caterpillar's skin. If not, the parasite goes off.

This little observation from India is confirmed by something similar from Africa. Dr. Carpenter was watching some hairy caterpillars belonging to the family Eupterotidæ. He saw a Tachinid fly approach them. It sidled about them in an amusing manner, but all the time kept facing the caterpillars. Now there was only one opening in the fence of hairs. The head end of the caterpillar was comparatively bare, and the fly seemed to know this point of weakness, for it made its attack at this open spot. It elevated itself on its hind legs, pushed underneath itself an enormous ovipositor the tip of which stuck out in front of its head. By this means it managed to place an egg in the open space near the head of the caterpillar. If it could not get at the head, then it tried to push its ovipositor between the hairs. But it clearly chose the open spot because it disliked the caterpillar's coat.

These little observations, I believe, give us the main clue to the use of the caterpillar's hairy covering. It is not an uncommon arrangement for the hair to be distributed in the form of a fringe along either side of the caterpillar. Take for example the Lasiocampids (Fig. 5). In these the fringes are so thick that the caterpillar is surrounded as if by a fence. For what purpose? Because the flank attack is the most dangerous. Hymenopterous parasites dislike hairs, and, so far as I have seen, do not alight direct on the caterpillar's body. They first settle on the leaf, then creep towards the caterpillar. Hence the danger to the caterpillar is from the sides. What it particularly wants is a fringe that surrounds it like a ringed fence.

We know so little, indeed scarcely anything, of the way in which these parasites perforate their victims. For example, what parts of the caterpillar are vulnerable? What parts do the parasites habitually make for? What is the length of the parasite's ovipositor, and its relation to the length of the caterpillar's hair? These and a hundred other questions will have first to be answered before we can know the whole reason for the arrangements of caterpillar's hairs.

Certainly we have a fragment of knowledge. Here and there

we have a record of a particular parasite being the enemy of a particular caterpillar. But what do we know beyond the names of the species? Where are the necessary field observations that will help us to elucidate the point in question? They are almost altogether absent. Too much care and patience is necessary for Naturalists even to dream of such a task. I believe if we had carefully detailed records of the manner in which say fifty parasites tried to penetrate fifty kinds of hairy caterpillars, the result would throw a flood of light on the multifarious designs of caterpillar structure. We should learn much that we never suspect of the uses of many of those peculiar appendages of spines, tufts, hairs, nodules, horns, tails, brushes, tussocks, and other strange superficial structures for which at present we see no use.

Hingston, R. W. G. 1930. "The Stinging Caterpillar (Euproctis Icilia)." *The journal of the Bombay Natural History Society* 34, 778–787.

View This Item Online: https://www.biodiversitylibrary.org/item/188012
Permalink: https://www.biodiversitylibrary.org/partpdf/154188

Holding Institution
Smithsonian Libraries and Archives

Sponsored by
Biodiversity Heritage Library

Copyright & Reuse
Copyright Status: In Copyright. Digitized with the permission of the rights holder
License: http://creativecommons.org/licenses/by-nc/3.0/
Rights: https://www.biodiversitylibrary.org/permissions/

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at https://www.biodiversitylibrary.org.

This file was generated 14 April 2024 at 05:15 UTC