

The Giant Stick Insect, *Eurycnema goliath* (Gray)

BY

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(With six plates)

Several years ago, prior to my departure on long leave, two large long-legged green-winged insects were brought to me. There was nothing I could do then about keeping them, so very reluctantly I had to refuse the gift. As the result of another gift early this year (1950) I have been able to observe and record the life-history of the insect, *Eurycnema goliath* (Gray), the Giant Stick Insect of Malaya and adjacent territories.

The gift consisted of some thirty eggs reported to have been laid by a large green-winged insect caught while clearing and burning jungle. The eggs were oval and slightly flattened, 5 mm. in length and 4 mm. in diameter; grey-brown in colour and very hard shelled. At one extremity was a small circular brown disc, superimposed on the centre of which was a small light brown sphere 1 mm. in diameter. This small sphere appears to have no function or practical use as it lacks contents and is often knocked off or damaged before the egg hatches. Eggs take some eight months to hatch. This period can be reduced somewhat by exposure to indirect sun heat.

The eggs were kept in a muslin-covered jar on a bed of coarse sand and were exposed to a certain amount of heat from indirect sunlight. Occasionally they were placed in a small wire sieve and given a thorough washing and soaking for a few minutes and returned to the jar.

Hatching is accomplished by the emerging nymph pushing out the brown disc at the extremity of the egg. This is actually a lid unsealed when the nymph is ready to emerge. The egg is lined with a thick white parchment-like membrane which is ruptured and left in a dry and crumpled condition in the egg after the nymph has left it.

The newly-hatched nymph is 2 cm. long, very thin in body, and with long slender legs. The overall colour is dark brown—almost black. Forty-eight hours after hatching the nymph commences to feed.

Mine were all raised on guava (*Psidium*) leaves which they readily accepted.

At the end of 11 days, by which time the body length is 3.20 cm., the first moult or ecdysis takes place; and when this is complete the body length has increased to 4.15 cm.

When the moult is imminent the nymph hangs upside-down from a leaf; in the case of larger nymphs twigs with an inclination towards the horizontal are selected. The nymph also makes sure that there is a clear free space immediately below. The legs are spread and firmly hooked to leaves and twigs; the abdomen droops earthwards. Some forty-eight hours prior to the moult it ceases to feed and remains immobile; shortly before the moult it moves about selecting the site.

The first indication of the moult is the up-and-down movement of the drooping abdomen and a see-saw motion of the head and thorax. The old skin splits down the centre of the upper thorax to just below the nymph wings. The head begins to bend inwards towards the underside of the thorax as the head is withdrawn from the slough. The head, thorax, legs, and abdomen are drawn out of the old skin by the pull exerted by the thorax straining, pulling, and heaving on the long legs, slowly extracted from the old skin firmly anchored to the leaves and twigs.

The chitin of the newly exposed skin is very soft and pliable; as the legs are withdrawn they are subjected to the most impossible angles, angles which would immediately snap them under any other circumstances.

As the moult progresses the tips of the legs can be seen gradually moving down and out of the old transparent skin under the pull of the straining thorax. Eventually all six legs are free. The head resumes its normal position. The insect is now held head downwards by the retention inside the old skin of the last two segments of the abdomen and the wing-like appendages at its tip. These appendages must be provided for this special purpose as they have no other function. In this precarious position the insect is held while the skin hardens. The legs and antennae are gently flexed and stretched. The now adult insect has increased considerably in size during the moult, a change which assists it in getting rid of its old skin.

Except for the period between hatching and the first moult little growth occurs between moults. Practically all increases in body length and bulk take place at the moults.

After a period of half-an-hour to an hour suspended in this



Adult Eurycnema goliath, the Giant Stick Insect

Photo : H. J. Kitchener

Eurycnema goliath, the Giant Stick Insect : The Moul



The nymph in position for ecdysis. The old skin has split along the thorax and the body is working out.



Body coming out of the old skin

peculiar manner the abdomen is bent inwards and upwards so that the legs are able to grasp the empty skin and leaves. The position of the body is now reversed, head uppermost and body hanging vertically. After a further period, up to several hours, the nymph commences to eat the empty cast skin, consuming as much as it can reach. Having consumed the shed skin it takes up a position on the food-plant where it remains immobile for a further twenty-four hours before it resumes feeding on the food-plant.

The procedure of moulting is identical at all stages of the nymph's growth. With each moult the colour lightens to light brown, then pinkish brown, on to greyish brown, and finally to ash-grey. It is interesting to note that each individual nymph, after the first moult, has its own particular rate of growth. Nymphs hatched on the same day within an hour or so of each other will undergo the first and probably the second moult together, but after that the stages between the moults vary from 11 to 20 days in different insects. There is little indication that a moult is imminent other than the forty-eight hours' fast, complete immobility, and the taking up of the characteristic upside-down position. Details of the moults and the growth-rate of a typical nymph are given in the Table below.

TABLE

Moult No.	Length prior to moult	Length after moult	Days between moults	Growth at moult	
	cm.	cm.		cm.	
1	3.20	4.15	11	0.95	≠
2	4.15	6.65	11	2.50	
3	6.65	9.25	10	2.60	
4	9.25	12.15	13	2.90	
5	12.15	15.60	13	3.45	@
6	15.60	16.75	18	1.15	

≠ Embryo wings appear.

@ Embryo parts of 'egg-scattering' organ appear.

The final moult from nymph to the adult winged insect is no different from that of the earlier moults. The results, however, are very different. For several days prior to the final moult the nymph's ash-grey colour commences to show traces of pale green in mottled bars across the legs and down the sides and below the abdomen. Dark

green bars appear on the underside of the thorax. The embryo wings turn green, thicken, and swell. The undercolour of green accentuates the thickness of the skin about to be shed. As the moment for the commencement of the moult approaches the underlying green intensifies and spreads to other parts. The characteristic upside-down position is assumed. Although nymphs in the early stages will undergo the moult at any time during the day or night the final moult always takes place at night, commencing in the early hours of the morning usually about 3.30 a.m. and completed by dawn.

This final moult takes several hours to complete. The moult in the younger nymphs takes anything up to an hour; with the fully-fed nymph it is a very lengthy business.

An hour or so after freeing itself from the old skin the now adult insect reverses its position and hangs vertically from the old skin. It is not until the vertical position is assumed that the embryonic wings commence to grow. They swell, thicken, and crinkle into green-and-red fleshy petals standing well away from the body. The colour is now green throughout. With the passing of time the wings lengthen and thin out until, after several hours, they reach maximum growth although still soft and flaccid. The vertical position is maintained without movement for several hours until the new skin and wings have hardened. Suddenly the insect shows signs of animation, and eagerly searches out and consumes its cast skin.

The 'egg-scatterer' at the extremity of the abdomen, parts of which made their appearance in embryonic form at the 5th moult, is now a very elaborate organ.

The colour darkens to a more solid apple-green. The underparts of the thorax are yellowish with mottled bands of dark green. The long legs are yellow with narrow mottled bands of pale green. The abdomen is pale green above and below with light creamy bands on the underside at the junctions of the segments. The short thick-based spines on the upper thorax are bluish green. On the short rounded forewings or tegmina are two small cream patches; the undersides are vermilion. The anterior portion of the hind wings resembles the tegmina in colour and texture; the posterior portion is transparent and pale azure blue. At the tips of the anterior green portions are short single narrow cream lines. The underside of the anterior part is also vermilion.

The new adult takes no food for another ten to twelve hours; from then on it eats ravenously, the abdomen rapidly increasing in size.

Eurycnema goliath, the Giant Stick Insect : The Moults (continued)



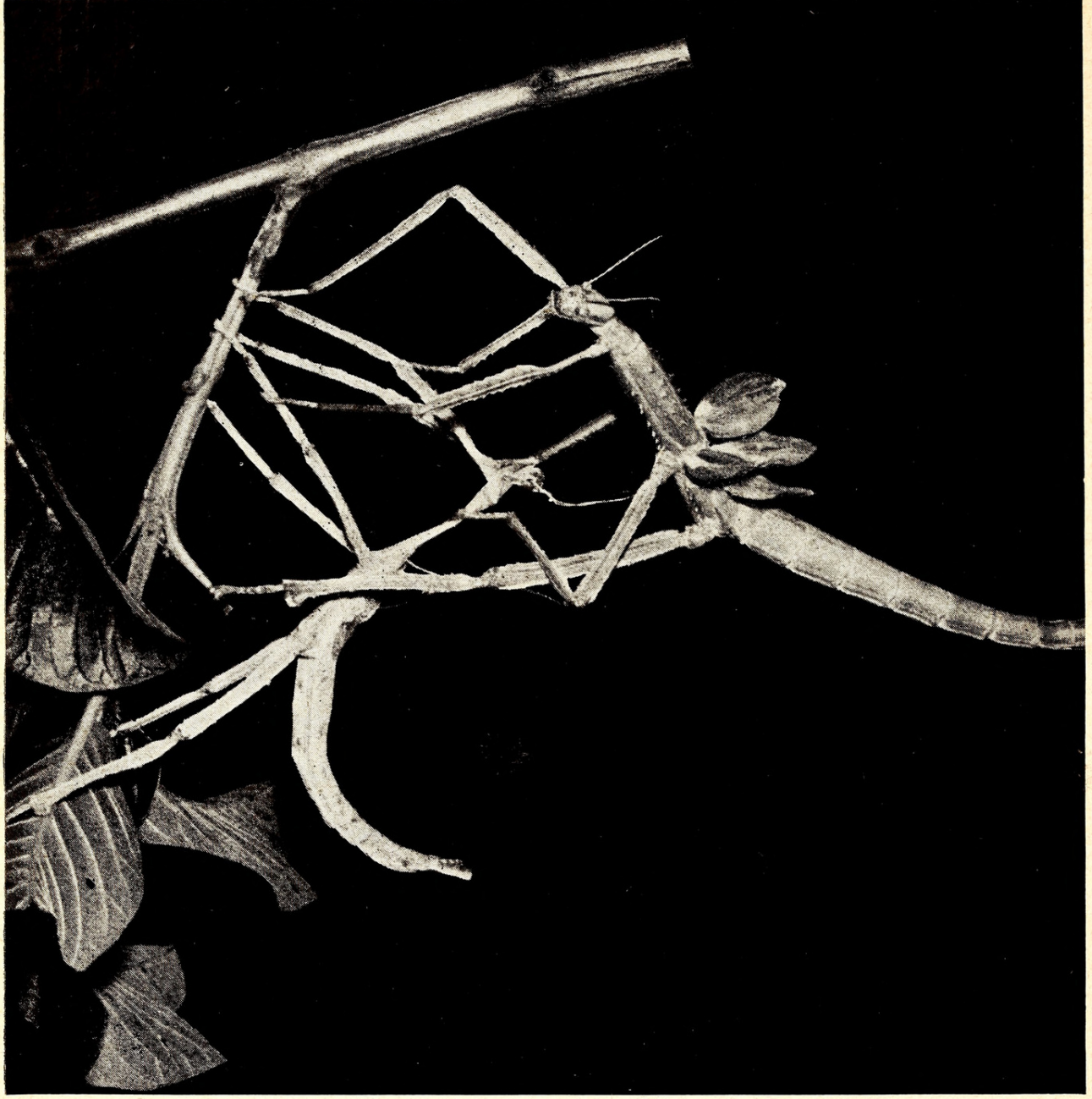
Body mostly emerged. Legs almost clear of old skin.



All legs clear. Tip of body firmly held in old skin. This position is maintained for an hour or more until skin and legs harden. Wings do not commence to grow until position is reversed.

Photos : H. J. Kitchener

Eurycnema goliath, the Giant
Stick Insect



The insect, now fully emerged, has reversed its position and the wings start to grow. When the wings reach their full size and harden, the cast skin is eaten.



Kitchener, H J. 1961. "The Giant Stick Insect, *Eurycnema Goliath* (Gray)." *The journal of the Bombay Natural History Society* 58, 147–154.

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