### REMEDIAL MEASURES.

It will not be possible, very probably, to put into practice a direct method for combating the disease since one of the aims, among others, of cover planting is to keep down the cost of garden up-keep as low as possible. The treatment of the fungus will certainly be very expensive. The only thing that can be done then is to help the *Vigna* plants so that they may be able to grow and close up the gaps with the healthiest plants possible during the dry season and the beginning of the rainy season. This can perhaps be attained by giving the ground a good tilling in the places where the disease has prevailed.

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# THE SOUTH ANDAMAN COCONUT SLUG-CATERPILLAR.

## *Thosea unifascia.* Wlk.

BY P. V. ISAAC B.A., M.Sc., (Lond.), D.I.C., F.E.S.

*Summarised for the Tropical Agriculturist by J. C. Hutson, Entomologist, Department of Agriculture, Ceylon.*

In the Agricultural Journal of India, Vol. XX, Part 5, September, 1925, there is an article, bearing the above title, which may be of interest to tea and coconut planters in view of the fact that several species of slug-caterpillars, or nettle-grubs, are known to attack tea and at least two species are minor pests of coconut in Ceylon. The South Andaman species of Thosea is not known to occur in Ceylon, but we have here at least three species of Thosea on tea, namely *Thosea recta*, the Morawak Korale nettle-grub, *T. cana*, the green nettle-grub, and *T. cervina*, while another species *T. aperiens* is occasionally found on coconuts.

### OCCURRENCE OF *THOSEA UNIFASCIA* IN SOUTH ANDAMAN.

It was in February, 1922, that *Thosea unifascia* was first noticed as a pest of coconut palms in South Andaman, where an outbreak occurred during the dry weather on an estate near Port Blair after the estate had been thoroughly weeded. The damaged leaves were removed and the treated palms recovered after the monsoon rains had started. During 1924 the pest reappeared on the same estate and attacked a number of palms on other estates near Port Blair.

Mr. A. T. Weringg, the lessee of the estate where the first outbreak occurred, after persistent efforts to check the pest, approached the Imperial Entomologist with the request for the scientific investigation of the pest. At the suggestion of the Imperial Entomologist this investigation was taken up by Mr. P. V. Isaac who spent about six weeks from the middle of February, 1925, in the South Andamans and neighbouring islands in studying the habits of the insect and trying control measures.

The investigator gives the following description of the conditions under which coconuts are grown in South Andaman :—"The coconut plantations in South Andaman of any magnitude are all within the settlement of Port Blair. There are about 3,850 acres of land under coconut cultivation. The plantations belong to and were till recently managed by Government, but since

1922 nearly 3,200 acres have been leased out to free settlers. The land was originally under forest and was cleared for coconuts. The plantations are some about fifty, some about thirty-five, some about nine years old. There are also a few acres which have been only recently planted. In most places there has been a good deal of undergrowth and there was hardly any attempt at cultivating the soil. The plantations are all along the coast and on small hills or sides of hills which rise up to about 300 feet from the sea. The soil is rather close in texture. As there is no system of terracing, there is nothing to prevent surface wash, and since Port Blair receives a rainfall of about 115 inches in the year the soil denudation is considerable and consequently the land is extremely poor in organic matter. The coconut palm is an introduced plant in South Andaman and observations show that it is not grown under satisfactory soil conditions. Besides, there are about one hundred palms planted to the acre, whereas the ideal recommended by experienced farmers is about sixty to the acre. The average yield of nuts has therefore been low."

**THE LIFE-HISTORY AND HABITS OF *THOSEA UNIFASCIA*. Wlk.**

Mr. Isaac states that owing to the shortness of the period spent on the study of this pest there are many points on which information is lacking and that a full knowledge of this pest can be arrived at only after continuous research. Meanwhile he gives some notes (here summarised) on the life-history and habits of the insect.

*Egg.*—A female moth lays about 400 eggs usually scattered singly on the lower surface of the leaves. The eggs are oval and scale like, lying flat on the leaf. They hatch in about five days.

*Larva.*—The young caterpillar at first eats a small surface patch, but later consumes portions of the leaf-blade, avoiding the midrib. The full-grown larva, or nettle-grub, is about one inch long and two-fifths of an inch broad. It is leaf-green in colour with a yellowish stripe down the middle of the back ; the sides and back are covered with regular rows of branching spines which have a very slightly irritating effect on the human skin. The larval stage lasts about eight weeks.

*Pupa.*—When full grown the coconut slug-caterpillar may form its cocoon in the internal axil of the leaf-stalk or it may crawl down the trunk and burrow up to four inches deep into the soil at the base. The larva then spins around itself an almost globular, brownish black cocoon with a cap at one end. The pupal period is about three weeks, after which he moth pushes open the lid and emerges.

*Moth.*—The moths are nocturnal and powerful fliers. They have no proboscis and do not feed. They are reddish brown in colour. The female has a very stout abdomen and is generally larger than the male. The antenuae of the female are very slender while those of the male are feathery. Wing expanse: male 30 mm. female 36 mm.

The total period occupied by each generation is about 12 weeks and there appear to be four generations in the year.

*Food Plants.*—Besides attacking coconut palms, the nettle-grubs feed on leaves of *Barringtonia racemosa*, Roxb. This and perhaps one or more other non-cultivated plants are very likely the natural food plants of the caterpillars.

## NATURE OF INJURY.

"These caterpillars feed voraciously and at times may occur in such large numbers in coconut plantations that a great many trees over a restricted area may be almost entirely defoliated. The mature spread-out leaves are preferred to the more tender central ones, and the caterpillars eat almost the whole of the green blade, leaving only the bare thin mid-ribs on the leaf-stalks. At first only a few trees are attacked, but these caterpillars turn into moths and successive generations of caterpillars in increased numbers are produced and the pest in a few months spreads over a large area, infesting every tree, and the injury done to the trees becomes both extensive and acute."

## DISCUSSION OF REMEDIAL MEASURES.

The investigator states that although there is no previous record either of this caterpillar pest or of the occurrence of the moth in the Andaman Islands, there is no reason to think that it is an introduced insect. He suggests the likelihood that it is indigenous and that it fed normally on some wild plants and that the balance of life between this and other forms of life associated with it was maintained by natural forces. Mr. Isaac further points out that the appearance of this insect as a pest in all the three plantations in Port Blair followed extensive and thorough weeding operations. It is suggested that the moths took to the coconut palms after the removal of the shade and protection afforded by the low-growing bushes of wild undergrowth. Or possibly the weeding may have temporarily reduced the number of the Braconid parasite and thereby relaxed one important check on the caterpillars. But further investigation is needed to bring speculations of this nature to any reasonable conclusion.

*Suggested control measures.*—After a study of the life history and habits of this pest it was possible to devise methods for checking any outbreak in its initial stage and preventing widespread damage. Since the larvae stick to the under-surface of the leaflets, and since young palms are the first to be attacked they are easily noticed. The injured leaves or portions of leaves with the caterpillars can be removed and burnt. The cocoons may be destroyed in the crowns of the palms by means of long knives or they may be collected from the soil by digging lightly. The moths are attracted to artificial light on dark nights in numbers, and simple light traps consisting of a hurricane lantern over a tub of water with a film of kerosene oil on it are suggested for places where an emergence of moths may be expected after an attack of caterpillars.

The control measures may be summarised as follows:—

1. Cut and burn infested leaves or portions of leaves as soon as the caterpillars are noticed.

2. Destroy the cocoons to be found within the leaf-axils or in the soil close to the tree trunk.

3. Use light traps and kill the moths.

*Natural enemies.*—These include a small wasp-like insect belonging to the family Braconidae which parasitises the caterpillars; birds, mainly crows and mynahs, which devour the larvae; and a wilt disease which kills the caterpillars when they are numerous. The Bracoinid parasite could be bred and distributed where required. Crows and mynahs are at present

rare and it may be an advantage to increase the mynah population. As regards the wilt disease past experience has indicated the impracticability of finding in a bacterial or fungoid disease a possible control method against any insect.

*Conclusion.*—In conclusion the investigator indicates the need for further research into the bionomics of *Thosea unifascia*. This is the first time that this insect has been known to occur as a pest. Moths of this species have been collected from Rangoon, Moulmein and Bhamo, but there is no record of its habits or of the appearance and food plants of the caterpillar. Since the problem of this insect is confined to the South Andaman Island, which is about 500 square miles in area, it is suggested by the investigator that a further study of this pest would open a very fruitful field for entomological work.

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# XYLEBORUS FORNICATUS IN INDIA.

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In his account of the distribution of *Xyleborus fornicatus* Eichh,—the shot-hole borer of tea—Speyer reviews the previous records of the occurrence of this species in India and concludes that "authorities in India have recorded this insect in that country on the slenderest ground" (Dept. Agri. Ceylon, Bull. 39 (1918) p. 7). He admits only one record as authentic *i.e.*, Bangalore, in castor oil tree, *Ricinus communis.**

In the 59th Annual Report of the Government Cinchona plantations and Factory in Bengal for 1920-21, p. 2, *Xyleborus fornicatus* is recorded from Mungpoo, Bengal, in Cinchona bushes.

In the Zoologische Mededeelingens' Rijks Museum, Leiden, Deel VII, p. 184 (published April 1923) Eggers refers to specimens from the Nilgiri Hills in the Hagedorn collection.

To these I am able to add the following records made personally in 1924 and 1925, which may be taken as proof that the species is indigenous in India.

MADRAS: 1. Nilambur Forest Division, 300 feet, in an unidentified timber.
2. Nadghani Ghat Road, 1,500 feet, Nilambur District in logs of *Ixora parviflora*.
3. Hillgrove, 4,000 feet, Nilgiris in logs of *Odina wodier and Erythrina indica*.
4. Coonoor River, 2.500 feet, Nilgiris in cut branchlets of *Albizzia odoratissima*.

MYSORE: 5. Bangalore, 3,000 feet, in living *Ricinus communis* trees.

BENGAL: 6. Chittagong Hill Tracts, 500 feet in suppressed *Gmelina arborea* saplings.

* Incidentally Speyer (l c. p. 7) incorrectly ascribes to the present writer the statement that *Xyleborus fornicatus* attacks *Shorea robusta* in India, an error which occurs in the abstract of the paper given in the Review of Applied Entomology, IV., p. 316, but not in the original article, (Indian Forester, XLII., (1916) pp. 216-223). *Xyleborus fornicatus* is not known to breed in *Shorea robusta*.