Insects Associated with Coffea arabica *and Some Other Crops in the Wau-Bulolo Area of New Guinea.*

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ABSTRACT.

In this paper all agricultural and forest pests found in the Wau-Bulolo area are listed in most cases with exact locality and chronological data. Many data represent new economic records or new distribution records. Reference is made to records mentioned in previous publications. Ninety-six phytophagous insects are listed and six predacious and parasitic insects. Certain ant species, which were found as nursing ants of scale insects and mealybugs, are mentioned in the chapter on Coccidae.

INTRODUCTION.

THE Senior Author visited the Wau-Bulolo area on many occasions between 1954 and 1966, studying agricultural and forest pests and conducting general insect collecting. An extensive coffee insect survey was carried out by the Senior Author in the Wau Valley in July-August, 1963, and another one by the Junior Author in February, 1966.

The insect Orders are listed in phylogenetical order (Imms, 1957), the families within the Orders, the genera within the families and the species within genera in alphabetical order. Abbreviations of the names of collectors which occur more often in this paper are—F. = A. Fischle ; K.= B. J. Kebby ; St.= R. M. Stevens ; Sz. = J. J. H. Szent-Ivany.

COLLEMBOLA.

Entomobryidae.

Salina sp.—This species was collected in large numbers in some plantations of the Wau Valley in July-August, 1963, on the leaves of *Coffea arabica* (Coll. Sz. and K.), however, it does not seem to cause such a degree of leaf shedding as was observed in the case of *Salina celebensis* Schaff on cacao and *Salina indica* on *Coffea canephora* in the Lowlands. Only minor damage is caused by leaf-etching.

ORTHOPTERA.

Acridiidae.

Valanga sp.—Agricultural Extension Station, Wau, IV.1965 on *Piper nigrum* (Coll. Sz.). Garden near Agricultural Extension Station, Wau, VII.1963, on *Brassica chinensis*, *B. oleracea* and *Hibiscus manihot* (Coll. Sz.).

Tettigoniidae.

Phaneroptera brevis Serv.—Rapagah Coffee Estate, Wau Valley, VII.1963, on the foliage of *Coffea arabica* (Coll. Sz.). Garden near Agricultural Extension Station, Wau, VII.1963, on *Brassica chinensis*, *Brassica oleracea* and *Hibiscus manihot*. New Guinea Goldfield Farm, Wau Valley, VII.1963, on *Coffea arabica* (Coll. Sz. and K.).

ISOPTERA.

Calotermitidae.

Neotermes sp.—Upper Crooked Road, Bulolo, 2,000 ft., 20.V.1963. In living *Terminalia catappa* (Coll. L. Clifford).

Rhinotermitidae.

Coptotermes elisae (Desneux).—Found many times in hoop-pine (*Araucaria cunninghamii*) of which it is a major pest in the Bulolo area (Ardley, Clifford and Gay, 1965).

HEMIPTERA.

Aleyrodidae.

Neomaskellia bergii (Sign) Wau, 3.VII. 1963.—In garden on the leaves of *Saccharum officinarum* (Coll. Sz. and K.).

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Aphididae.

Rhopalosiphum maidis (Fitch.).—Agricultural Extension Station, Wau, VII.1963, on *Zea mais* (Coll. Sz.).

Toxoptera aurantii (B. de Fons.).—Agricultural Extension Station, Wau, 3.VII.1963, on leaf of *Coffea arabica* (Coll. Sz. and K.). Riverside Estate, Wau Valley, 18.IV.1965, only a few leaves affected on a *Coffea arabica* bush (Coll. Sz.).

Toxoptera citricidus (Kirk.).—Kaisenik Village Plantation, Wau Valley, approximate altitude 3,200 ft., 19.IV.1965. On *Citrus* leaves (Coll. Sz.).

Cicadellidae.

Batrachomorphus blotei Ghauri.—This insect together with *Batrachomorphus szentivanyi* of the Central Highlands was recently described by Dr. M. S. K. Ghauri (1964). During the Senior Author's coffee insect survey this species was found in medium to dense populations in various plantations in the Wau Valley (Coll. Sz. and K.). However, it appeared to cause similar damage to that of the related *B. szentivanyi* at Aiyura (Barrett 1966) in only one plantation. In an area of this plantation about a dozen young coffee bushes showed set-back in growth, distortion of the growing point, tip-wilt of laterals, and drooping and wilting of the foliage. An unidentified disease (probably fungal), seems to control this and various other leaf-hopper pests in the Wau Valley. In the plantation where some of the trees were severely damaged, the Senior Author found 65 dead specimens of *Batrachomorphus blotei* on and around the growing point and the upper laterals of a coffee bush. These showed the symptoms of a fungus infection. On some bushes 80 to 90 per cent. of the leaf-hopper population was dead. This species was also collected on *Coffea arabica* at Nondugl, Western Highlands District of New Guinea (approximately 5,500 ft.), on the 18.X.1954 (Coll. Sz.) and on *Piper nigrum* at the Agricultural Extension Station, Wau, on the 18.IV.1965 (Coll. Sz.).

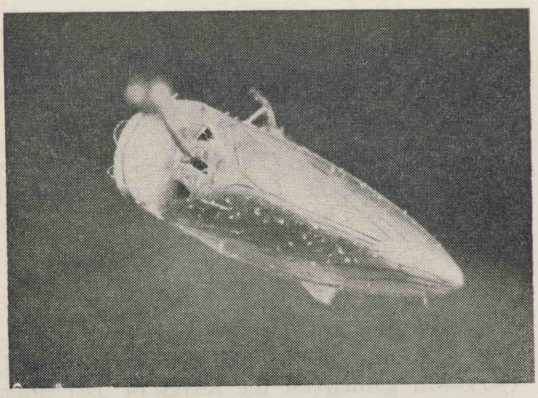

***Plate* I.—*Batrachomorphus blotei* Ghauri.**

Tartessus sp.—New Guinea Goldfield Coffee Block, 3,400 ft., 26.VII.1963. In low population density on *Coffea arabica* bushes (Coll. Sz.). Agricultural Extension Station, Wau, 15.II.1966, on *Coffea arabica* (Coll. F. and St.).

Coccidae.

Aonidiella citrina (Coq).—Wau, 16.II.1958, on fruit of *Citrus aurantiaca* (Coll. Sz.) (Szent-Ivany, 1956 (1959)).

Aspidiotus destructor Sign.—Wau, town area VIII.1959, on fronds of *Cocos nucifera* (Coll. Sz.) (Szent-Ivany and Catley, 1960).

Ceroplastes destructor Newst.—This waxy scale occurs in low population density in various plantations of the Wau Valley on *Coffea arabica*; it is usually found in pockets (Coll. Sz. and K., July-August, 1963, Coll. F. and St., February, 1966). Riverside Estate, Wau Valley, 21.IV. 1965 (Coll. Sz.). The damage to the foliage and twigs in Wau Valley coffee plantations is insignificant. The only place where almost every coffee bush was affected by this coccid, was in a small *Coffea arabica* block, planted along the road, near Sunshine Plantation in the Snake River Valley (20.IV.1965; Coll. Sz.). Other hostplants of *Ceroplastes destructor* in the Wau Valley are *Gardenia* sp. and *Plumeria acutifolia.* Heavy infestation by this coccid was found by the Senior Author in a flower garden in the town area of Wau in July, 1963. *Plumeria* was more heavily infested than *Gardenia*; on both hostplants *Ceroplastes* was associated with sooty mould fungus.

Chrysomphalus aonidum (L.).—Forestry nursery, Bulolo, 18.IV.1965; seedlings of *Pinus* sp. severely damaged. This represents a new economic record for the Territory of Papua and New Guinea (Coll. J. Smith and Sz.).

Coccus viridis (Green).—Rapagah Estate, Wau Valley, 22.VII.1963, on *Coffea arabica,* tended by the ants *Technomyrmex* sp. and *Iridomyrmex* sp. The green scale was found by the Senior Author and B. J. Kebby in various plantations of the Wau Valley on *Coffea arabica* in 1963 associated with sooty mould. However, in most cases 90 to 95 per cent. of the scales were dead. They were killed by entomogenous fungi.

Hemiberlesia palmae (Ckll.).—Wau, VIII. 1959, on ornamental *Cocos nucifera* (leaves) (Coll. Sz.) (Szent-Ivany and Catley 1960).

Paraputo leveri (Green).—Sunshine Plantation—Snake River Valley, 12.VII.1960, on the roots of *Coffea arabica* (Coll. A. Catley). Sunshine Plantation, 2.VII.1963; on the underground stem and roots of *Coffea arabica* (Coll. Sz. and K.) same locality, II.1966, tended by the ant *Pheidole megacephala* (Fabricius) (Coll. St.) *Paraputo leveri* (Green) was described by Green from the British Solomon Islands as *Pseudococcus leveri* and then placed into the new genus *Paraputo* Laing by Williams (1960). To the best of the Authors' knowledge this species has not been found in any other area but the mainland of New Guinea and the British Solomon Islands and in Fiji (Hinckley 1963). K. S. Cole found it the first time in the Territory of Papua and New Guinea. He found *Paraputo leveri* on the roots of *Coffea canephora* in a village coffee block (Inanianene Village), in the Milne Bay District in September, 1959 (Szent-Ivany and Catley 1960). The first major damage by *Paraputo leveri* to the roots of coffee bushes was reported from Sunshine Plantation, in the Snake River Valley. In this plantation about 100 mature *Coffea arabica* bushes died as a result of the root mealybug damage in 1962-1963. The Senior Author visited Sunshine Plantation in the company of Mr. A. Ireland, the Proprietor of Sunshine Plantation, and Mr. B. J. Kebby, the resident Agricultural Officer in the Wau Subdistrict, on the 2nd July, 1963. On arrival in the coffee block most affected by the mealybug, a three and a half year old dying coffee bush was pulled out of the ground. Upon examining the roots and underground portion of the stem it was found that the bulk of the population of the pinkish white coloured mealybugs was resting under a layer of a polyporid fungus on the underground part of the stem. Samples of the fungus were forwarded to the Commonwealth Institute of Mycology (Kew, England) and the polyporid was identified by Mr. G. F. Laundon as *Diacanthodes philippinensis* (Pat.) Singer. Three ants were found associated with *Paraputo leveri* in the ground. These were identified by Professor E. O. Wilson of Harvard University as a *Paratrechina* (*Nylanderia*) sp., a *Monomorium* sp. and *Odontomachus simillimus* (Fr. Smith). One of these—the *Paratrechina* species—seems to be the main nursing ant of *Paraputo leveri.* When the tree was pulled out of the ground, workers of these ants became very active and they began to carry away individuals of the mealybug. The *Monomorium* species is also a suspected nursing ant of *Paraputo leveri.* Several queens of this ant were found under the bark of the underground portion of the stem in close vicinity of the root mealybugs. Only a few workers of the large *Odontomachus* were seen in the hole made by pulling out the dead coffee bush from the ground. These probably fell into the hole from the surface of the ground. Many more workers of this larger ant were seen running in various directions on the surface of the ground in the whole coffee block.

Dr. D. Shaw, Principal Plant Pathologist with the Department of Agriculture, Stock and Fisheries, Konedobu, made a thorough study of the literature on *Diacanthodes philippinensis* in the Plant Pathological Section of the Department of Agriculture in Ottawa (Canada) and she agreed with the Senior Author that this fungus lives in a type of symbiosis with *Paraputo leveri.* Similar observations were made on the relation of the fungus *Polyporus coffeae* and the coccid *Pseudococcus deceptor* by Donk in Java. The imperfect stage of *Polyporus coffeae* is *Bornetina corium* which, according to Singer, is identical with *Diacanthodes philippinensis.* According to Dr. Shaw " the present concensus of opinion is that the fungus does not harm the insect and that it depends on both the sugary liquid exuded by the living roots as a result of sucking activities of the coccid, and the liquid excreted by the insect itself. The coccid may thrive without the fungus, but on the other hand, the fungus seems entirely dependent on the coccid for its full development ". As the coccid is protected from enemies by the thick layer of the fungus, the

Senior Author believes that the relation of *Paraputo leveri* and *Diacanthodes philippinensis* can be considered a true symbiosis. The first symptoms of *Paraputo* damage to a coffee bush is the wilting and drooping of the leaves on the top laterals of the tree which is followed by the wilting of the foliage on the next row of laterals ; then the stem begins to die and eventually the whole bush dies.

During the Junior Author's visit (February, 1966) to the coffee block of Sunshine Plantation which was so severely damaged by *Paraputo leveri* in 1962-1963, she could not find more than one coffee bush attacked by the root mealybug. As in 1963, *Paraputo leveri* was mainly found under layers of the polyporid fungus *Diacanthodes philippinensis* (Pat.) Singer.

Planococcus citri (Risso.).—There was a severe outbreak of this polyphagous mealybug in some plantations of the Wau Valley in 1956-1957. In one plantation *Planococcus citri* was associated with a few other coccids, such as *Pseudococcus adonidum* (L.), *Coccus viridis* (Green) and *Saissetia coffeae* (Walk.) and the reduction of yield in some coffee blocks of this plantation was estimated at 70 to 75 per cent. as a result of mealybug and scale insect damage. However, Mr. J. H. Ardley, who was the resident entomologist in the Morobe District in 1956-1957 visited this plantation several times and he came to the conclusion that *Planococcus citri* represented 90 to 95 per cent. of the coccid populations. Populations of the ladybird *Cryptolaemus affinis* (Crotch) were introduced to the Wau Valley from the coastal area (Markham Valley), for the control of *Planococcus citri* and this biological control trial was very successful (Szent-Ivany 1963b). During the Senior Author's comprehensive coffee insect survey in July to August, 1963, it was found that of 33 plantations visited only three had high population density of *Planococcus citri*. More than one third of the plantations had no *Planococcus citri* populations and 17 plantations had low or insignficant population density of the mealybug. *Cryptolaemus affinis* was found in 21 plantations and it was observed on several occasions feeding on *Planococcus citri*. During the Senior Author's visit to several plantations in the Wau Valley in April, 1965, *Planococcus citri* was found only in very low population density. In February, 1966, the Junior Author visited the coffee block of the Agricultural Extension Station at Wau and six plantations in the Wau Valley in the company of Mr. A. Fischle, the resident Agricultural Officer at Wau. *Cryptolaemus affinis* was observed in every plantation and the population density of *Planococcus citri* was very low. Other host plants of *Planococcus citri* observed in the Wau Valley are *Leucaena leucocephala* and *Tephrosia candida* (VII.1956, Coll. Sz. VII-VIII. 1956 ; Coll. Sz. and K.). *Planococcus citri* is tended by various ants in the Wau Valley. These are *Anoplolepis longipes* (Jerd.), *Iridomyrmex* sp., *Nylanderia* sp. (Group of *bourbonica* Forel), *Nylanderia bourbonica* Forel aff., *Pheidole megacephala* (Fabr.) *Technomyrmex* sp. *Pheidole megacephala* was observed building mud-tents above *Planococcus citri* on the stem of young coffee bushes at Kosali Plantation (Wau Valley) (3.VII.1963, Coll. Sz.).

Genus near *Perissopneumon*.—Wau, town area, 12th February, 1966. In very dense populations on *Persea gratissima*, causing death of the tree (Coll. F. and St.). This is a large fleshy mealybug, orange coloured with black markings (it changes its colour when preserved in alcohol) ; it reaches the length of 2 cm. and the width of nearly 1 cm. Apart from the gall-forming *Apiomorpha pedunculata* Full (Szent-Ivany and Womersley 1962) this is the largest mealybug so far recorded from the Territory of Papua and New Guinea. This species was previously found feeding on the branches of *Psidium guajava* at Port Moresby on 26.IX.1960 (Coll. A. Catley) and in very dense populations on *Terminalia catappa* on 10.VIII.1962 (Coll. W. Francis). This insect and most other Coccidae mentioned in this paper were identified by Dr. D. J. Williams (U.S. Department of Agriculture, Washington).

Pseudococcus adonidum (L.).—Found on coffee bushes in very low population density at Wau Coffee Estate and on Messrs. Clarke and Fry's Estate on 23rd July, 1963. The Senior Author collected this species on *Coffea arabica* more recently at Etesena Coffee Block, in the Okapa Subdistrict of the Eastern Highlands District at an approximate altitude of 6,000 ft. above sea level, on 7th January, 1965.

Pulvinaria sp.—Sunshine Plantation, Snake River Valley, IV.1965, on *Coffea arabica* foliage (Coll. Sz.).

Saissetia coffeae (Walk.).—This brown scale is found almost in every coffee plantation in the Wau Valley and also in the Bulolo-Snake River area on *Coffea arabica* in very low population density. On Rapagah Estate on the 22nd July, 1963, it was found associated with two nursing ants (*Technomyrmex* sp. and *Iridomyrmex* sp.) (Coll. Sz. and K.).

Saissetia nigra (Nietn.).—Kolega No. 2 Estate, Wau Valley, VII.1963 on *Leucaena leucocephala* (Coll. Sz. and K.). Blue Mountain Coffee Estate, 10.XI.1954, on *Crotalaria anagyroides* shade trees (Coll. R. E. P. Dwyer and Sz.).

Steatococcus samaraius Morr.—Wau, 3. VIII.1959, on *Tephrosia candida*, planted as shade tree in coffee plantation (Coll. Sz.) (Szent-Ivany and Catley 1960). McAdam Memorial Park near Wau, approximately 4,500 ft. 19.IV. 1965 ; on leaves of *Pipturus argenteus* (Coll. Sz.).

Coreidae.

Leptoglossus australis (F.).—Citrus orchard of the Bulolo Gold-Dredging Company, Bulolo, approximately 2,400 ft., July, 1956, on *Citrus reticulata* (Coll. Sz.). In a mixed grapefruit (*Citrus paradisi*) and mandarin (*C. reticulata*) orchard *Leptoglossus australis* was observed feeding on mandarin and causing severe premature fruit-fall in March, 1965, previous to the visit of the Senior Author to this orchard. *Leptoglossus* apparently left the grapefruit untouched (Szent-Ivany and Catley 1960b) ; Wau, town area, 1.VI.1957 on *Passiflora edulis* (Coll. Sz.) ; Riverside Estate, Wau Valley, 3,400 ft., IV.1965. Feeding on tender branch of *Coffea arabica* ; Vegetable Farm of Bulolo Gold-Dredging Company, approximately 2,400 ft., March, 1956, feeding on fruit of *Lycopersicum esculentum* (Observation by Mr. W. Walker) ; McAdam Memorial Park, near Wau, Morobe District of New Guinea, 19.IV.1965, on *Momordica charantia* (Coll. Sz.).

Riptortus sp.—Near *distinguendus* Blote. Poltalloch Estate, Wau Valley, 3,400 ft., 18. IV.1965. On the pods of *Tephrosia candida* (Coll. Sz.).

Riptortus linearis (F.).—D. Bonnie's Estate, near Kaisenik Village, Wau Valley, approximately 3,200 ft., 19.IV.1965, on *Tephrosia candida* (pods and branches) (Coll. Sz.).

Flatidae.

Colgar tricolor Dist.—Wau Valley and Agricultural Extension Station, Wau (several plantations) VII-VIII.1963, on leaves and branches of *Coffea arabica* (Coll. Sz. and K.). Garden near Agricultural Extension Station, Wau, VII.1963 on *Brassica chinensis*, *Brassica oleracea*, *Hibiscus manihot* (Coll. Sz. and K.) ; Yallaru Plantation, Wau Valley, 4.VIII.1963, in commercial flower garden on *Gladiolus* sp. (Coll. Sz.) ; Agricultural Extension Station, Wau and several plantations in the Wau Valley, II.1966, on *Coffea arabica* (Coll. F. and St.). The Authors wish to mention here that approximately 60 per cent. of the populations of *Colgar tricolor* were found by B. J. Kebby and the Senior Author killed by an entomogenous fungus during the comprehensive coffee insect survey in July to August, 1963.

Euphanta sp.—Agricultural Extension Station, Wau, 18.IV.1965 (Coll. Sz.).

Phymoides sp.—Bencula Estate, Wau Valley, approximately 4,300 ft., 23.VII.1963, on *Coffea arabica* (Coll. Sz. and K.) ; Bubu Estate, Wau Valley, 3,400 ft., 22.VII.1963, on *Coffea arabica* (Coll. Sz. and K.) ; Powerhouse Coffee Block (Property of New Guinea Gold-field Company), Wau Valley, 4,000 ft., 23.VIII.1963, on

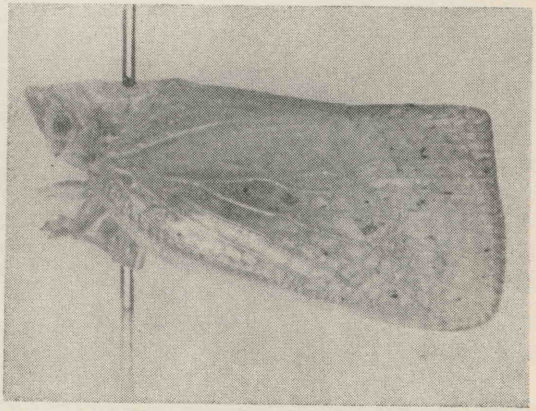

Plate II.—*Colgar tricolor* Dist.

Coffea arabica (Coll. Sz. and K.) ; Agricultural Extension Station, Wau, 18.IV.1965, on *Coffea arabica* (Coll. Sz.).

Sephena sp.—Bencula Estate, Wau Valley, approximately 4,200 ft., 23.VII.1963, on *Coffea arabica* (Coll. Sz. and K.) ; Kaisenik Village Plantation, Wau Valley, approximately 3,200 ft., 2.VIII.1963, on *Coffea arabica* (Coll. Sz. and K.).

Issidae.

Hemisphaerius sp. (*Plate* III).—Agricultural Extension Station, Wau, VII.1963 on *Coffea arabica* foliage (Coll. Sz. and K.), 18.IV.1965 on *Coffea arabica* foliage (Coll. Sz.) ; Lane's Coffee Estate, Wau Valley, approximately 3,400 ft., 25.VII.1963, on *Coffea arabica* (Coll. Sz. and K.) ; Warra-Wau Estate, Wau Valley approximately 3,400 ft., 17.IV.1963 on *Coffea arabica* Power House Coffee Block (Property of New Guinea Gold-field Company), 4,000 ft., 23.VII. 1963, on *Coffea arabica* ; Poltalloch Estate, Wau Valley, 3,400 ft., 2.VII.1963, on *Coffea arabica* (Coll. Sz.). Mr. R. G. Fennah, Assistant Director, Commonwealth Institute of Entomology (London), has kindly informed the Senior Author that this small fast jumping leaf-hopper may represent a new species. It seems to be widely distributed in the Wau Valley, but it is found in rather low population density on *Coffea arabica.*

Membracidae.

Gen. et species indet. (*Plate* IV).—This is a small species with two conspicuous processi ("horns") on its head which occurs in most coffee plantations of the Wau Valley in low to medium population density, feeding near the growing point of *Coffea arabica.* Specimens with the following locality data were forwarded for indentification to the Commonwealth Institute of Entomology ; Agricultural Extension Station, Wau, 15th February, 1966 (Coll. F. and St.) ; Kaisenik Village Plantation, Wau Valley, approximately 3,200 ft., 2.VIII.1963 (Coll. Sz. and K.) ; Kunai Creek Coffee Block (Property of New Guinea Gold-field Company), Wau Valley, 4,000 ft., 23.VIII.1963 (Coll. Sz. and K.) ; Poltalloch Estate, Wau Valley, 3,400 ft., 2.VIII 1963 (Coll. Sz. and K.) ; Power House Coffee Block (Property of New Guinea Gold-field Company), 4,000 ft., 23.VII.1963 (Coll. Sz. and K.) ; Shanahan and Schuster's Plantation, Wau Valley, approximately 3,400 ft., 25.VII. 1963 (Coll. Sz. and K.) ; Wau Coffee Estate, Wau Valley, approximately 3,400 ft., 24.VII. 1963 (Coll. Sz. and K.). All the abovementioned were collected on *Coffea arabica.* This species could not be identified in the Commonwealth Institute of Entomology ; apparently neither the genus nor the species are represented in the collection of the British Museum (Natural History). It is hoped that a specialist will make further systematic studies on this membracid and will describe it if it proves to be new to science.

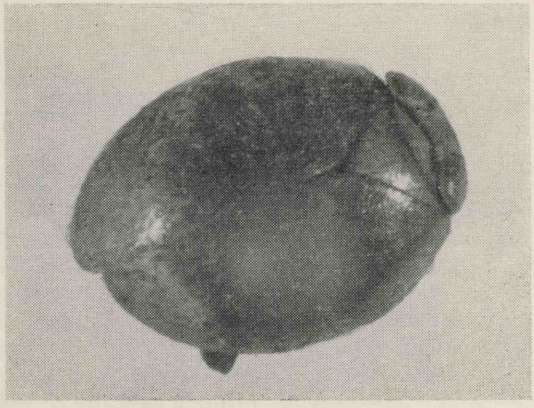

***Plate* III.—*Haemisphaerius* sp.**

Terentius nubifasciatus Walk. (*Plate* V).—Kunai Creek Coffee Block (Property of New Guinea Gold-field Company), Wau Valley, 4,000 ft., 23.VIII.1963, on *Coffea arabica* (Coll. Sz. and K.).

Pentatomidae.

Agapophyta sp.—Stirling Chase Estate, Wau Valley, approximately 3,400 ft., VIII.1963, on *Tephrosia candida* and *Coffea arabica* (Coll. Sz. and K.).

Agapophyta similis Blote.—Poltalloch Estate, Wau Valley, 3,400 ft., 18.IV.1965, on *Tephrosia candida* (Coll. Sz.). This species has been also found on *Cajanus cajan* on Kar Kar Island in the Madang District.

Agapophyta viridula Blote.—Poltalloch Estate, Wau Valley, 3,400 ft., 18.IV.1965, on *Tephrosia candida* (Coll. Sz.). New economic record for the Territory.

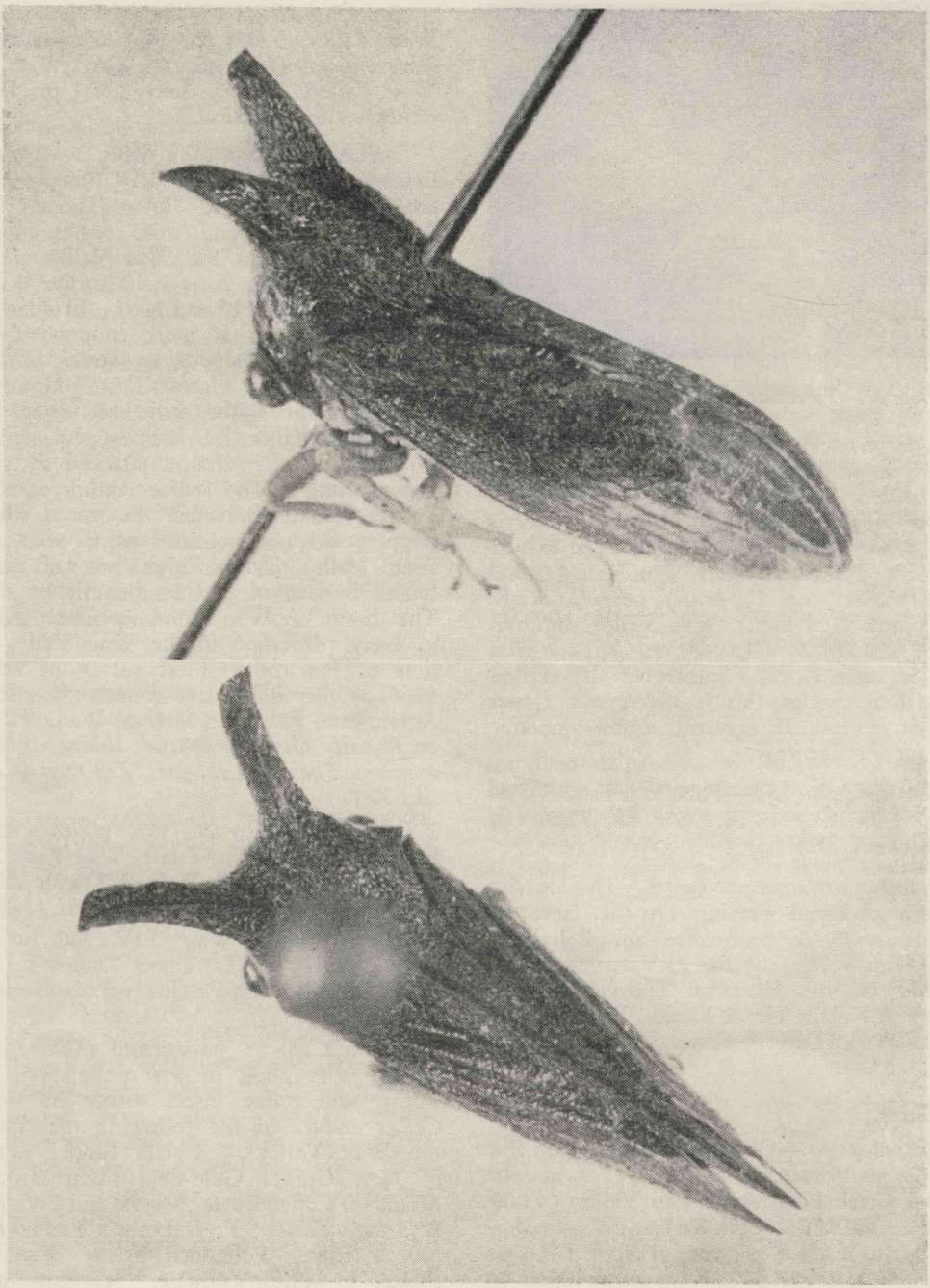

Plate IV.—A membracid, common on *Coffea arabica* in the Wau Valley (Genus et species indet). Dorsal and lateral view.

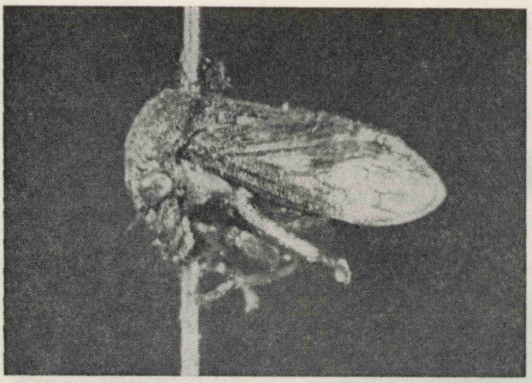

Plate V.—*Terentius mubifasciatus* Walk.

Antestiopsis semiviridis (Walk.).—Agricultural Extension Station, Wau, 24.VIII.1963, on *Coffea arabica* (Coll. Sz. and K.), 17.IV.1965, on *Piper nigrum* (Coll. Sz.) ; Clarke and Fry's Estate, Wau Valley, II.1966, on *Coffea arabica* (Coll. St.) ; Poltalloch Estate, Wau Valley, 3,400 ft., 18.IV.1965, on *Tephrosia candida* (Coll. Sz.) ; Warra-Wau Estate, Wau Valley, approximately 3,400 ft., 24.VII.1963, on *Coffea arabica* (Coll. Sz. and K.). Contrary to the related East African species, this is a very minor pest of *Coffea arabica*. It represents a new economic record for the Territory.

Nezara viridula (L.).—Poltalloch Estate, Wau Valley, 3,400 ft., 18.IV.1965, on *Tephrosia candida* (Coll. Sz.).

Platynopus melacanthus Boisd.—This species has been observed preying on the larva of *Heliothis armigera* on coffee on Poltalloch Estate (Wau Valley) on the 23.VII.1963 (Coll. Sz.) and on the larva of *Tiracola plagiata* (Walk.) at Kolega No. 2 Estate (Wau Valley) on 17.IV.1963 (Coll. Professor J. I. Balogh and Sz.).

Reduviidae.

Pristhesancus sp.—Observed preying upon the flatid *Colgar tricolor* Dist. on *Coffea arabica* at Kunai Creek Plantation, Wau Valley (4,000 ft.), on 23.VII.1963 (Coll. Sz.).

Ricaniidae.

Armacia sp.—Bubu Estate, Wau Valley, approximately 3,400 ft., VII.1963, on *Coffea arabica* (Coll. Sz. and K.).

Armacia basigera (Walk.).—Poltalloch Estate, Wau Valley, 3,400 ft., IV.1965, on *Leucaena leucocephala* (Coll. Sz.), Warra-Wau Estate, Wau Valley, approximately 3,400 ft., IV.1965, on *Coffea arabica* (Coll. Sz.).

Euricania discigutta (Walk.).—Agricultural Extension Station, Wau, 5.IV.1960, on *Coffea arabica* (Coll. R. T. Simon Thomas). The Senior Author found this species in almost every plantation of the Wau Valley on *Coffea arabica* during his many visits to the Wau Subdistrict between 1954 and 1965. In some plantations this species is more common than the cicadellid *Batrachomorphus blotei* Ghauri or the flatid *Colgar tricolor* Dist. However, in most plantations the flatid seems to be the commonest minor leaf-hopper pest. *Euricania discigutta* is often found attacked by entomogenous fungi. The Senior Author agrees with Dr. F. J. Simmonds that the reason why leafhoppers do not become major pests in the Wau Valley, is the high rate of mortality caused by natural enemies, mainly by diseases. The Junior Author found *Euricania discigutta* in every plantation in the Wau Valley at the time of her coffee insect survey in February, 1966. Other host plant records : Garden near Agricultural Extension Station, Wau, VII.1963 ; on *Brassica oleracea*, *Brassica chinensis*, *Hibiscus manihot*, *Phaseolus vulgaris*, *Zea mais* (Coll. Sz. and K.).

Euricania disciguttata var. *villica* (Stal.).—Blue Mountain Coffee Estate, Wau Valley, 3,400 ft., 10.XI.1954 (Coll. R. E. P. Dwyer and Sz.).

Ricanula trimaculata (Guer.).—Agricultural Extension Station, Wau, 5.IV.1960, on *Coffea arabica* (Coll. R. T. Simon Thomas) ; 17.IV. 1965, on *Coffea arabica* (low population density) (Coll. Sz.).

Ricanula sp. nr. *puncticosta* (Walk.).—This species was found in low population density during the coffee insect survey in 1963 on *Coffea arabica* in the following plantations of the Wau Valley : 'Albizia Block' (Property of New Guinea Gold-field Company) ; Blue Mountain Coffee Estate ; Clarke and Fry's Estate ; L. Lane's Estate ; P. J. Leahy's Farm ; Kolega No. 1 Estate, Poltalloch Estate, Wau Coffee Estate, J. Wilson's Estate. It seems to have invaded the coffee plantations in recent years. The Senior Author has not found it on *Coffea arabica* in the Wau Valley before 1963.

Ricanula sp.—Wau, 31.V.1957 ; 15.II.1957, on *Coffea arabica* (Coll. Sz.).

Tarundia sp.—Clarke and Fry's Estate, Wau Valley, approximately 3,400 ft., II.1966, on *Coffea arabica* (Coll. St.).

LEPIDOPTERA.

Arctiidae.

Creatonotus gangis (L.).—Vegetable Farm of Bulolo Gold-Dredging Company, approximately 2,400 ft., VII.1956, larva on *Zea mais* (Coll. Sz.) ; Garden near Agricultural Extension Station, Wau VII.1963 ; larva on *Zea mais* (Coll. Sz.). This arctiid must have various indigenous host plants of the family Gramineae. It appears at electric lights, both white light and mercury vapour lamps, in large numbers in the Wau area.

Cossidae.

Zeuzera ? coffeae Nietn.—A minor pest of *Coffea arabica* in the Wau Valley. There was a slight outbreak at New Guinea Gold-field Farm in 1956-1957. The borer holes were individually treated with creosote.

Gelechiidae.

Phthorimea operculella (Zell.).—Wau, home garden, reared from larvae in tuber of *Solanum tuberosum* (Coll. J. H. Ardley).

Geometridae.

Cleora sp.—Agricultural Extension Station, Wau, 18.IV.1965. Reared ex larva on *Coffea arabica* (Coll. Sz.).

Ectropis sabulosa Warr.—Reared from larvae on *Coffea arabica* and *Leucaena leucocephala* by the Junior Author at Clarke and Fry's Estate (Wau Valley), and at Sunshine Plantation (Snake River Valley) in February, 1966.

Hyposidra talaca (Walk.).—Waramouli Estate, Wau Valley, VII.1963 young larvae feeding on *Coffea arabica* leaves (Coll. Sz.). Poltalloch Estate, Wau Valley, 3,400 ft., 18.IV. 1965, reared from larva on *Coffea arabica* (Coll. Sz.). Warra-Wau Estate and Clarke and Fry's Estate (Wau Valley) and Sunshine Plantation (Snake River Valley), II.1966, larvae found in low population density feeding on *Coffea arabica* (Coll. St.).

Milionia isodoxa (Prout).—This species was recorded as a pest of hoop pine (*Araucaria cunninghamii*) in the Eastern Highlands (Szent-Ivany and Catley 1960). Adult moths were observed by the Senior Author not far from Department of Forests' Pine Plantation ('Andersons Logging Area'), at McAdam Memorial Park in April, 1965. Larvae have not been recorded so far from hoop pine needles in the Wau-Bulolo area.

Limacodidae.

Chalcocelis alboguttata Snellen.—This species was found on *Coffea arabica* in the following plantations : Agricultural Extension Station, Wau, July, 1963 (Sz. and K.), 17.IV. 1965 (Coll. Sz.) ; Blue Mountain Coffee Estate, Bubu Estate, Clarke and Fry's Estate, Kosali Plantation, Poltalloch Estate, Riverside Estate, Rousey Estate, Warra-Wau Estate, Wau Coffee Estate, J. Wilson's Estate, all in the Wau Valley in July to August, 1963 (Coll. Sz. and K.). This slug caterpillar is a minor pest of *Coffea arabica* which never causes major defoliation.

Parasa sp.—Blue Mountain Coffee Estate, Wau Valley, VII.1963. Reared from larva on *Coffea arabica* (Coll. Sz. and K.).

Scopelodes dinawa B. Bak.—This species was found on two occasions causing almost complete defoliation of *Mangifera indica*, the first time at Blue Mountain Coffee Estate in November, 1954, by the late R. E. P. Dwyer and the Senior Author (Szent-Ivany 1955), and the second time in the town area of Wau in 1965 by J. Sedlacek.

Lymantriidae.

Dasychira sp.—Wau, 10.XI.1954, some leaf damage by the larva of this species was found on *Cassia fistula* in an ornamental garden (Coll. Sz.).

Euproctis sp.—This and possibly another species is commonly found on *Coffea arabica* plantations in the Wau Valley. Its population density is always low.

Orgyia postica (Walk.).—The Senior Author found this species causing damage to the leaves of *Cassia fistula* at Wau on 10.XI.1954. Similar to the *Euproctis* species, it occurs in low population density on *Coffea arabica* in all plantations in the Wau Valley and at Sunshine Plantation in

the Snake River Valley (Coll. Sz., Coll. St.). The Senior Author found *Orgyia postica* on one occasion feeding on *Leucaena leucocephala* (Poltalloch Estate, Wau Valley, April, 1965).

Noctuidae.

Achaea janata (F.).—Agricultural Extension Station, Wau, 3.VII.1963, reared from larva on *Coffea arabica* (Coll. Sz.). Riverside Estate, Wau Valley, 3.VII.1963. Bred from larva on *Coffea arabica.*

Agrotis interjectionis Guen.—This species appears in medium population density at the light source of 'Insecta Flash' Electrocutors and at Mercury Vapour Lamps in the Wau Valley. The Senior Author reared this species from garden lawn in Goroka in the Eastern Highlands District. It most likely causes damage to garden lawns also in the Wau Valley.

Heliothis armigera (Hbn.).—A severe outbreak of *Heliothis armigera* was found by the Senior Author in the vegetable farm of the Bulolo Gold-Dredging Company at Bulolo in July, 1956. In a block of maize at least 40 per cent. of the corn cobs were attacked by *Heliothis* larvae. In the same block *Heliothis armigera* larvae were also found damaging tomatoes, together with the larvae of *Spodoptera litura* F. Other observations on *Heliothis armigera* in the Wau-Bulolo area: (1) A few larvae were observed feeding on coffee cherries (*Coffea arabica*) at Poltalloch Estate on 23rd July, 1963 (Coll. Sz.). (2) Adults were observed flying round cabbage heads at Biangi Farm and round ornamentals in a commercial flower garden at Yallaru Farm (Coll. Sz.). (3) *Heliothis armigera* appears at Wau in medium population density at Mercury Vapour Lamps or white light (Coll. Sz.).

Othreis fullonia (Clk.).—Bishop Museum Field Station, Wau, 4,000 ft., IV.1965, reared from larvae on *Erythrina indica* (Coll. J. Sedlacek).

Pericyma cruegeri (Butl.).—This noctuid appeared the first time on ornamental legume trees (*Delonix regia* and *Pelthophorum ferrugineum*) in the Territory of Papua and New Guinea in 1958. The first serious outbreak was in the Port Moresby town area in February to May, 1958. In subsequent years it invaded the areas of many other towns and townships in several districts of the Territory (Szent-Ivany 1959, 1960, 1963b) (Szent-Ivany and Catley 1960a). Adult moths appeared in medium population density at the light source of an 'Insecta Flash' Electrocutor during a demonstration in March, 1964, at Poltalloch Estate. At the same time adult moths were also collected at Mercury Vapour Lamps at the Bishop Museum Field Station in Wau (Coll. Sz.). The first larvae were found by the Senior Author feeding on *Delonix regia* during a short visit to the Bishop Museum Field Station in March, 1966. Some branches of the tree in the Station's Garden were severely defoliated.

Spodoptera exempta (Walk.).—This common and widely distributed grass-moth appeared in very dense populations at Mercury Vapour Lamps at the Bishop Museum Field Station at Wau in March, 1964. It was also attracted by the light source of the 'Insecta Flash' Electrocutor at Poltalloch Estate. Damage to garden lawns was apparent in various parts of the town area, most likely caused by this species. The appearance of *Spodoptera exempta* in vast numbers in 1964 was not confined to the Wau area only. Severe outbreaks were reported from the Yoda Valley (Kokoda, Northern District of Papua), Port Moresby and Tapini (Central District of Papua) and Mendi (Southern Highlands District of New Guinea).

Spodoptera litura (F.).—For some years vegetable farmers in the Wau Valley were suffering severe losses as a result of the damage by this noctuid to cabbage and other garden crops. The Senior Author observed *Spodoptera litura* damaging the following cultivated plants in the Wau area: *Brassica chinensis*, *Brassica oleracea*, *Hibiscus manihot*, *Lactuca sativa*, *Lycopersicum esculentum*. Damage to tomato fruit at the Vegetable Farm of the Bulolo Gold-Dredging Company in July, 1956, was also quite severe.

Tiracola plagiata (Walk.).—During the coffee insect survey in 1963 the Senior Author and B. J. Kebby found the larvae of this moth in small pockets at Blue Mountain Coffee Estate and some larvae were found also in other plantations in the Wau Valley. The damage caused to coffee foliage was insignificant. During a visit to the Wau Valley in April, 1965, *Tiracola plagiata* was observed on both *Leucaena* shade trees and coffee bushes at Warra-Wau Estate and at Kolega No. 1 Estate. The population density at Kolega No. 1 Estate was slightly

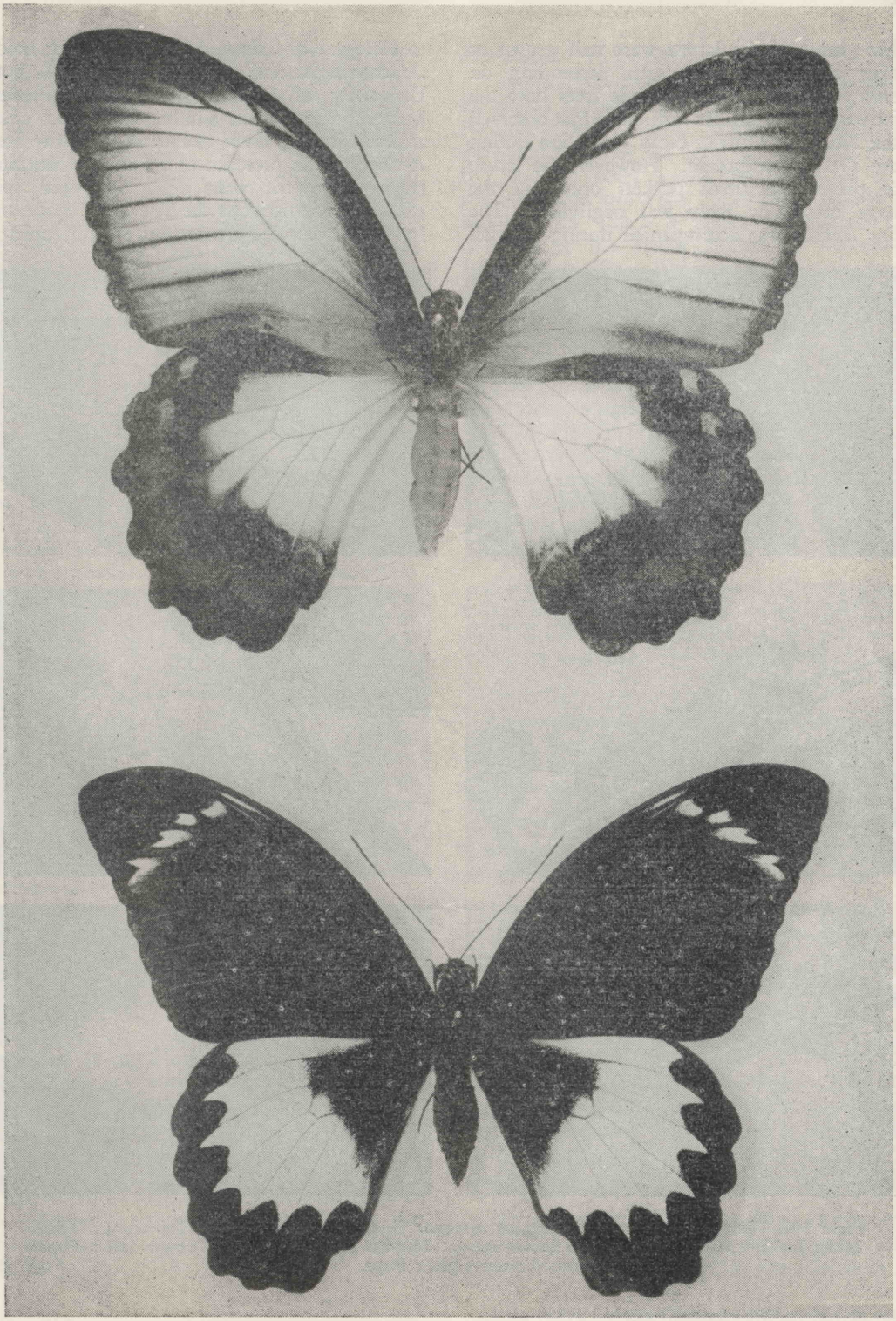

Plate VI.—Bottom : *Papilio aegeus ormenus* Guen. (Male). Top : *Papilio aegeus ormenus* Guen (Albino Female).

higher ; most of the larvae were half grown or smaller and many were seen descending on threads from the *Leucaena* shade trees onto the coffee bushes in a similar fashion to that observed in the Northern District cacao plantation during severe *Tiracola* outbreaks. However, the larvae were present in small pockets only and the damage caused by them was negligible. The Senior Author was accompanied during his visit to Kolega No. 1 Estate by Professor J. I. Balogh, Arachnologist, and soil zoologist of the L. Eotvos University of Science (Budapest). Professor Balogh, whose main aim was to collect spiders and soil insects, drew the attention of the Senior Author to the presence of an almost continuous large canopy of webs of an argiopid spider (*Epeira* sp.) between the *Leucaena* shade trees. In these webs large numbers of phytophagous

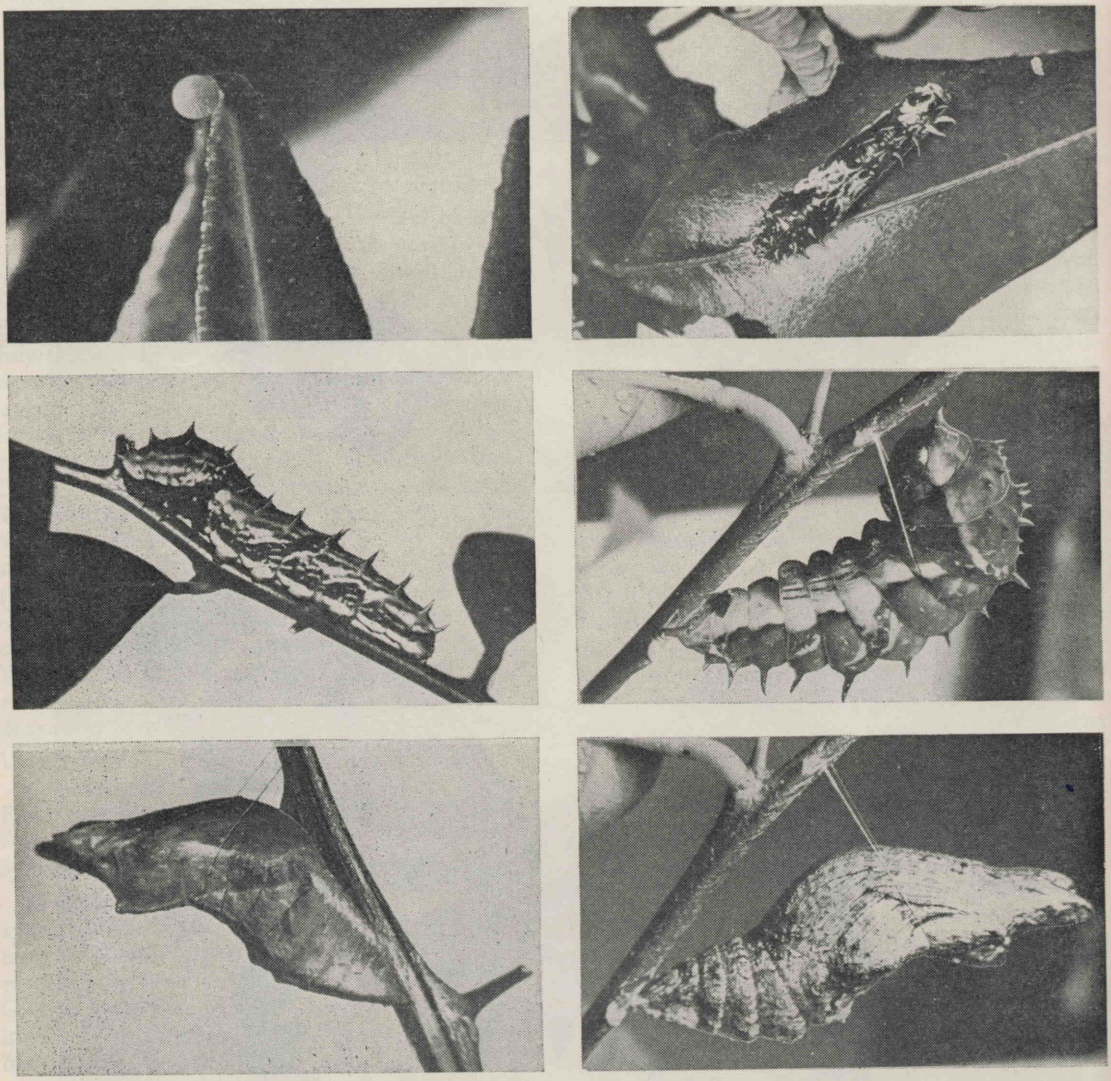

Plate VII.—Early stages of *Papilio aegeus ormenus* Guen. Top left : Egg. Top right : Third Instar larva. Middle left : Fifth Instar larva. Middle right : Prepupa. Lower left : Pupa. Lower right : Pupa.

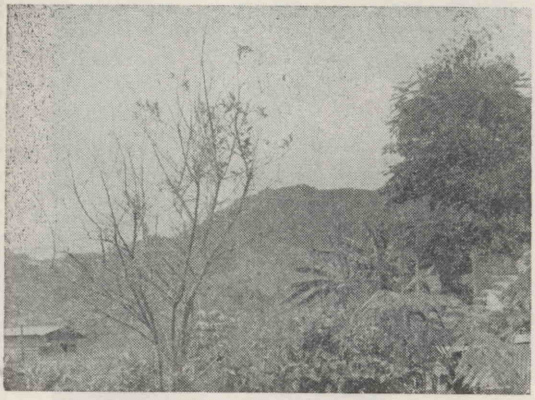

Plate VIII.—Severe defoliation of *Citrus* tree by *Papilio aegeus ormenus* Guen.

and other caterpillars were caught. Thus, this *Epeira* species must have contributed a great insects, such as leaf-hoppers, leaf-roller larvae and adults, younger instars of *Tiracola plagiata* deal in this plantation to the control or reduction of the population density of phytophagous insects, including that of *Tiracola*. The Junior Author, during her survey in February, 1966, found *Tiracola plagiata* on *Coffea arabica* at Clarke and Fry's Estate in the Wau Valley and at Sunshine Plantation in the Snake River Valley. Both Authors collected adult moths of *Tiracola plagiata* at Mercury Vapour Lamps at the Bishop Museum Field Station and at the light source of 'Insecta Flash' Electrocutors at Poltalloch Estate (the Junior Author also at Sunshine Plantation), always in low population density.

Papilionidae.

Papilio aegeus ormenus Guen. (*Plate* VI.).—This swallowtail, commonly known as 'citrus' or 'citrus orchard butterfly' in Australia and in Papua and New Guinea, is very common in the Wau-Bulolo area. However, it rarely causes severe defoliation, and usually only single trees are affected in ornamental gardens. Complete defoliation of a *Citrus* tree by *Papilio aegeus* was observed by the Senior Author in November, 1954, in a home garden in the Wau town area (*Plate* VIII). The ichneumonid *Echthromorpha insidiator* Sm. was observed as a larval parasite and the mantid *Hierodula* (*Tamolamica*) *tamolama* (Branes.) was observed preying on the larva of *Papilio aegeus* in the Wau Valley (Coll. Sz.).

Pieridae.

Catopsilia pomona pomona (F.).—Commonly known as 'cassia butterfly' in the Territory of Papua and New Guinea. It has a Territory-wide distribution (from sea level up to about 6,000 ft.) and it causes severe defoliation in some years to *Cassia fistula* and *Cassia alata* in the Wau-Bulolo area. Such a severe defoliation was observed by the Senior Author in November, 1954 (*Plate* X). There were large numbers of adult butterflies present in the town area. Most of them were damaged females which indicated that they had emerged from their pupae some time ago and they had most likely migrated to Wau from an area where the cassia trees were completely defoliated (Szent-Ivany 1956 (1959)). *Catopsilia pomona pomona* has many individual colour varieties. The most important ones are *f. crocale* Cr. and *catilla* Cr. (*Plate* IX). For a long time the *f. crocale* was considered a distinct species.

Plutellidae.

Plutella maculipennis Curt.—Biangi Vegetable Farm, Wau Valley, approximately 3,400 ft., VII.1963; larvae attacking cabbage heads (Coll. Sz. and K.).

Psychidae.

Crematopsyche pendula Joannis.—Wau Coffee Estate, Wau Valley, approximately 3,400 ft., 21.VII.1963. Reared from larva on *Coffea arabica* (Coll. Sz.).

Pteroma sp.—Poltalloch Estate, Wau Valley, 3,400 ft., 23.VII.1963; cases hanging by threads on *Leucaena leucocephala* shade trees (Coll. Sz. and K.). Agricultural Extension Station, Wau, IV.1965; dense populations on *Leucaena leucocephala* shade trees (Coll. Sz.) same locality, II.1966; feeding on *Coffea arabica* and *Vanilla planifolia* (Coll. F. and St.).

Pyralidae.

Hymenia recurvalis (F.).—Vegetable Farm of Bulolo Gold-Dredging Company, Bulolo, approximately 2,400 ft., July, 1956, on *Beta vulgaris* (Coll. Sz.).

Sphingidae.

Agrius convolvuli (L.).—Wau, town area, 10.XI.1954, larva found on sweet potato. This moth commonly known in the Territory as

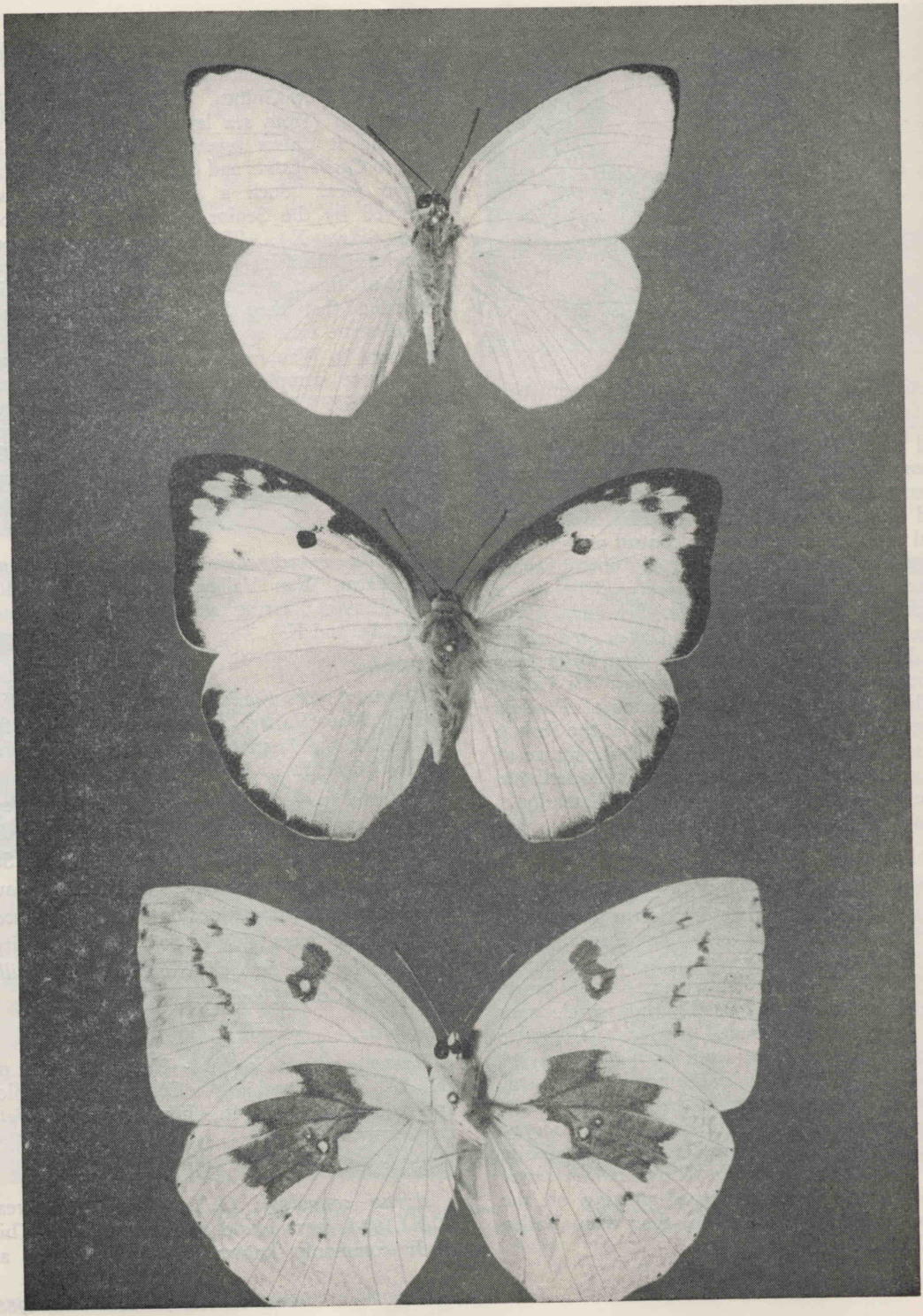

Plate IX.—Top : *Catopsilia pomona pomona* (F.). Centre : *Catopsilia pomona pomona* (F.) f. *crocale* Cr. Bottom : *Catopsilia pomona pomona* (F.) f. *catilla* Cr.

Plate X.—Severe defoliation of *Cassia fistula* tree by *Catopsilia pomona pomona* (Fabr.) at Wau.

'sweet potato hawkmoth', sometimes causes considerable damage to *Ipomoea batatas* in the Territory, mainly in the lowland areas (Szent-Ivany 1961). It is of no importance as a pest of sweet potato in the Wau Subdistrict. It must have alternate indigenous host plants as it is one of the commonest hawkmoths round electric lamps in the Wau town area. It is also strongly attracted by Mercury Vapour Lamps and the light source of the 'Insecta Flash' Electrocutor.

Hippotion celerio (L.).—Wau, town area; larvae feeding on *Vitis vinifera* (Coll. Sz.). It has been recorded as a pest of sweet potato, and taro in the Territory (Dumbleton 1954; Froggatt 1938). The Senior Author found it on *Colocasia* in various districts in recent years and A. Catley collected the larvae of *Hippotion celerio* on *Caladium* at Plant Industry Centre, Bubia, near Lae. An alternate weed host plant is *Boerhavia erecta* (Family Nyctaginaceae) (Szent-Ivany and Carver 1967 in press).

Tineidae.

Setomorpha ridella Zell.—Bulolo, VII.1964. Seed borer of klinki pine (*Araucaria hunsteinii*) reared by G. S. Dun.

Tortricidae.

Homona coffearia (Nietn.).—Ubureng Plantation, Wau Valley, VII-VIII.1963. Leaf-roller on *Coffea arabica* (Coll. Sz. and K.). Agricultural Extension Station, Wau, and Warra-Wau Estate, 17.IV.1965, on *Coffea arabica* in low population density (Observation by Sz.). The 'coffee leaf-roller moth' or 'tea-tortrix' as it is called in Ceylon, seems to be even less important as a pest of *Coffea arabica* in the Wau Valley than in the coffee growing areas of the three Central Highlands Districts.

DIPTERA.

Agromyzidae.

Agromyza ? coffeae Nietn.—Agricultural Extension Station, Wau, VII.1963, on *Coffea arabica* (Coll. Sz.). This leafminer was observed on *Coffea arabica* by Mr. B. J. Kebby and the Senior Author in July to August, 1963, at the Agricultural Extension Station in Wau and at Becula Estate in the Wau Valley. Some leaves with typical *Agromyza* damage were also found by the Senior Author at the Agricultural Extension Station, Wau, on the 18th April, 1963.

Melanagromyza phaseoli (Tryon).—Bubu Estate, Wau Valley, 10.XI.1954; severe damage to the roots of *Phaseolus vulgaris* (Coll. N. White Snr. and Sz.).

HYMENOPTERA.

Ichneumonidae.

Echthromorpha insidiator Sm.—Stirling Chase Estate, Wau Valley, VII.1963. Reared from pupa of *Papilio aegeus ormenus* Guer. found on *Citrus* tree (Coll. Sz.).

Megachilidae.

Megachile frontalis (F.).—The Homestead Coffee Estate, 10.XI.1954, constructing nests in the garden lawn in the ground (Coll. Sz.); Bishop Museum Field Station, Wau, Morobe District, New Guinea, IV.1965; cutting leaves of *Cassia* sp. in ornamental garden.

COLEOPTERA.

Cetoniidae.

Glycyphana sp.—McAdam Memorial Park, near Wau, approximately 4,500 ft., 19.IV.1957. On *Crotalaria anagyroides* and *Crotalaria striata* (Coll. J. I. Balogh, J. Sedlacek and Sz.).

Glycyphana incerta (Wall.).—McAdam Memorial Park, 19.IV.1957, on *Crotalaria anagyroides* and *Crotalaria striata* (Coll. J. I. Balogh, J. Sedlacek and Sz.).

Lomaptera annae Hell.—Bishop Museum Field Station, Wau, 4,000 ft., 18.IV.1965, on the flowers of *Spathodea campanulata* ('african tulip') (Coll. J. Sedlacek and Sz.).

Coccinellidae.

Cryptolaemus affinis Crotch. (*Plate* XI).—Introduced from the Markham Valley in 1957.

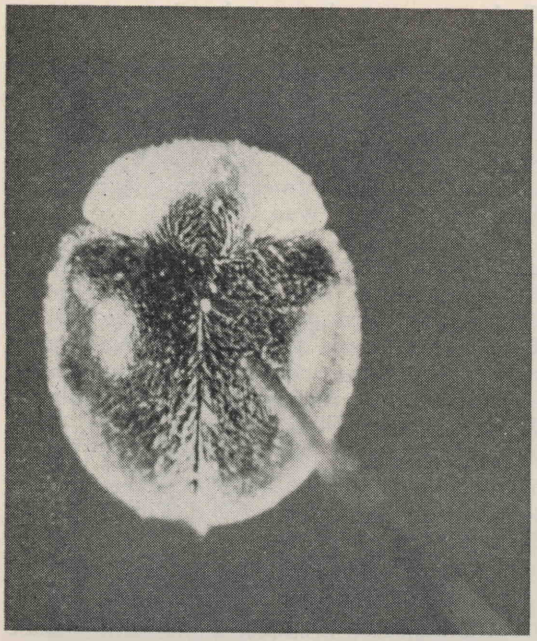

Plate XI.—*Cryptolaemus affinis* Crotch.

It is now well established in the Wau Valley and it seems to be one of the main controlling factors of *Planococcus citri* (Risso) on *Coffea arabica.* The Senior Author also found the larvae preying on *Ceroplastes destructor* Newst. feeding on *Plumeria acutifolia* in an ornamental garden in the Wau town area in July, 1963.

Henosepilachna signatipennis (Boisd.).—Wau town area, XI.1957, feeding on *Cucurbita pepo* (Coll. Sz.). Vegetable Farm of the Bulolo Gold-Dredging Company, Bulolo, approximately 2,400 ft., VII.1956, on *Beta vulgaris* (Coll. Sz.). Bubu Estate, Wau Valley, 10.XI.1954, on the flowers of *Cucurbita pepo* (Coll. Sz.).

Menochilus 4-plagiatus Switz.—Wau, town area, 31.V.1957, preying on aphid on *Crotalaria anagyroides* (Coll. Sz.).

Orcus sp. Predacious on Coccidae.—The Senior Author found this species in every coffee plantation in the Wau Valley in July to August, 1963. The Junior Author also found this *Orcus* sp. in most areas visited.

Curculionidae.

Alcidodes sp.—Vegetable Farm of the Bulolo Gold-Dredging Company, Bulolo, approximately 2,400 ft., July, 1955, on *Beta vulgaris* (Coll. Sz.).

Apirocalus cornutus Pasc.—Vegetable Farm of the Bulolo Gold-Dredging Company, Bulolo, approximately 2,400 ft., July, 1955, on *Beta vulgaris, Daucus carota, Ipomea batatas* (Coll. Sz.). Blue Mountain Coffee Estate, Wau Valley, VII.1963, on the foliage of *Coffea arabica,* Mount Kaindi, IV,1965, on *Bambusa* sp. (Coll. Sz.).

Cylas formicarius (F.).—This species, commonly known as the 'sweet potato weevil' caused very severe damage to large sweet potato blocks at Wau in 1954 and in 1956, resulting in almost 100 per cent. loss of crop. It was observed in the Wau Valley and in the Eastern Highlands that the most serious damage by *Cylas formicarius* was caused to sweet potato when is was repeatedly planted in larger blocks throughout several growing periods. However, extreme drought also brings about medium to severe outbreaks of *Cylas formicarius.*

Gymnopholus weiskei Hell.—Kunai Creek Coffee Block (Property of the New Guinea Goldfield Company), 4,000 ft., 16.II.1957; on *Tephrosia candida* (Coll. Sz.); Bishop Museum Field Station, Wau, 4,000 ft., IV.1964, in orna-

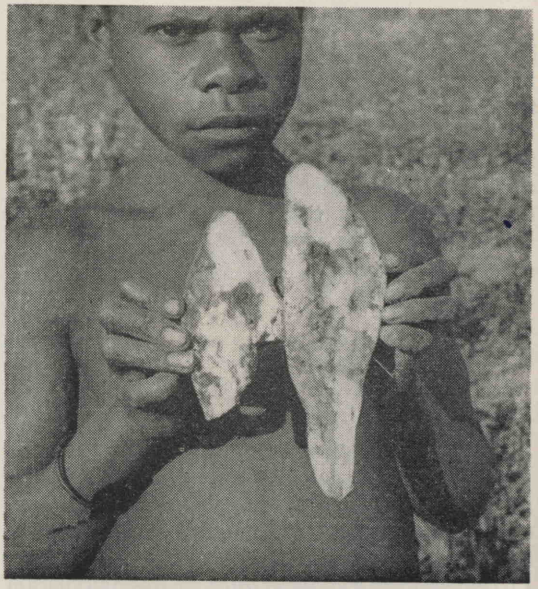

Plate XII.—Damage to Sweet Potato tuber by *Cylas formicarius* F. at Wau.

Plate XIII.—*Gymopholus weiskei* Hell.

mental garden on *Melia azedarach*, *Pipturus argenteus* and *Trema amboinensis* ; Mr. Sedlacek has kindly informed the Authors that *Gymnopholus weiskei* sometimes completely defoliates *Melia azedarach* (Szent-Ivany 1965 ; Gressitt, Sedlacek and Szent-Ivany 1965).

Oribius sp.—Kasangara village, Wau Subdistrict, 22.I.1962, on *Coffea arabica* foliage (Coll. K.).

Oribius cinereus Mshl.—Bishop Museum Field Station, Wau, 4,000 ft., 17.IV.1965, on the leaves of *Hibiscus rosa sinensis* (Coll. Sz.) ; Kaisenik Village Plantation, Wau Valley, approximately 3,200 ft., 19.IV.1965, shot-hole damage caused to *Citrus* foliage (Coll. Sz.) ; Power House Coffee Block (Property of New Guinea Gold-field Company), Wau Valley, 4,000 ft., feeding on the leaves of *Coffea arabica* (Coll. Sz.). This species was described as a new species by Sir Guy A. K. Marshall (1959), based on specimens collected on *Coffea arabica* foliage in the Saidor Subdistrict (Madang District) in 1958. This is the only previous record of *Oribius cinereus*.

Vanapa oberthuri Pouill.—This large weevil has been known as a major stem borer pest of *Araucaria cunninghamii* in the Goroka and Kainantu Subdistrict of the Eastern Highlands and in Bulolo for many years (Szent-Ivany and Womersley 1958).

Eumolpidae.

Rhyparida sp.—Agricultural Extension Station, Wau, 17.IV.1965, on *Coffea arabica* (Coll. Sz.).

Rhyparida coriacea Jac.—Wau, town area, 31.V., 1.VI.1957, 26.IV.1958 causing severe defoliation to *Eucalyptus deglupta* ; feeds at night, rests during the day in dense populations under loose bark of the main stem and on the under-surface of the leaves (Coll. Sz.) (Gressitt 1963).

Galerucidae.

Aulacophora pallidifasciata Jac.—Bubu Estate, Wau Valley, 10.XI.1954, on *Cucurbita pepo* (Coll. Sz.).

Melolonthidae.

Genus et species indet.—Larvae of an unknown cockchafer were found attacking klinkii pine (*Araucaria hunsteinii*) seedlings in a nursery of the Department of Forests at Wau on 29.IV. 1965. A scoliid larva was found associated with the larvae (Coll. J. Smith).

Genus et species indet.—Larvae were found damaging the roots of *Delonix regia* in an ornamental garden at Wau on 10.XI.1954 (Coll. R. E. P. Dwyer and Sz.).

Scolytidae.

Hylurdrectonus araucariae Schedl.—This is a major pest of hoop pine (*Araucaria cunninghamii*) in the Wau-Bulolo area. It is a needle-borer and it was described by Professor K. E. Schedl as a new species in 1964 (Schedl 1964).

SUMMARY.

At the time of writing this paper *Coffea arabica* has no major pests in the coffee growing area of the Wau Valley. There was a severe outbreak of the semicosmopolitan, polyphagous mealybug *Planococcus citri* (Risso) in 1956-1957 in some coffee plantations where it caused up to 75 to 80 per cent. reduction of yield. After the introduction of the predacious Lady Bird *Cryptolaemus affinis* Crotch from the Markham Valley, the population density of *Planococcus*

has rapidly decreased. Young coffee trees are still affected by mealybug damage especially where there are nursing ants building 'mud-tents' above the mealybug populations on the mainstem of the young coffee bushes and in the area of ramification.

The almost complete absence of *Celeuthetini* weevils in most coffee plantations is remarkable in contrast to the situation in the Eastern Highlands (Szent-Ivany and Barrett 1960).

Leaf eating caterpillars (mainly *Ectropis sabulosa*) were only causing severe damage to *Coffea arabica* in recent years in one plantation in the Snake River Valley. The cicadellid *Batrachomorphus blotei* Ghauri and the flatid *Colgar tricolor* Dist. are found sometimes in very dense populations on coffee trees; fortunately they are kept under control by entomogenous fungi. Some years ago *Spodoptera litura* appeared as a major pest of cabbage, lettuce and other vegetables in the Wau valley. Giant Toads (*Bufo marinus*) were introduced by the farming community to reduce the noctuid populations.

At the present the only major economic pests in the Wau-Bulolo area are three pests of hoop pine (*Araucaria cunninghamii*), the termite *Coptotermes elisae* Desneux, the curculionid *Vanapa oberthuri* Pouill, and the scolytid *Hylurdrectonus araucariae* Schedl.

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