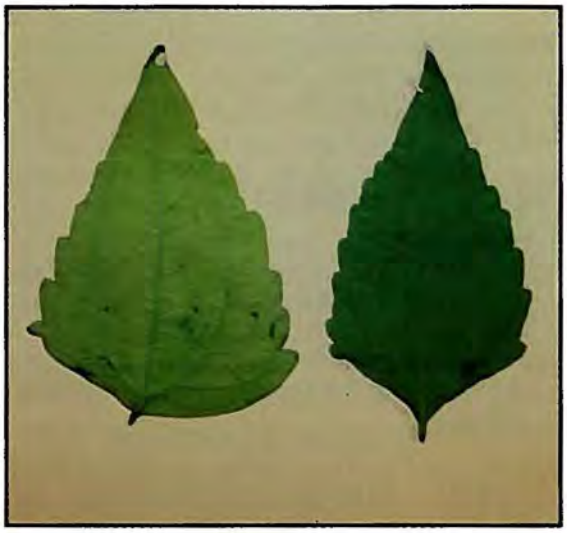
CHROMOLAENA ODORATA
Newsletter

Number 2 October 1988



Left: Insect induced yellow leaf of *Chromolaena odorata*. **Right:** Normal green leaf of *Chromolaena odorata*.

Insect induced yellowing in the bushes of *Chromolaena odorata*.

Chromolaena odorata defoliated by *Pareuchaetes pseudoinsulata* on Rota (the same area as in the bottom figure).

Chromolaena odorata infested pasture area in Rota.

A NOTE FROM THE EDITOR;

R. Muniappan, College of Agriculture and Life Sciences, University of Guam, Mangilao, Guam 96923 U.S.A.

PROCEEDINGS IN DEMAND!

Proceedings of the First International Workshop on Biological Control of *Chromolaena odorata* was prepared and mailed in July-August, 1988 to scientists involved or indicated interest in this subject area. Few copies are still available and will be distributed upon request.to R. Muniappan, College of Agriculture and Life Sciences, University of Guam, Mangilao, Guam 96923, U.S.A.

SHIPMENTS OF *PAREUCHAETES PSEUDOINSULATA*

P. pseudoinsulata has been shipped to Yap and Ponape in the Caroline Islands, Thailand and South Africa from Guam since the last newsletter.

ACKNOWLEDGEMENTS

The secretariat wishes to recognize Mr. Patrick E.Q. Perez for typesetting and formatting and thank the Cooperative Extension Service, College of Agriculture and Life Sciences, University of Guam for funding the publication of this newsletter.

C. ODORATA IN HAINAN, CHINA;

F.D. Bennett, Department of Entomology and Nematology, University of Florida, Gainesville, Florida 32611-0143 U.S.A.

While on Hainan Island, People Republic of China, 1-3 June 1988 to survey for natural enemies of certain citrus pests in the company of Dr. Ren Hui, Guangdong Entomological Institute, Guangzhou, I frequently observed solid stands of the following three Neotropical weeds: *Chromolaena odorata, Parthenium hysterophorus* and *Lantana camara*. Light damage to *C. odorata* by chrysomalid adult feeding, larvae of a polyphagous Lepidoptera and a green aphid was noted, but these appeared to have little impact on plant growth. Although a few plants have sustained heavy attack of aphids which caused leaf curling and distortion of the terminal growth, aphids were attacked by coccinellids, (2 spp.), syrphids, chamaemyiids (Leucopis sp.), chrysopids and hemerobiids.

SOME ADDITIONAL REFERENCES ON *C. ODORATA*

Dove, M.R. 1986. The practical reason of weeds in Indonesia: Peasant vs. State views of *Imperata* and *Chromolaena*. Human Ecology. 14(2): 163-190.

Ooi, P.A.C., Sim, C.H. and Tay, E.B. 1988. Status of the arctiid moth introduced to control Siam weed in Sabah, Malaysia. Planter, Kuala Lumpur. 64: 298-304.

Seibert, T.F. 1988. Biological control of the weed, *Chromolaena odorata* (Asteraceae), by *Pareuchaetes pseudoinsulata* (Lepidoptera: Arctiidae) on Guam and the Northern Mariana Islands. Entomophaga (in press).

APPLICATION OF SOILS INFORMATION IN THE STUDY OF THE DISTRIBUTION OF *CHROMOLAENA ODORATA*

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Siam weed (*Chromolaena odorata*) is wide spread in Southeast Asia and spreading to other parts of the tropics. Its resilience is so great that it has emerged as one of the most obnoxious weeds of the tropics. It has the capability of even smothering out alang alang (*Imperata cylinderica*). The recent workshop on 'Biological Control of *Chromolaena odorata*'[1], has addressed the issue of its spread, not only historical but also the potential.

This note is based on observations of the author and is not substantiated by any kind of study. Neither is the author an expert on this weed. The purpose of the note is to stimulate soil scientists to be involved in this potential problem of global significance as the distribution of the weed is controlled by soil and climate.

Preliminary observations suggest that the weed prefers acid soils, though it has been reported on base rich soils. It proliferates in areas with a mean annual soil temperature of more than 22°C and it does not seem to tolerate prolonged mositure stress. Even if these environmental conditions prevail, it appears to be concentrated in open areas and not under shade. In rubber and oil-palm plantations in Malaysia, if the canopy is thick, there is practically no weeds; but when light penetrates the canopy or at the edges of the fields, the weed is rampent.

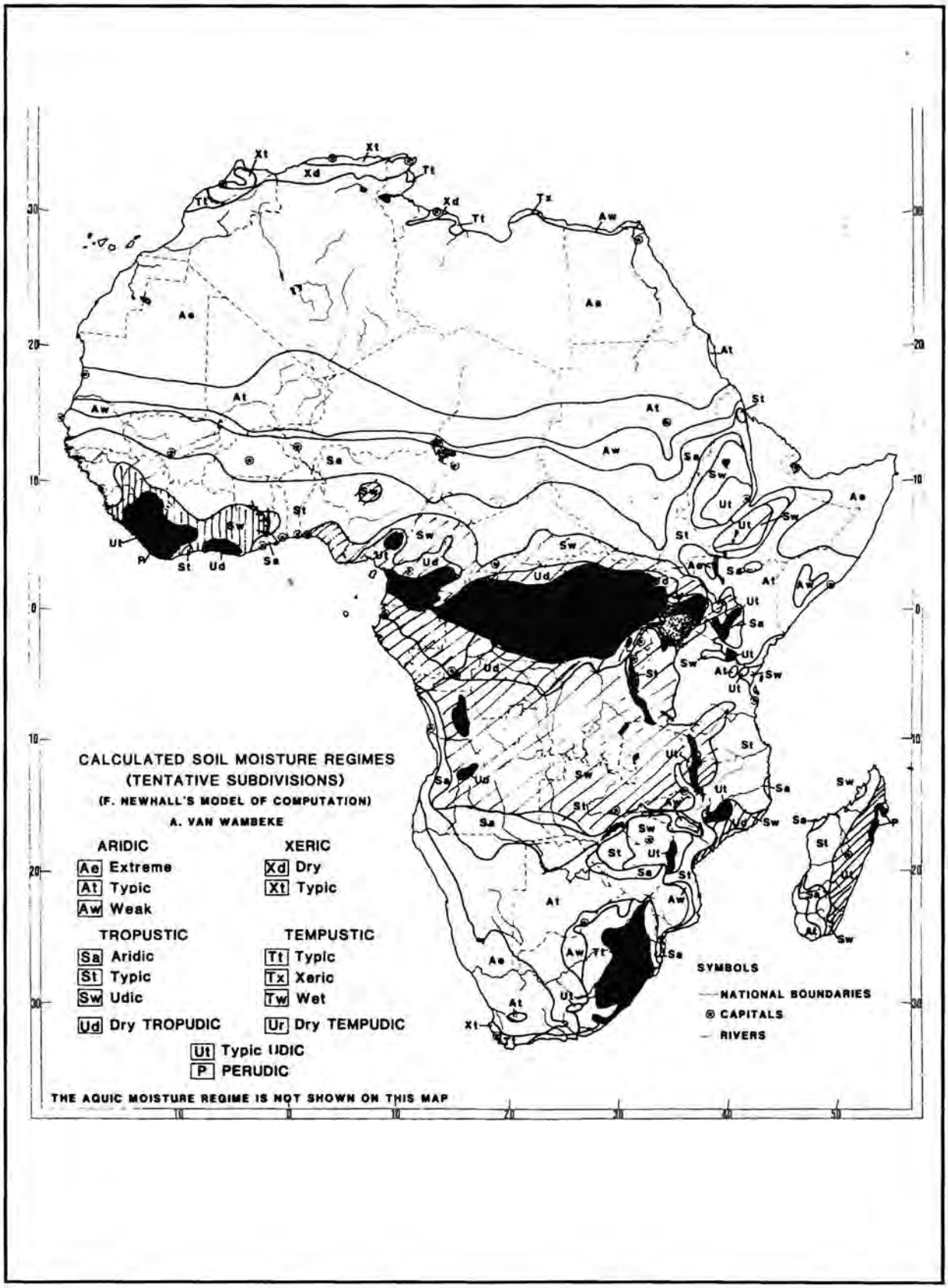
Soil scientists consider soil moisture and soil temperature regimes as soil properties. Both the Soil Moisture Regimes (SMR) and Soil Temperature Regimes (STR) may be computed from atmospheric data and the storage capacity of the soil and the regimes can be plotted on a map, as shown in the map of Africa.

The units, 'Ut and P' represent moist and humid areas of the warm tropics and these are also the areas where *C. odorata* is prevalent in Africa. The units 'Tw and Sw' and more specifically the latter, are the subunits of the regions with a dry season. These subunits, however, have a much longer moist season than the typical (Sa and St). The units 'Sw and Ud' represent areas which will be threatened in the near future with respect to spread of the weed. Although they are not ideal for the crop, the weed can survive under these conditions.

The map thus shows current and potential areas of spread of *C. odorata*. The map can be further refined if other soil properties are taken into consideration. The present scale of the map will not permit it but this can be done for any given country. Similar maps could be drawn for other parts of the world and this would present a more comprehensive picture of the situation. The agronomic requirements of the weed needs more attention and would contribute to its control.

Occurence of this weed is one of the first indicators of soil degradation. Colonization by *C. odorata* takes place upon deforestation or on abandoned land. It can be prevented or retarded by establishing a cover crops such as *Pueraria* sp. or *Centrosema* sp. Colonization also takes place on land which has been severely eroded and the acid subsoil is exposed to the surface. As it is tolerant to high soil acidity and aluminum saturation, it establishes before any other plant can establish. Once it is established, it has the advantage of reducing soil loss through erosion; this is a beneficial role. However, permanent eradiction is a problem, particularly in low-input agriculture and this is the major source of concern.

[1]February 29 through March 4, 1988, Bangkok, Thailand. Proc. Publ. Agric. Exp. Station, Guam U.S.A.


CALCULATED SOIL MOISTURE REGIMES
(TENTATIVE SUBDIVISIONS)
(F. NEWHALL'S MODEL OF COMPUTATION)
A. VAN WAMBEKE
ARIDIC
Ae Extreme
At Typic
Aw Weak
XERIC
Xd Dry
Xt Typic
TROPUSTIC
Sa Aridic
St Typic
Sw Udic
Ud Dry TROPUDIC
TEMPUSTIC
Tt Typic
Tx Xeric
Tw Wet
Ur Dry TEMPUDIC
Ut Typic UDIC
P PERUDIC
THE AQUIC MOISTURE REGIME IS NOT SHOWN ON THIS MAP
SYMBOLS
NATIONAL BOUNDARIES
CAPITALS
RIVERS

PHYTOPHAGOUS INSECTS RECORDED FROM *C. ODORATA**

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Thysanoptera

Elaphothrips sp. nr. *angusticips* (Crawf.), Yucatan, Mexico.
Haplothrips gowdeyi Franklin, India (Anon., 1983-1984).
Leptothrips sp., Yucatan, Mexico.

Orthoptera

Acrididae:

Abracis obliqua (Thun.), Yucatan, Mexico.
Chromacris miles (Drury), Venezuela (Guagliumi, 1966).
Osmilia flavolineata (deG), Yucatan and Veracruz, Mexico.
Patanga succincta R., Thailand (Pholboon, 1965).
Sitalces trinitatis Bruner, feeding on many other plants, Trinidad.
Zonocerus variegatus in Nigeria (Iheagwan 1983, Chapman et al., 1986).

Pyrgomorphidae:

? *Calamacris* sp., Veracruz, Mexico.
Neorthacris acuticeps (Bolivar), India (Muniappan and Viraktamath, 1986)

Tettigoniidae:

Conocephalus sp. ? *cinereus* Thun., Turrialba, Costa Rica.
Conocephalus ictus (Scudd), Veracruz, Mexico.

Gryllidae:

Nisitra vittata Scop., Sumatra (Naezer & Meer Mohr, 1953).

Hemiptera

Membracidae:

Acanophora concolor (Walk.), Trinidad.
Acutalis fusconervosa (Fairm.), Costa Rica.
Amastris sp., Costa Rica.
Bolbonota inaequalis (Fabr.) Costa Rica.
Bolbonota pictipennis Fairm., also on cacao and other plants, Trinidad, Mexico and Yucatan.
Campylenchia hastata Fabr., also on pigeon pea, Trinidad.
Ceresa vitulis (Fabr.), also on sugarcane, Trinidad and Costa Rica.
Cocostrephus sp., India (Anon., 1983).
C. minutus (Fabricius), India (Muniappan and Viraktamath, 1986).
Cyphonia clavata F., also on pigeon pea and other plants, Trinidad.
Cyphonia flavovittata Stal., Trinidad.

*All records from Cruttwell, 1974 except where another reference is given.

Enchophyllum dubium Fowler, Yucatan and Costa Rica.
Entylia sp., also on guava, Trinidad.
Entylia carinata (Forster), Costa Rica.
Entylia gemmata (Germ), Venezuela (Guagliumi, 1966).
Hypsoprora coronata (Fabr.), Costa Rica.
Leptocentrus sp., India (Anon., 1983).
Membracis humilis Fowl., Trinidad.
Membracis tectigera (Stoll), Trinidad.
Micrutalis calva (Say), Trinidad, also on many plants in the U.S.A. (Beirne, 1959).
Micrutalis epihippium (Burmeister), Costa Rica.
Poppea capricornis Fowl., Trinidad and Costa Rica.
Sphongonophorus sp., Yucatan.
Sphongonophorus guerini Fairm., Trinidad.
Stegaspis viridis Funkh., also on other plants, Trinidad.

Plataspidae:

Coptosoma sp., India (Anon., 1983-1984).
Coptosoma siamicum Walk., Sumatra (Naezer & Meer Mohr, 1953), also on crops in Ceylon (Hutson, 1930).
Sepontia nigrofusca Dist., India (Anon., 1983-1984).

Pentatomidae:

Acrosternum marginatum (Beauvois), Mexico.
Antestia anchora Thunb., Sumatra (Naezer & Meer Mohr, 1953), also on coffee in Asia.
Antiteuchus t. tripterus Fabr., also on Thunbergia, Trinidad.
Edessa meditabunda F., also on other plants, Trinidad.
Edessa rufomarginata (DeGeer), Costa Rica.
Euschistus obscurus (Beauvois), Mexico.
Podisus sagitta (Fabr.), Mexico.
Proxys punctulatus (Beauvois), Mexico.

Coreidae:

Anoplocnemis curvipes in Nigeria (Iheagwan 1983).
Anoplocnemis phasianus F., Sumatra (Naezer & Meer Mohr, 1953), also on numerous crop plants in Asia (Maheswariah & Puttarudriah, 1956).
Archimerus sp., Costa Rica.
Hypselonotus atratus Dist., Costa Rica.
Leptocorisa acuta (Thunberg), India (Anon., 1983-1984).
Mictis longicornis Westw., Sumatra (Naezer & Meer Mohr, 1953).
Riptortus pedestris (Fabricius), India (Anon., 1983-1984).
Serinetha abdominalis Fabr., Thailand (Pholboon, 1965).
Zicca taenida (Dallas), Costa Rica.

Lygaeidae:

Ligyrocoris abdominalis (Guerin), Yucatan, Mexico.
Ligyrocoris litigiosus (Sta.), Yucatan, Mexico.
Ochrimnus mimulus (Stal), Costa Rica.
Ochrostomus poeyi (Guerin), Mexico.
Ochrostomus verecundus (Distant), Mexico.
Ortholomus scolopax (Say), Costa Rica.
Pachybrachius bilobata (Say), Costa Rica.
Paromius longulus (Dallas), Yucatan, Mexico.

Pyrrhocoridae:	*Dysdercus* sp., Yucatan, Mexico. *Dysdercus cingulatus* F., Sumatra (Naezer & Meer Mohr, 1953), also on many Malvaceae in India. *Dysdercus delauneyi* Lett., St. Vincent, W.I., also on many plants including cotton (Sands, 1917). *Dysdercus koenegii* Fabricius, India (Anon., 1983-1984). *Dysdercus mimus* (Say), Mexico and Costa Rica. *Dysdercus obscuratus garskei* Schmidt, Costa Rica. *Dysdercus obscuratus obscuratus* Distant, Mexico. *Jadera sanguinolenta* Fabr., Trinidad. *Largus* sp., Trinidad. *Macrocerca grandis* Gray, Trinidad.
Tingidae:	*Phymata simulans* Stal. ssp. *recifensis* Ker., on flowers, Trinidad.
Miridae:	*Collaria oleosa* (Dist.), Venezuela (Guagliumi, 1966). *Helopeltis* ? *theivora* Wat., Sumatra (Naezer & Meer Mohr, 1953), also on tea in India. *Lopidea* sp., Costa Rica.
Cercopidae:	*Sphenorhina* (*Tomaspis*) *rubra* (L.), also on *Eupatorium* sp., Demerara (Urich, 1914).
Cicadellidae:	*Agallia* sp., Mexico. *Agallia* sp., Venezuela (Guagliumi, 1966). *Agrosoma placetis* Medler, Costa Rica. *Agrosoma* sp., Costa Rica. *Catagonalia marginella* Fabr., Yucatan, Mexico. *Diedrocephala variegata* (Fab.), Costa Rica. *Graphocephala* sp., Costa Rica. *Gypona* sp., Costa Rica. *Metascarta coeruleovittata* (Sign), Venezuela (Guagliumi, 1966). *Omcometopia clarior* (Walker), Yucatan, Mexico. *Omcometopia* sp., Costa Rica. *Parathona cayennensis* G., Trinidad. *Poeciloscarta* sp., Costa Rica. *Tettigella ceylonica* Melich, India (Anon., 1983-1984).
Jassidae:	*Sibovia occatoria* Say, Trinidad, also on many other plants in Mexico and Costa Rica.
Cixiidae:	*Bothriocera* sp., Yucatan, Mexico and Costa Rica.
Delphacidae:	*Peregrinus maidis* (Ashmead), Yucatan, Mexico.
Flatidae:	Gen. near *Docerus* sp. indet., Veracruz, Mexico. *Euhyloptera corticalis* Fenn., Trinidad. *Lawana conspersa* Walk., Sumatra (Naezer & Meer Mohr, 1953), also on tea in Malaya (Corbett, 1935). *Monoflata* (sensu latu) sp., Veracruz, Mexico. *Poeciloptera phalaenoides* L., Trinidad.

Acanaloniidae:	*Acanalonia* sp., Trinidad. *Acanalonia* sp., Veracruz, Mexico.
Aleurodidae:	*Aleurodicus trinidadensis* Q & B., also on coconut, Trinidad. *Bemisia tabaci* Genn., Sumatra (Naezer & Meer Mohr, 1953), also on cotton and other crops (Laan, 1940).
Aphididae:	*Aphis gossypii* Glov., Trinidad, Nigeria (Iheagwam 1983), also on many plants in Thailand (Patch, 1938; Pholboon, 1965). *Aphis spiraecola* Patch., Trinidad, also on many plants in India (Bennett & Rao, 1968; Patch, 1938). *Brachycaudatus helichrysi* (Kaltenbach), India (Joy et. al., 1979). *Dactynotus ambrosiae* (Thos.), Costa Rica, also on many other plants (Patch, 1938). *Rhopalosiphum maidis* Fitch, India (Ganguli and Raychaudhuri, 1980). *Toxoptera odinae* (v.d. Goot), India (Yadav et. al., 1981).
Orthezidae:	*Orthezia insignis* Browne, also on many crops, Trinidad. *Orthezia pseudinsignis* Morrison, Mexico.
Coccidae:	*Ceroplastes* sp., Trinidad. *Saissetia* sp., India (Muniappan and Viraktamath, 1986). *Saissetia oleae* Bern., also on many crops, Trinidad.
Pseudococcidae:	*Dysmicoccus* sp., Mexico. *Phenacoccus gossypii* Townsend & Cockerell, Mexico, also on many plants (McKenzie, 1967). *Pseudococcus* sp., Sumatra (Naezer & Meer Mohr, 1953).

Lepidoptera

Tineidae:	*Recurvaria* sp. Adults reared in Trinidad from larvae feeding in flowers of *C. odorata* and *Condylidium iresinoides* (H.B.K.) K & R, which are only present December_May; other plants probably attacked during remaining months. Eggs laid singly in flower-heads, larvae feed in developing seeds. Mature, larvae pupate in flower-head without a cocoon; adult emerges in one to two weeks. Each larva destroys the seeds in one flower-head. Larvae parasitised by a Eulophid, *Euderus* sp.
Lyonetidae:	*Bucculatrix* sp. Larvae collected mining leaves of *C. odorata* in Mexico and of *E. hookerianum* in Tucuman, Argentina. A similar species occurs in Trinidad attacking *C. iresinoides* but not *C. odorata.* Larvae are solitary and pupate in the mines.
Stenomidae:	*Antaeotricha* sp., from pupa on leaf, Costa Rica.

Gelechiidae

Dichomeris (*Trichotaphe*) sp. nr. *eupatoriella* Cham., leaf-roller, also on *C. ivaefolia*, Trinidad. Adults reared from leaf-rolling larvae on *C. odorata* were identified as a new species of *Dichomeris* in the *delotella* sub-group. For biology and host range see Cruttwell, 1973b.

Larvae parasitised by the solitary endoparasitic Braconids *Xanthomicrogaster seres* Nixon and *Apanteles* sp., and pupae by a third solitary endoparasitic Braconid as yet unidentified.

Dichomeris sp. nov. 2. Adults reared from leaf-rolling larvae on *C. odorata* in Belem, Brazil were identified as a second new species of *Dichomeris*, Life-history similar to *Dichomeris* sp. 1.

Tortricidae:

Amorbia catenana Wals., leaf-roller, Trinidad, also on banana in Brazil, Antilles and Central America (Da Costa Lima, 1951).

Amorbia emigratella Busck., leaf-roller, Veracruz, Mexico.

Archips micaceanus (Walker), India (Muniappan and Viraktamath, 1986).

Platynota sp., leaf-roller, Yucatan.

Platynota rostrana (Wlk.) leaf-roller, Mexico.

Sparganothis restitutana Wkr. Reared from larvae feeding on the Composites *Wedelia trilobata* (L.), *W. caracasana* DC., *Wulffia baccata* (L.), *Synedrella nodiflora* (L.) Gaertn., *C. odorata, C. ivaefolia* and *C. iresinoides*.

Eggs laid in clusters on leaves, newly hatched larvae disperse and feed initially on leaf buds. Larger larvae feed on leaves or flowers, living and pupating in a loose leaf-roll or between leaves or flowers fastened together with silk.

Larvae parasitised by a Braconid and an Ichneumonid as yet unidentified, and pupae by another Ichneumonid and by *Spilochalcis* sp.

Cochlidae:

Phalonidia multistrigata Wals., feeding in flowers, Trinidad.

Pterophoridae:

Adaina bipunctata Moeschl. Trinidad, reared from flowers of *C. odorata* and *C. iresinoides*. Recorded from U.S.A. (McDunnough, 1939) and Puerto Rico, where "larvae were intercepted on *Pluchea purpurascus*" (Wolcott, 1948). Flowers of other Composites probably attacked when *C. odorata* not in flower. Larvae stout and cream-colored, feeding in flower-heads, entering new ones by chewing through involucral bracts. Mature larva pupates inside flower-head without a cocoon, adult emerges in a few days.

Larvae attacked by a solitary endoparasite, *Bracon* sp. nr. *vulgaris* Ashm.

Adaina sp., larvae in hollow stems, Veracruz, Mexico.

Thyrididae:

Dysodia oculataria Clem., leaf-roller, Yucatan, Mexico.

Palthis sp. nr. *agroteralis* (Guen.), leaf-roller, Veracruz, Mexico.

Pyralidae:

Mescinia parvula (Zeller). Larvae shoot-borers attacking *C. odorata* and *C. ivaefolia* in Trinidad; similar larvae collected on *C. odorata* in Veracruz, Mexico and Belem, Brazil, and on *E. hookerianum* in Tucuman, Argentina. The biology and host-range of the species have already been described (Cruttwell, 1977a), under the name *Mescinia* sp. nr. *parvula*.

Larvae in Trinidad attacked by eight hymenopterous and one Tachinid parasite. One species, a gregarious ectoparasite, *Hormius* sp. nov., also attacks small larvae of *Hypsipyla grandella* (Zell.) in mahogany and cedar in Trinidad. There are four other ectoparasites, *Ipobracon* sp., *Hormius* sp., *Euderus* sp., *Horismenus* sp., and two solitary egg-larval endoparasites emerging from the pre-pupal larvae, *Phanerotoma* sp., and *Microchelonus* sp. *Parasierola* sp. and the Tachinid, as yet unidentified, are both solitary endoparasites of the larvae.

Herpetogramma sp. ? *bipunctalis* (Fabr.), pupa on leaf, Trinidad.

? *Hyalospila* sp., larvae feeding in open gall in stem tips, in Costa Rica, and Veracruz, Mexico.

Laetilia portoricensis (Dyer), from withered stem, Puerto Rico (Wolcott, 1948).

Loxostege new sp., leaf-roller, Veracruz, Mexico and Costa Rica.

Pionea (Hapalia) *upalusalis* Wkr. Reared from larvae feeding on *C. odorata, C. ivaefolia, Fleischmannia microstemon, Austroeupatorium inulaefolium* and *Ageratum conyzoides* in Trinidad. Also recorded from Puerto Rico and West Indies generally and from Venezuela (Wolcott, 1948).

Green spherical eggs laid in groups of one to three on the underside of the leaves, newly hatched larvae live in a silken tube on the underside and older larvae in a leaf-roll, usually in the leaf centre. Larvae pale green in colour until mature, when they become pink with white lines and pupate in the tube. No parasites known.

Psara ambitalis Reb., defoliator, Sumatra (Naezer & Meer Mohr, 1953), also on tomatoes and tobacco in Sumatra (Laan, 1940).

Geometridae:

Apicia asterica Druce, defoliator, Morelos, Mexico.
Chloropteryx languescens Warr., feeding on flowers, Trinidad.
Eupithecia sp., reared from gall in stem tip, Trinidad.
Eupithecia sp. nr. *maleformata* Warr., feeding on flowers, Trinidad.
Hyposidra talaca (Walker), India (Muniappan and Viraktamath, 1986).
Racheospila rufilineata Warr., feeding on flowers, Trinidad.
Synchlora sp. ? *frondaria* Gn., defoliator, Trinidad.

Sphingidae:

Pholus labruscae Moss., defoliator, Trinidad (Moss, 1912), also on *Vitis, Cissus* and *Ampelopsis* in Guadeloupe (D'Aguilar, 1966).

Noctuidae:

Chrysodeixis chalcites (Esper), India (Muniappan and Viraktamath, 1986).
Perigea albigera Guen., defoliator, also on *F. microstemon*, Trinidad, Costa Rica and Yucatan, and on *Chrysanthemum*, Barbados (Bourne, 1921).
Spodoptera (Prodenia) *latifascia* Wkr., defoliator, Trinidad, also on tomatoes and other crops in Puerto Rico (Wolcott, 1948).

Arctiidae:

Diacrisia (Spilosoma) *alcumena* Berg., feeding on *C. odorata*, Bolivia, also on mango, Venezuela (Guagliumi, 1966).
Diacrisia obliqua Walker, India (Anon., 1983-1984).
Paraeuchetes pseudoinsulata Rego Barros (Incorrectly recorded as *Ammalo insulata* Walker in Bennett and Cruttwell 1973 and Cruttwell 1974), defoliator on *C. odorata* and *C. ivaefolia* in Trinidad.
Pareuchetes insulata (Walker) defoliator on *C. odorata* and *Ageratum* in Florida, Central America and Venezuela (Cock and Holloway 1982).
Pericallia ricini (Fabricius), India (Anon., 1983-1984).

Riodinidae:

Calephelis laverna G. & S. This species occurs in Brazil, Venezuela and Central America, as well as in Trinidad (Barcant, 1970) where larvae have been collected feeding on *C. odorata, C. ivaefolia, F. microstemon* and *Hebeclinium macrophyllum* (L.) DC.

Larvae solitary and sluggish, pale green, covered with long silky green hairs. They feed on the leaves then pupate inside a silk cocoon attached to leaves or stem.

Larvae parasitised by a gregarious *Apanteles* sp.

Lycaenidae:

Thecla palegon Cr., feeding on flowers, also on *C. iresinoides*, Trinidad.

Acraeidae:

Actinote anteas Doubleday, defoliator, Costa Rica. Recorded from Trinidad (Barcant, 1970).

Danaidae: *Pteronymia lincera* H-S., Venezuela (Guagliumi, 1966).

Diptera

Ceratopogonidae: *Forcipomyia* sp., reared from nail-gall on leaf, Turrialba, Costa Rica.

Cecidomyidae: (see Gagne, 1977)

Asphondylia corbulae Mohn, (see Gagne 1977) reared from flowers of *Eupatorium* sp. in El Salvador (Mohn, 1960) and of *C. odorata* and *F. microstemon* in Trinidad. Larvae feed singly inside developing achenes which swell to a gall two to three mm in diameter. Two or three galls form per flower-head and few seeds develop. Parasitised by *Tenuipetiolus* sp. (Eurytomid), *Horismenus* sp., *Galeopsmyia* sp. 3, *Tetrastichus dimachus* Walk. and *Leptacis* sp. 2 (Eulophidae).

Contarinia sp. nr. *perfoliata* Felt, reared from flowers of *C. odorata*, *C. ivaefolia* and *F. microstemon* in Trinidad. Larvae live and feed in corollas or between achenes, causing little apparent damage. Pupation occurs in the flowers and the adults emerge in a few days.

Dasyneura corollae Gagne, larvae singly within petal-tubes of young flowers, Trinidad and Bolivia.

Clinodiplosis (Hyperdiplosis) *eupatorii* (Felt), reared from conical nail-galls on upper surface of leaves of *Eupatorium* sp. in St. Vincent, W.I. (Felt, 1911) and of *C. odorata* and *C. ivaefolia* in Trinidad, Costa Rica and Belem, Brazil.

Larvae in Trinidad parasitised by *Horismenus* sp., *Galeopsymia* sp. 1, *Achrysocharis* new sp. and *Leptacis* sp. 1, the last two also occurring in Belem, Brazil.

Clinodiplosis sp. Adults reared from bud-galls in *C. odorata* in Costa Rica. Larvae occur singly in hollow pear-shaped galls, three to five mm long, in stem tips or axillary buds, with several small leaves developed without internodes beneath the gall, giving a 'rosette' appearance.

No parasites are known.

Clinodiplosis sp., from bud-galls in *C. odorata* and *C. ivaefolia* in Trinidad. one to three larvae live between the bud leaves of stem tips or axillary buds, destroying the tissue and preventing further growth. The bud leaves swell slightly and become red and densely covered with hairs. Mature larvae leave the gall and pupate just below the soil surface; adults emerge in 11 to 18 days. The species is widespread and abundant in Trinidad, breeding throughout the year.

Larvae are attacked by the predatory cecidomyid *Lestodiplosis callipus* Gagne and by the parasites *Tetrastichus* sp. and *Patasson* sp.

Neolasioptera cruttwellae Gagne. Adults reared from stem galls in *C. odorata* and *C. ivaefolia* in Trinidad and Bolivia. Galls develop in young shoots and when mature reach about one cm diameter. one to three larvae feed and pupate in tunnels in each gall.

Larvae in Trinidad parasitised by a solitary parasite *Metanopedias brunneipes* (Ashm.) and by a gregarious ectoparasitic Ceraphronid as yet unidentified, and in Bolivia by four species of Hymenoptera, *Leptacis* sp. (Eulophid), *Aphariogmus* sp. (Ceraphronid), *Rhoptrocentrus* sp. (Braconid) and *Eupelmus* sp. (Eupelmid).

Neolasioptera frugivora Gagne, adults reared from flowers of *C. odorata*, and adults probably of this species from *F. microstemon*, both in Trinidad. Larvae singly inside the achenes, each consuming one achene and pupating inside. No external damage caused. No parasites known.

Perasphondylia reticulata Mohn. Adults reared from bud-galls on *C. odorata* and *Eupatorium* sp. in El Salvador (Mohn, 1960) and from *C. odorata* and *C. ivaefolia* in Trinidad, in Belem, Brazil, and in Bolivia. Larvae occur singly in a hollow pear-shaped gall, seven to nine mm long and five to six mm wide, in stem tips and axillary buds. Species scarce and confined to the cooler valleys in Trinidad but in Brazil and Bolivia galls were more common.

The following Eulophids were reared from galls in Trinidad: *Tetrastichus valerus* Walker, *Paragaleopsymia* sp., *Galeopsymia* sp. 1 and *Eurytoma* sp. from pupae. In Bolivia, *Galeopsymia* sp. 2 and *Rileya* sp. were reared from galls.

Trypetidae:

Procecidochares new sp., reared from stem-galls in *C. odorata* in Veracruz, Mexico, in Belem, Brazil, and in Bolivia. Similar adults from stem-galls in *C. laevigata* in Bolivia did not attack *C. odorata*. Eggs inserted into the stem tip by the female; abnormal growth of the stem starts before the eggs hatch.

Larvae feed in curved tunnels in the gall tissue, one to seven larvae in separate tunnels in the gall. Mature larvae pupate in the tunnel below an epidermal 'window' through which the adult emerges. Galls slow and distort but do not arrest further growth of the stem.

Larvae in Brazil parasitised by a gregarious Braconid *Heterospilus pallidipes* Ashm. and by *Heterospilus* sp. nr. *humeralis* Ashm.; in Bolivia by *Heterospilus* sp. 1 and *Syntomosphyrum* sp.; in Mexico by *Torymus umbilicatus* (Gahan), *Eupelmus* sp., *Neocatolaccus* sp. and an indet. Pteromalid. Larvae and pupae from *C. laevigata* in Bolivia were parasitised by *Heterospilus* sp. 1, *Dimeromicrus cecidomyidae* Ashm. and *Eupelmus* sp.

Cecidochares fluminensis (Lima). Larvae of this species, previously recorded from S.E. Brazil (Aczel, 1953), feed in the flowers of *C. odorata* and *C. ivaefolia* in Trinidad. In December and January eggs are inserted singly into the flower buds, and the fat, white pilose larvae feed on the developing achenes in one flowerhead, pupating in the cavity formed. Puparia oval, black and pilose; adults emerge in 10-14 days, probably remain in sexual diapause for nine to ten months until *C. odorata* flowers again.

A Pteromalid, *Pseudocatolaccus* sp., has been reared from the pupae.

Euaresta ? bellula Snow., from flowers, Trinidad.

Polymorphomyia basilica Snow, galls stems of *C. odorata* in Puerto Rico (Wolcott, 1948).
Trupanea sp. from galls, Venezuela (Guagliumi, 1966).
Xanthaciura insecta (Loew.), larvae in flowers, also of *F. microstemon, Ageratum conyzoides, Wedelia caracasana*, Trinidad, from *C. odorata*, Bolivia, from flowers of *Bidens pilosa*, Florida (Needham, 1946).

Lauxanidae:

Caliope sp., from flowers, also of *C. ivaefolia*, Trinidad.
Sapromyza sp., from pupae on leaves, Trinidad.

Oscellinae:

Olcella pleuralis Becker, from flowers, also of *C. ivaefolia* and *C. iresinoides, F. microstemon, Ageratum conyzoides, Aspilia verbesinoides, Wedelia caracasana* and *Wulffia baccata*, Trinidad.

Agromyzidae:

Agromyza eupatoriae Mall., mines leaves, U.S.A. (Frost, 1924).
Calycomyza flavinotum Frick., mines leaves, Trinidad, also on *E. purpureum, Viburnum, Arctium* and *Alomia*, U.S.A. (Frick, 1959).
Calycomyza jucunda (Wulp.), mines leaves, also of other plants, Puerto Rico (Wolcott, 1948).
Melanagromyza eupatoriella Spencer, from stem tips of *C. odorata* and *C. ivaefolia* in Trinidad, in Belem, Brazil and in Bolivia. Larvae occur singly in young shoots, tunnelling spirally down the stem, destroying the conducting tissue and killing the shoot for about 6 cm. Mature larvae pupate in the hollow stem after cutting an epidermal window through which the adults emerge.

Breeding is continuous throughout the year; the species is abundant generally.

In Trinidad, larvae attacked by *Euderus* spp., and an indet. Pteromalid, and by two larval-pupal parasites, *Eurytoma walshii* How. and *Tropideucoila rufipes* Ashm. In Bolivia larvae attacked by *Tropideucoila* sp., and in Brazil by *Euderus* sp., *Eurytoma* sp. and *Opius* sp.

Melanagromyza longicaudalis Mall., on flowers, Bolivia and Jamaica (Spencer, 1963).

Melanagromyza mallochi (Kendel), bores in stem, Puerto Rico (Spencer, 1963).

Melanagromyza minima Mall., reared from flowers of *C. odorata, C. ivaefolia, C. iresinoides* and *Wedelia trilobata* in Trinidad. one to three larvae in a flower-head, young larvae feeding within single achenes and older larvae between achenes. Each larva destroys 20 to 30 achenes and pupates in the cavity left.

Two parasites, *Tetrastichus* sp. and an unidentified Chalcid, reared from pupae.

Coleoptera

Lampyridae: ? *Psilocladus* sp., Morelos, Mexico.

Cantharidae: *Belotus* sp., Morelos, Mexico.
Canthari sp., Turrialba, Costa Rica.
Silis sp., Veracruz, Mexico.

Elateridae: *Aelolus* sp. nr. *facetus* Candeze, Veracruz, Mexico.
Glyphonyx sp., Veracruz, Mexico.

Helodidae: *Cychon* sp., Turrialba, Costa Rica.

Languridae: *Langurites lineata* (Cast), Veracruz, Mexico.

Anobiidae: *Cryptorama* sp., Veracruz, Mexico.

Lamiidae: *Aerenica hirticornis* Klug., recorded from Argentina and Central and Southern Brazil (Guerin, 1953); collected from *C. odorata* in Trinidad and in Santa Cruz, Bolivia. No other host known.

Adults 10-15 mm long, pale buff colour with darker brown markings; when resting in typical position with the head on the plant stem and the body projecting up at an angle, closely resemble the dried flower-heads. Adults present in Trinidad from June -August, feed by scraping tissue from stem tips, killing these. Eggs laid singly near stem tips, larvae feed in the pith. Larvae full grown and have hollowed one to two metres of stem by October or November. As only the pith destroyed, stem growth not

affected. Frass ejected through holes along the stem. Larvae remain in stem until May when they pupate near the stem base. Adults emerge seven to ten days later, remain quiescent for a further two to three weeks; adult activity may be initiated by the rains which commence at this season.

In Bolivia, south of the Equator, half and full_grown larvae were present in April and May. Life-cycle synchronized with the host, with active stages present in the season of maximum plant growth.

In Trinidad, young larvae are attacked by a solitary endoparasitic Eulophid.

Cerambycidae:

Ataxia sp., larvae boring in stem, Yucatan, Mexico.

Lophalia sp. nr. *cyanicollis* (Dupont), adults feeding inside stem base, Yucatan, Mexico.

Chlamisidae:

Aulocochlamys sp. Adults, black, 1.8-2.5 mm long, and larvae feed by scraping stems and leaf petioles of *C. odorata* and *C. ivaefolia*. Eggs laid singly in cylindrical ribbed cases of faecal matter. These form the apex of the larvae case, being gradually enlarged into a conical case 3.5-3.7 mm long and 1.6 mm maximum diameter. Mature larvae attach the case to the stem, pupate inside, and adults emerge in one to two weeks. Widespread in Trinidad, occasionally abundant in the valleys of the Northern Range.

No parasites known.

Chlamisus insularis Jac. Recorded from Mexico and Panama (Blackwelder, 1957); adults black with golden markings, 3.3-4.3 mm long and 2.5-3.0 mm maximum width. Widespread in Trinidad throughout the year but not abundant.

Life-history similar to *Aulocochlamys* sp.; egg case 1.4 mm long and 1.0 mm diameter, mature larval case conical with a rough surface, six to seven mm long. Feeding adults collected on *C. odorata*, *C. ivaefolia* and *Bidens pilosa*.

A black Eulophid reared as a solitary egg parasite.

Hispidae:

Pentispa explanata Chap. Recorded from Mexico to Colombia (Blackwelder, *op. cit.*), and Venezuela where it is recorded on *Pithecoctenium* sp. (Bignoniaceae) (Maulik, 1937). In Trinidad adults collected on *C. odorata* and *C. ivaefolia* would not feed on *Pithecoctenium echinatum* Jacq. when tested.

Adults, present throughout the year, feed by scraping away the tissues of the leaf from below, leaving characteristic scars. March-April, congregate and mate in groups of six to 20. Eggs laid April-July, inserted singly under the leaf epidermis, covered with a faecal plug. Larvae hatch in 12 days and mine the leaves, forming irregular blotch mines two to three cm in diameter when full size, 20-25 days later. Mature larvae pupate in the mine; adults emerge in five to eight days. Newly-emerged adults disperse and feed on the leaves but do not breed until the next year.

P. explanata occurs on *C. odorata* throughout Trinidad but is rare except in the northern valleys. Adults avoid open sunlight; in the laboratory, adults survive but do not breed in cages exposed to the sun.

Larvae parasitised by a solitary ectoparasitic Elasmid, *Austelasmus* sp., and are taken by predatory wasps especially *Polistes* and *Polybia* species.

Chrysomelidae:

Antipus ? *mutabilis* Lac., Morelos, Mexico.
Cephaloleia ? *limonensis* Uhman, Turrialba, Costa Rica.
Chelymorpha sp., Morelos, Mexico.
Colaspis sp., Morelos, Mexico.
Colaspoides batesi Jac., Turrialba, Costa Rica.
Corynodes sp., India (Anon., 1983-1984).
Cryptocephalus ? *trizonatus* Suffr., Veracruz, Mexico.
Cryptocephalus 18-*punctatus* Suffr., Veracruz, Mexico.
Ctenochira cumulata (Bog), adults defoliators, also on *Citrus, Coffea*, and other plants, Costa Rica.
Ctenochira ? *ferranti* Spaeth, Veracruz, Mexico.
Diabrotica sp., Turrialba, Costa Rica.
Disonycha sp., Veracruz, Mexico.
Disonycha sp. nr. *glabrata* Fab., Turrialba, Costa Rica.
Disonycha sp. nr. *politula* Horn., Turrialba, Costa Rica.
Exema sp., Veracruz, Mexico.
Glyptoscelis sp., adults defoliators, also on other plants, Trinidad.
? *Hecataeus* sp., Yucatan, Mexico.
? *Maecolaspis* spp., Veracruz, Mexico.
? *Malacosoma* sp., Yucatan, Mexico.
Mesomphalia sp., Veracruz, Mexico.
Metacycla marginata Chap., Yucatan, Mexico.
Metriona sp. nr. *tuberculata* F., Veracruz, Mexico.
? *Monolepta* sp., Veracruz, Mexico.
Nodonota sp., Veracruz, Mexico and Turrialba, Costa Rica.
Omophoita sp., Veracruz, Mexico.
Pachybrachys sp., Morelos, Mexico.
Physonota sp. nr. *alutacea* Boh., Veracruz, Mexico.
Plectrotreta ? *clarkei* Jac., Guanacaste, Costa Rica.
Plectrotreta ? *dogrni* Jac., Veracruz, Mexico.
? *Rhabdopterus* sp., Veracruz, Mexico.
Saxinis sp., Veracruz, Mexico.

Zygogramma sp., Veracruz, Mexico.

Bruchidae:

Acanthoscelides oblongoguttatus (Fahreus), also larvae in seeds of *Acacia* spp., Mexico.
Caryedon sp., India (Anon., 1983-1984).

Curculionidae:

Amblyrrhinus sp., India (Anon., 1983-1984).
Apion sp., India (Anon., 1983-1984).

Apion brunneonigrum B.B. Recorded from Venezuela and Argentina (Blackwelder, 1957) as well as Trinidad; the only hosts known are *C. odorata* and *C. ivaefolia*.

Biology of this weevil has already been described (Cruttwell, 1973a). In Trinidad, *C. odorata* flowers in late December; weevils oviposit in flower-buds December-January, larvae feed and pupate in the flowers, adults emerge February-March. Newly-emerged adults initially remain on the flower-heads, then disperse to plants in shaded areas where they feed on buds and young leaves. Adults remain sexually immature until October, when the reproductive system begins to develop. In November when flower-buds are forming on the host plant, the weevils congregate on suitable plants, and mating followed by oviposition begins.

Astycus aurovittatus Heller, India (Anon., 1983-1984).

Rhodobaenus sp. nr. *cariniventris* Champ. Adults feed on stems and leaf petioles of *B. pilosa, C. odorata, C. ivaefolia* and *A. inulaefolium*, and larvae in the stems of the three latter species. Adults often found together with *Rhodobaenus* 13-*punctatus* Ill. whose larvae do not feed in these 3 species, but have been collected from stems of *B. pilosa* in Trinidad, and in the U.S.A. are recorded from several Composites including *Eupatoriadelphus purpureus* (Satterthwaite, 1948).

Life-history of *R.* sp. nr. *cariniventris* described by Bennett (1955). Eggs are laid in stem tips and larvae feed in stems. When mature, larva cuts off the tip of the hollow stem; the piece about 2 cm in length containing the larva falls to the ground. The open ends are plugged with frass and the larvae pupates within.

Rhodobaenus ypsilon Cheor., reared from larvae collected in stems of *C. odorata* in Vera Cruz, Mexico. Adults feed on stems and foliage.

Adults of the following Curculionids feed on the flowers, buds and leaves of *C. odorata*:

Antenistes attennuatus (Fabr.), Trinidad.
Anthomus sp., on flowers, Trinidad.

Apion sp., Morelos, Mexico.
Baris sp., common on flowers and leaf-buds, also attacks other Composites, Trinidad.
Brachyomus octotuberculatus (F.), on leaves, also attacks crop and garden plants, Trinidad and Venezuela (Guagliumi, 1966).
Centrinaspis spp., on flower and leaf-buds, Trinidad and Costa Rica.
Coleocerus ? *setosus* Boh., Morelos, Mexico.
Compsus simoni Faust., on leaves, also attacks other plants, Trinidad and Venezuela (Guagliumi, *op.cit.*).
Derosomus sp., Yucatan, Mexico.
Eustylus puber Oliv., on leaves, also attacks crop plants, Trinidad.
Exopthalmus jekelianus White, Turrialba, Costa Rica.
Glyptobaris ? *viduata* (F.), Trinidad.
Hoplopactus sp., adults defoliators, Trinidad.
Hypomeces squamosus F., Sumatra (Naezer & Meer Mohr, 1953), also attacks crop plants (Hung, 1966).
Lixus sp., adults defoliators, also attacks other Composites, Trinidad.
Lixus sp. ? *impressicollis* Boh., Porto Alegre, Brazil.
Lixus sp. nr. *nigrinus* Champ., Yucatan, Mexico.
Myrmex sp., Yucatan, Mexico.
Myrmex sp. nr *mexicanus* (Chevr.), Veracruz, Mexico.
Pantomorus spp., Veracruz, Mexico.
Promecops sp., on buds and leaves, Trinidad.
Sibinia sp., Trinidad.

Meloidae: *Mylabris* sp., India (Anon., 1983-1984).

Acarina

Eriophyidae: *Acalitus adoratus* Keifer, causing erineum growth on leaves and stems, Trinidad, Brazil and Bolivia.
Calacarus sp., India (Muniappan and Viraktamath, 1986).
Phyllocoptes cruttwellae Keifer, on leaves, Trinidad. Biology of both mites described in Cruttwell 1977b.

Oribatidae: *Eremulus flagellifer* Berlese, India (Ramani and Haq, 1983).
Galumna sp., India (Ramani and Haq, 1983).
Lamellobatus palustris Hammer, India (Ramani and Haq, 1983).
Parolamellobates bengalensis Bhaduri and Raychaudhuri, India (Ramani and Haq, 1983).
Pelokylla malabarica Clement and Haq, India (Ramani and Haq, 1983).
Scheloribates sp., India (Ramani and Haq, 1983).

Tarsonemidae: *Polyphagotarsonemus latus* Banks, India (Muniappan and Viraktamath, 1986).

Tetranychidae: *Tetranychus* sp., India (Muniappan and Viraktamath, 1986).

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