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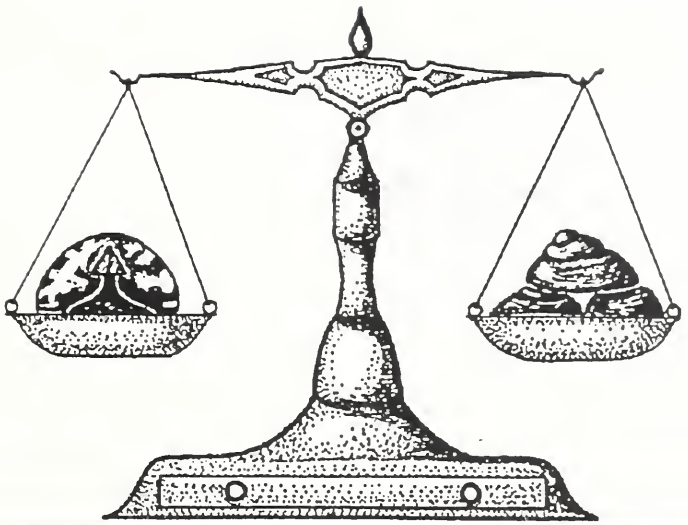
# The Scale



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Vol. XXIV March 2000

## SCALE INSECT FORUM

Just a reminder that this website is available for use of individuals wishing to communicate about scale insects. If you want more information or have suggestions you can contact Francesco Porcelli at scaleinfo@iea8.uniba.it. You can view the site at http://193.204.185.103/scaleinfo/scale.htm and see what it has to offer.

## ISSIS-IX ON THE HORIZON

A note from **Giuseppina Pellizzari**: As you may know, the first Circular for the next ISSIS was sent in September 1999 by surface mail. It is possible that some interested individuals have yet to received the circular (our colleagues from New Zealand got theirs in January!) or that it has been lost. So I propose inclusion of the First Circular of the Symposium in the next edition of The Scale. [ed. A copy is included; if more are need, feel free to copy the attached form.]

## NEWS FROM AROUND THE WORLD

**Editors Note**: If you have news that you would like to have appear in the next edition I would be most happy to receive it. E-mails are especially appreciated.

**Valentina Yasnosh, Institute of Plant Protection, Georgia:** I took part in the XIV International Plant Protection Congress in Jerusalem, Israel 25-30 July, 1999 together with my colleagues B. Seci. D., Ekaterine Tabatadze. Our Poster was: Biocontrol and IPM strategy in citrus orchards in Georgia, by Yasnosh, Chkhaidze and Tabatadze. About 20 coccid species are pests in citrus groves. The large complex of natural enemies (introduced and native) is able to suppress most of the noxious species. Results of 18 years of monitoring pests and natural enemies, and the introduction of biological control agents in Georgia were presented. A review of some mealybugs (Pseudococcidae) on arbor plants and their natural enemies in Georgia will be published in Proceedings of ISSIS VIII . An article on Japanese Wax Scale and its natural enemies in Tbilisi was published with my postgraduate student G. Japoshvili. In this article we discuss observations on *Ceroplastes japonicus* Green, a pest of many subtropical plants and its

introduced parasitoid *Microterys clauseni* Compere. Further work is underway with B. Sei. D. and G. Japoshvili. Japanese wax scale and later its effective parasitoid *Microterys clauseni* Comp. (Hymenoptera, Encyrtidae) have accidently spread and acclimatized in Tbilisi. Best wishes for a happy New Year 2000!

**Ekaterina Tabatadze, Institute of Plant Protection, Georgia**.: My research is on the scale insects and their natural enemies in citrus orchards on the Black Sea coast of Georgia. My principal interest is in the Japanese scale - *Lopholeucaspis japonica* Ckll, a pest of citrus and many other subtropical plants (see "The Scale", Vol. XX, February, 1996, p. 11). In the past this pest was a very serious problem, but it presently is far less significant, because it is suppressed by a complex of natural enemies, predominantly the fungus *Aschesonia* sp., which was previously unknown in the Caucuses. I also took part in the XIV International Plant Protection Congress in Jerusalem, Israel 25-30 July, 1999. My poster "New pathogen of armored scales in Georgia" was devoted to *Aschersonia* sp., the new entomopathogen of Japanese and other scales in Georgia. I was also one of the coauthors of the Poster byYasnosh, Chkhaidze, and Tabatadze mentioned above. An article on the population dynamics and biocontrol of the Japanese scale in Georgia (authors: E. Tabatadze, V. Yasnosh) will be publish in the proceedings of ISSIS VIII and a second article on a new entomopathogen of coccids-*Aschersonia* will be publish in Quarantine and Plant Protection Journal, Moscow. Best wishes for the New Year 2000.

**Gillian Watson** continues to work for CAB INTERNATIONAL as part of the Biosystematics and Molecular Biology section of CABI Bioscience. She is based in the Entomology Department of The Natural History Museum, London, and has regular contact with Doug Williams when he visits there each week. Her main effort over the next 2.5 years will be on producing an electronic identification aid to economically important species of Diaspididae on CD-ROM, in collaboration with ETI (University of Amsterdam). Gillian also provides identifications; individual training, and workshops on preparation and identification; of scale insects, whiteflies and aphids, either in the UK or in other countries. She will be staging a Mealybug Identification Workshop in Belize in March. Please note her NEW contact details: Dr. Gillian W. Watson, Taxonomist, Sternorrhyncha, CABI BIOSCIENCE, c/o Entomology Department, The Natural History Museum, Cromwell Road London, SW7 5BD, UK.

**Ferenc Kozár, Plant Protection Institute, Budapest, Hungary**: I am continuing my work on a world revision of Ortheziidae. I am now studying the material in the Paris museum, which has several undescribed species. Best wishes to all.
Ferenc

**Roberto Gonzalez, Facultad de Ciencias Agrarias y Forestales, Universidad de Chile, Santiago**: Some items that might be of interest are: 1. Catalog of the exotic Diaspididae from Argentina, Brasil and Chile, by Claps (Instituto Lillo, Tucuman, Argentine), Wolf (Instituto de Biociencias, Porto Alegre, Brasil) and Gonzalez is ready for submission. Information on host plants, distribution, synonyms, and relevant bibliography is presented for each of the 88 species dealt with in the catalog. 2. Native Diaspididae from the southern cone of the Neotropical

Region are being studied by the same authors. It is noted that studies in that part of the continent were undertaken by Cockerell in the very late 1800, who in 1902 listed 195 species of coccids of which, 135 pertained to the Brazilian fauna. 3.The mealybugs of Chile, with particular emphasis on the species occurring on fruit trees, is being studied by Dr. Roberto H. Gonzalez. The collection is being augmented with new material collected on deciduous fruit trees and berries. Apart from their quarantine importance, this group of insects is becoming an important group of economic pests on pome fruits.

**Jan Koteja, Institute of Applied Zoology, Krakow, Poland**: As you know, my main work is gathering information, and cataloguing, coccid fossils in all public and private collections worldwide. By the end of 1999 the number of registered specimens increased to 1087, and in March 2000, I assume that I will get an additional 200 specimens (amber inclusions). Obviously, the majority is Baltic amber material. I mentioned March because at its beginning the world largest amber fair (AMBERIF) will be held in Gdansk (Poland). I hope to attend. Considering paleontology, the older the material is, the more valuable the information that it contains. So far, pre-Cretaceous coccid fossils are few and obscure, but there are well preserved and numerous Cretaceous fossils. Among impressions, in addition to the already published fossils from Lower Cretaceous Siberian deposits, another Lower Cretaceous matsucoccid wing impression has been described from southern England (reprints not received yet). Inclusions in various fossil resins are much more abundant. In 1999, I completed a monograph of the New Jersey amber coccids (ca 70 specimens, 8 families, to be published by the American Museum of Natural History), and recently a single inclusion in Alaskan amber (coauthored by George Poinar). Currently, the oldest known fossiliferous amber from Lebanon is being studied, and another sample of Burmese amber believed to be of Cretaceous age, too. Information that a fossil, even the best preserved amber inclusion, can provide is always sparse. Thus the more specimens of the same form, the better. Several years ago I described a wingless male believed to be a relative of eriococcids. Dug Miller suggested that it might be a pityococcid. Now I have a number of both males and females (even in copula) on my desk, and their pityococcid relationship became evident. I am quoting this case to explain why so many fossils are needed and why studies on fossil material proceed so slowly. And conclusions? Collecting nice Baltic or Dominican amber inclusions may be a hobby; these forms are similar to those we know today. But information provided by Cretaceous and older forms is something more, it constitutes a basis of paleontology and science. Most of them became extinct and have been replaced by new genera and families. Scale insects do evolve, believe it or not. Some other comment on another subject are as follows: The metathoracic wings in scale insects - halteres or hamulohalteres - are believed to cooperate with the mesothoracic wings in that they hook at the anal margin of the forewings by means of curved setae (hamuli). As I am aware, nobody observed this mechanism in action. In the ground pearls (Margarodidae s. str.), hamuli are absent, but the apex of halteres abruptly taper forming a strong hook that is inserted (we believe) in the pouch of the anal lobe in flight, like the hamuli in other coccids. However, I have directly observed that margarodid males attach the halteres at the costal(!) margin and 'help' the forwings to assume a resting position after flight. This was really an exciting observation. It thus means that margarodid halteres play a double function - in flight and rest. Another evident autapomorphy of the ground pearls. The

paper on this phenomenon will soon be published, I hope. My best wishes to all.

**Penny Gullan, Department of Entomology, Davis, California:** Penny is in the process of moving from Australia to the United States and really didn't have time to give an update on her Laboratory's progress. She did send the following note: Our flight to Davis is on 2 March. Perhaps you could put a note in the next issue of the Scale to say that from early March my address will be: Department of Entomology, University of California, Davis, CA 95616, USA. I won't have email until after I buy a computer and I'm not sure how long it will take for the order to go through the UCD system, but I'll send my new email address as soon as I have one. I'll keep this ANU address active for a few months so that messages can be sent on. [ed. Her new email is pjgullan@ucdavis.edu]

**Evelyna Danzig, Zoological Institute, St. Petersburg, Russia:** I am continuing the revision of the Pseudococcidae of the former USSR. My current project is the genus *Phenacoccus* Sign. A large group with a high level of intraspecific variation. The work is especially difficult because some species were described based on one small series and I have no additional material to decide if we have several different species or one variable species. In a separate project, I described a new species of gall-forming *Diaspidiotus* on the leaves of *Nitraria retusa* from Israel. In the beginning of the last century *Diaspidiotus nitraria* (Marchal) was described from Tunisia. It also forms gall on *Nitraria* but the new species has many morphological differences. The discovery of two gall-forming diaspidid species on the same host plant is remarkable. The genus *Nitraria* consists of 10 species that are widespread in the deserts of the Palaearctic, but the diaspidids are only recorded from *N. retusa*, the most primitive member of the genus (opinion of botanists). I am grateful to Dr. D. Gerling, Dr. Y. Ben-Dov and Dr. Kravchenko (Israel) and to Dr. E. Sugonyaev (Russia) for their help with this work. The publication in Zoosystematica Rossica will appear next month. I also am continuing to identify scale insects that are collected in Mexico by my colleagues, who are specialists on parasitic Hymenoptera: Prof. V. Trjapitzin with his wife and Dr. S. Myartseva. They are interested in the scale insects since they are the hosts of parasites. I thank Dug Miller for his help in this work. In June last year I, with my friend Valentina Kuznetetova, were fortunate to visit southern Italy. This was possible because of the kind invitation of Francesco Porcelli (see Scale Insect Forum, N 3, 1999). Best regards.

**Imre Foldi, Muséum national d'Histoire naturelle, Entomology, Paris:** My primary project is a generic revision of the Margarodidae. However, at present, I am working on a smaller study on the Mediterranean margarodids. Currently, there are 34 species belonging to 14 genera. I plan to publish this work in 2001 or 2002. Another paper is in press on the diversity of scale insect communities in the HyFres islands in natural and man-made environments. An additional work was published in 1999 on two remarkable margarodid male scale insects that have antennae unique in structure for scale insects. It was great having Ferenc Kozar visit here for two months. The discussions about coccidology were without end.

**Agatino Russo, Istituto di Entomologia Agraria, Catania, Italy:** In Catania we (Santi Longo, Gaetana Mazzeo, Pompeo Suma and myself) are working on the taxonomy and faunistics of the

Sicilian scale insects. In this regard several projects are underway: 1) Population monitoring and integrated control of *Aonidiella aurantii* and *Aonidiella citrina*; 2) Management of *Planococcus citri* using synthetic pheromones (monitoring, mass trapping etc.) This is an international project with Israeli, Portugal and France partners; 3) Biology of *Ceroplastes japonicus*.

**Michael Kosztarab and Karen Veilleux, Virginia Polythechnic Institute and State University, Blacksburg, Virginia:** The work on cataloging the world aphid and scale literature and enlarging the ScaleNet database continued with Karen Veilleux's able work. Doug Pfeiffer joined the project last fall as co-PI. I bought a new computer for home use in March and a printer last fall. My grandson Matthew installed the printer software and made the computer Y2K compliant. Now we can also take messages with attachments. Matilda and I visited Hungary in May and flew to France in June to enjoy a 16-day tour in Paris, Brittany, Normandy, and the Loire Valley. I stopped at the Natural History Museum in Paris and donated my scales collected in France to Danielle Matile-Ferrero. While in Paris, we had a good time with Yair and Yehudith Ben-Dov. Last spring, Harlan J. Hendricks' PhD. dissertation on the Revision of Serrolecaniini was printed in a hard cover book in Germany by de Gruyter & Co. The Hungarian text for my "Transylvanian Roots" book was printed in December. This was my fourth book since retirement. The second installment of my library on scale insects was given to Paris Lambdin and his graduate students, hoping that it will help them complete the book on scales of the southeastern United States. After four years of waiting, the joint article with Mary Rhoades on the disjunct distribution and endemism in the Appalachian scale insect fauna was printed last fall. The year ended with two invited talks given at the Entomological Society of America meeting in Atlanta last December. One of the talks dealt with Coccidology in Hungary and is included in the "Notes of Interest" section.

**Francesco Porcelli, Istituto di Entomologia Agraria, Università di Bari, Italy**: There have been some administrative problems in finalizing the Proceedings of ISSIS VIII, but progress is rapid now. I expect that it will be printed and available in the next several months. It is a very nice volume!!!

**Chris Hodgson, The National Museum of Wales, Cardiff, UK**: I have now retired from Wye College and my new contact address is: Department of Biodiversity and Biological Systematics, The National Museum of Wales, Cathays Park, Cardiff,CF10 3NP. Tel. No. 029 20573224. Fax. No. 029 20359829 or 029 20239009. Email address: hodgsoncj@cardiff.ac.uk. As the above address implies, I am still working hard on scales. I completed editing the Proceedings of the last International Symposium on Scale Insect Studies late last summer and the m/s have been with Entomologica since then. It is expected that they should be published in the next few months. In addition, Rosa Henderson and I have now completed our revision of the adult female soft scales of New Zealand and this has been published in the Fauna of New Zealand series. It includes some beautiful colour plates taken by Rosa. There are now 43 indigenous species known from New Zealand - and we have concluded that none have been recorded outside New Zealand. Indeed, there is only one record of an indigenous species on a non-indigenous plant and that was in a mixed hedge! It seems unlikely that they will become important pests elsewhere!

The revision also includes illustrations and brief descriptions of the adventive, cosmopolitan species which have been recorded to date from NZ. Because Rosa Henderson is such an efficient collector, we also have many other stages of these indigenous species and so are planning to produce two other volumes in the Fauna of New Zealand Series, one on the prepupae, pupae and adult males (this is nearing completion and should be finished this summer) and the other is on the female immature stages and 2nd-instar males (this is about half complete). In addition to the above, I am also currently cooperating with Ian Millar in Pretoria on an interesting coccid/aclerdid; with Dug Miller in Washington on an eriococcid from Chile and with Penny Gullan in Davis. The latter will be a revision of the soft scales of Australia and I am hoping that we shall be starting on this in earnest later this Spring. In addition, Christina Granara de Willink and I are also hoping to start on the Argentinian soft scales - but this may have to wait until next year!! Looking forward to hearing from you all.

**Maren Gimpel, Gary Miller, and Dug Miller, Systematic Entomology Laboratory, USDA, Beltsville, Maryland**: Many things have been going on at Beltsville including visits from Elzbieta Podsialdo and Gillian Watson. ScaleNet continues to progress at a pace that is much too slow for our needs. Unfortunately, the Diaspididae is a very large group and has extensive literature. We are currently working on the Diaspidinae and related groups. Our strategy has been to enter most of the data from the Borchsenius catalog and then develop information one genus at a time beginning with those that start with the letter "A." Maren informed me yesterday that she was finally working on the "D"s. The manuscript catalog on the eriococcids is with the publisher and we are hopeful that it will be available soon. Dug will be going to Davis again this year to do more work on the collection there. Doug Williams will again participate as will Penny Gullan who now calls Davis "home." This past year Dug has taken up a new area of scale biology by traveling to Mexico twice to explore for parasites of *Paracoccus marginatus* the so called papaya mealybug. He and his colleagues Juan Antonio Villanueva, Hector Gonzalez, and Michael Schauff have managed to collect at least three different encyrtid parasites that currently are in culture in Newark, Delaware. Since this mealybug is becoming an increasingly important pest in Florida and the Caribbean, it is hoped that one or all of the Mexican parasites will control this new pest. We are fortunate to have Gary Miller again helping with scale insect research. We already are working on several joint research papers and are hoping to have a scale insect web page that will provide online information on the holdings of the collection, recent research, and copies of "the Scale" We may also have a historical photo gallery of some of the more prominent coccidologists. The event that occupied most of our time for much of the year was moving our offices and collections to a different building. It took a huge amount of time, but we now are in much nicer facilities and are all together in one area. Please note the new address: Systematic Entomology Laboratory, Room 137, Building 005, BARC-W, Beltsville, MD 20705, USA. The telephone, fax, and email are the same.

## NECROLOGY

A sad note from Ray Gill. "For those of you who might remember him, John Steinweden, formerly an Entomologist with the California Department of Food and Agriculture for 35 years, passed away Saturday May 15, 1999 in Salinas, California. He was 94 years old." Two of his most important publications were: Steinweden, J.B. 1929. Bases for the generic classification of the coccoid family Coccidae. Annals of the Entomological Society of America 22: 197-245. and Steinweden, J.B. 1946. The identity of certain common American species of *Pulvinaria* (Homoptera: Coccoidea: Coccidae). (Contribution no. 49). Microentomology 11: 1-28.

# NOTES OF INTEREST

## Notes on scale insects described by Gladys Hoke Lobdell

by
**Terence Lee Schiefer,**
*Mississippi State University, Mississippi State, Mississippi 39762 USA*

I thought that the coccidology community would be interested in learning that additional specimens of Gladys Hoke Lobdell's scale insects have been discovered. The new material was found in the attic of Lobdell's son who passed away last year. His widow has donated the specimens to the Mississippi Entomological Museum. Included in the material are paratypes of most of the species she described as well as two holotypes. Specimens of several species of interest are present including the holotype of *Trionymus mori*, a specimen of *Pseudococcus obesus* labeled "part of type", and two paratypes of *Trionymus rostellum*. I've attempted to make an accounting of Lobdell's type material that we have in the MEM; a copy is enclosed. I've listed the "type" information given in her publications and give a list of our "old" and "newly discovered" specimens. In many cases the status of the specimen being a "type" is only given on the slide envelope and not on the slide itself. Also many of the "type" slides lack the name of the new species although it is on the envelope. I've indicated in my list where this is the case. I should also note that in addition to the "type" slides that I have listed, we have other non-type material of Lobdell's species, some slides of which are from the type locality. The whereabouts of the majority of Lobdell's holotypes remains a mystery. Of the 24 species she described, the type depository was given in her papers as follows: not indicated (3 species); USNM (1 species); author's collection (1 species); Mississippi State Plant Board (19 species). Only three holotypes are definitely accounted for. The holotype of *Trionymus setosus* has always been in the MEM collection. The holotype deposited in the Hoke Lobdell's collection, *Lepidosaphes ilicis* was with the newly discovered material, as was the Mississippi State Plant Board holotype of *Trionymus mori*. The later species was wrapped in a paper with hand written descriptive notes possibly indicating that Lobdell had this holotype on hand because she was "actively" working with it. It may never be known whether the rest of the Mississippi State Plant Board types were transferred to another collection, borrowed by a researcher and not returned, or put in a "safe place" and still awaiting discovery. Please let me know if you learn the location of these types.

1) *Lepidosaphes camelliae* **Hoke 1921.** Type: not designated. Specimen depository: not indicated. Host: *Camellia joponica.* Localities, dates, and collectors: Big Point, MS, 29 June 1917, R.L. Eberhard/ 25 June 1918, J.C. Roberts; Laurel Hill, MS, 19 Oct. 1918, J.S. McGhee; Magnolia, MS, 1 Sep. 1920, W.M. Lampton; Moss Point, MS, 27 Dec. 1918, G.B. Brown; South Pascagoula, Jan. 1921, R.P. Barnhart, E.K. Bynum; Woodville, 1920, J.C. Hamilton. **Notes on old MEM material:** Slide 1) Envelope labeled "Part of type"; slide without type designation. ID on envelope & slide: *Lepidosaphes camelliae.* Slide 2) "Part of type" Same as in slide 1. Slide 3) "Part of type" Same as in slide 1. Slide 3) "Part of type" Same as in slide 1. Slide 4) "Part of type" Same as in slide 1. Slide 5) "Part of type" Same as in slide 1. Slide 6) "Part of type" Same as in slide 1. **Notes on new MEM material:** Slide 1) Envelope labeled "Part of type"; slide without type designation. ID on envelope & slide: *Lepidosaphes camelliae.* Slide was mixed in with miscellaneous other slides.

2) ***Scobinaspis dentata* Hoke 1921.** = *Velataspis dentata* (Hoke). Type: not designated. Specimen depository: not indicated. Localities, dates, collectors, and hosts: Vicksburg, MS, April 1920, Luther Brown on Maple (*Acer*) leaves; Cat Island, MS, 8 Sept. 1920, R.P. Barnhart, on black haw (*Bumelia lanuginosa*). **Notes on new MEM material:** Slide 1) Envelope & slide labeled "Paratype" ID on envelope: *Lepidosaphes (Scobinaspis) dentata* n.sp.; ID on slide: *Scobinaspis dentata* n.sp. Slide was mixed in with miscellaneous other slides.

3) ***Mytiella sexspina* Hoke 1921.** Synonym. = *Lepidosaphes gloverrii* (Packard). Type: not designated. Specimen depository: not indicated. Localities, dates, collectors, and hosts: Logtown, MS, 22 Aug. 1916, E.C. Lindsey, on Citrus leaves and twigs; Fort Pierce, FL, 7 Jan. 1920, Gladys Hoke, on Satsuma oranges; Laurel, MS, August, 1920, H.L.Dozier, L.E. Miles, R.C. Price, J.V. Vernon, on *Euonymus japonica,* leaves and twigs; Yazoo City, MS, February 1921, R.N. Lobdell, G.D. Dorroh. **Notes on new MEM material:** Slide 1) Envelope & slide labeled "from type lot" ID on envelope: *Mytiella sexspina* and *Lepidosaphes gloverii* Pack. ID on slide: *Mytiella sexspina* n.sp. Only data on slide is lot no. 5654. Host on envelope is listed as *Cassia*. Slide was mixed in with miscellaneous other slide.

4) ***Leucaspis knemion* Hoke 1925**. Valid name. Types: USNM. Host: *Pinus pinea*. Locality: Beirut, Syria. Date: 18 Apr. 1923. Note: Described from two larval shed skins, one nymph, five nymphal shed skins, and five adult females. MEM type material: none.

5) ***Aspidiotus socialis* Hoke 1927.** = *Quadraspidiotus socialis* (Hoke). Holotype: Mississippi State Plant Board. Paratypes: USNM, & collection of Author. Host: Water-oak (*Quercus* sp.). Locality: Aberdeen, MS. Date: 4 May 1921. Collector: H.L. Dozier. **Notes on old MEM material**: Slide 1) Envelope labeled both "Paratype" & "Cotype"; slide labeled "Cotype". ID on envelope: *Aspidiotus socialis* n.sp.; ID on slide: *Diaspidiotus pseudoforbsi.* **Notes on new MEM material**: Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Aspidiotus socialis* n.sp. Slide was in section of box labeled "Some Type Material".

6) ***Crypthemichionaspis ulmi* Hoke 1927.** = *Fissuraspis ulmi* (Hoke). Holotype: Mississippi State Plant Board. Paratypes: USNM, & collection of Author. Host: Elm (*Ulmus americana*). Locality: A. & M. College, MS. Date: 15 Oct. 1926. Collector: J.N. Roney. **Notes on old MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope: *Crypthemichionaspis ulmi* n.sp.; ID on slide: none. Cover slip off slide. Slide 2) Envelope labeled "Paratype"; slide without type designation. ID on slide & envelope: *Crypthemichionaspis ulmi* n.sp.

**Notes on new MEM material**: Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope: *Crypthemichionaspis ulmi* n.sp.; ID on slide: *Xerophilaspis* n.sp.? In section of box labeled "Some Type Material". Slide 2) Envelope labeled "Paratype"; slide without type designation. ID on envelope & slide: *Crypthemichionaspis ulmi* n.sp. Slide was mixed in with miscellaneous other slides(males?).

**7) *Lepidosaphes ilicis* Hoke 1927.** = *Niveaspis ilicis* (Hoke). Holotype: Collection of Author. Paratype: Mississippi State Plant Board. Host: Holly (*Ilex opaca*). Locality: Horse Shoe Lake, Tallahatchie River bottom near Como, MS. Date: 29 Oct. 1921. Collector: the Author (Lobdell Hoke). **Note:** Drawing of 2nd stage female from Flint Creek Swamp, Wiggins, MS, Dec. 1920. Described from 2 adult females, 2 second stage females, 1 male, and the scales. **Notes on old MEM material:** Slide 1) Envelope labeled "Type material"; slide without type designation. ID on envelope & slide: *Lepidosaphes ilicis* n.sp. **Notes on new MEM material**: Slide 1) Envelope & slide labeled "Type of male"; ID on envelope & slide: *Lepidosaphes ilicis* n.sp. Slide was mixed in with miscellaneous other slides (males?). Slide 2) Envelope & slide labeled "Holotype"; ID on envelope & slide: *Lepidosaphes ilicis* n. sp. Slide was mixed in with miscellaneous other slides. Slide 3) Envelope labeled "Type material"; slide without type designation. ID on envelope & slide: *Lepidosaphes ilicis* n.sp. Slide was mixed in with miscellaneous other slides.

**8) *Lepidosaphes solidaginis* Hoke 1927.** = *Aonidomytilus solidaginis* (Hoke). Holotype: Mississippi State Plant Board. Paratype: Collection of Author. Specimens from the type material: USNM. Host: Golden Rod (*Solidago* sp.). Locality: Pickens Co., AL. Date: 8 Sep. 1925. Collector: George F. Arnold. **Notes on old MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope & slide: *Lepidosaphes solidaginis* n.sp. **Notes on new MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope: *Lepidosaphes solidaginis* n.sp.; ID on slide: *Lepidosaphes* n.sp. ? Slide was in section of box labeled "Some Type Material".

**9) *Diaspis dignus* Hoke 1928.** Holotype: Mississippi State Plant Board. Paratypes: USNM, & collection of Author. Host: Button Snakeroot (*Eryngium aquaticum*). Locality: Round Island, MS. Date: 30 Sep. 1927. Collector: Troy Thompson. **Notes on old MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Diaspis dignus* n.sp. Slide 2) "Paratype". Same as in slide 1. Slide 3) "Paratype". Same as in slide 1. Slide 4) "Paratype". Same as in slide 1. **Notes on new MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Diaspis dignus* n.sp. Slide was mixed in with miscellaneous other slides.

**10) *Protodiaspis varus* Hoke 1928**. Holotype: Mississippi State Plant Board. Paratypes: Mississippi State Plant Board, & Collection of Author. Host: Laurel Oak (*Quercus laurifolia*). Locality: Meridian, MS. Date: 11 Jun. 1928. Collector: M.L. Grimes. **Notes on old MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Protodiaspis varus*. Slide 2) Envelope labeled "Paratype"; slide without type designation. ID on envelope & slide same as in slide 1. Slide 3) Envelope labeled "Type"; slide without type designation. ID on envelope & slide same as in slide 1. Slide 4) Envelope labeled "Type"; slide without type designation. ID on envelope: *Protodiaspis varus* n.sp.; ID on slide: Protodiaspis. Slide 5) "Type". Same as in slide 4.

**11) *Eriococcus pilosus* Lobdell 1929.** Synonym. = *Acanthococcus missourii* (Hollinger). Holotype: Mississippi State Plant Board. Host: Thistle (*Cirsium* sp.). Locality: A. & M. College,

MS. Date: 14 Feb. 1927. Collector: M.R.Smith. **Notes on new MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope: *Eriococcus pilosus* n.sp.; ID on slide: *Eriococcus.* Slide was in section of box labeled "Some Type Material". Date is "15 Feb."

12) ***Eriococcus smithi* Lobdell 1929.** *Acanthococcus smithii* (Lobdell). Holotype: Mississippi State Plant Board. Paratypes: Mississippi State Plant Board, USNM. Host: Broom Sedge (*Andrpogon virginicus*). Locality: Meridian, MS. Date: 14 Nov. 1927. Collector: M.R. Smith. **Notes on old MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Eriococcus smithi* n.sp. Slide 2) "Paratype". Same as in slide 1. **Notes on new MEM material:** Slide 1) Envelope & Slide labeled "Paratype". ID on envelope & slide: *Eriococcus smithi* n.sp. Slide was in section of box labeled "Some Type Material".

13) ***Phenacoccus insignis* Lobdell 1930.** = *Heliococcus insignis* (Lobdell). Holotype: Mississippi State Plant Board. Paratypes: Mississippi State Plant Board, USNM. Host: Elm Bark (*Ulmus* sp.). Locality: Columbus, MS. Date: 30 Nov. 1926. Collector: M.R. Smith, J.N. Roney. **Notes on old MEM material:** Slide 1) Envelope & slide labeled "Cotype". ID on envelope & slide: *Phenacoccus insignis* n.sp. Notes on new MEM material: Slide 1) Envelope labeled "Cotype"; slide without type designation. ID on envelope: *Phenacoccus insignis* n.sp.; ID on slide: *Phenacoccus* sp. Slide was in section of box labeled "Some Type Material".

14) ***Pseudantonina giganticoxa* Lobdell 1930.** Holotype: Mississippi State Plant Board. A paratype: Collection of E.E. Green. Host: Apparently *Cyperus ovularis* or *echinatus.* Locality: A. & M. College, MS. Date: 9 & 10 Jan. 1929. Collector: M.R. Smith. **Notes on old MEM material:** Three "Paratype" slides on loan. **Notes on new MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope and slide: *Pseudantonina giganticoxa* n.sp. Slide was in section of box labeled "Some Type Material" Date on slide is "1928"

15) ***Pseudantonina spirapuncta* Lobdell 1930.** = *Syrmococcus spirapuncta* (Lobdell). Holotype: Mississippi State Plant Board. Some of the material: Collection of E.E. Green. Host: Grass roots. Locality: A. & M. College, MS. Date: 28 Nov. 1927. Collector: M.R. Smith, W.A. Douglass. **Notes on new MEM material:** Slide 1) Envelope & slide labeled "Paratype"; ID on envelope & slide: *Pseudantonina spirapuncta* n.sp. Slide was in section of box labeled "Some Type Material".

16) ***Pseudococcus acutus* Lobdell 1930.** = *Oracella acutus* (Lobdell). Types: Mississippi State Plant Board. Host: Pine twigs (*Pinus* sp.). Locality: Ocean Springs, MS. Date: 28 March 1927. Collector: J.P. Kislanko. Note: Similar specimens from A. & M. College, MS, 3 Aug. 1927, J.M. Langston. **Notes on new MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope: *Pseudococcus acutus* n.sp.; ID on slide: none. Slide was in section of box labeled "Some Type Material".

17) ***Pseudococcus dentatus* Lobdell 1930.** Types: Mississippi State Plant Board. Host: Ragweed (*Ambrosia* sp.) roots. Locality: A. & M. College, MS. Date: 28 Nov. 1927. Collector: M.R. Smith. MEM type material: none.

18) ***Pseudococcus difficilis* Lobdell 1930.** = *Dysmicoccus difficilis* (Lobdell). Types: Mississippi State Plant Board. Host: Ash (*Fraxinus* sp.). Locality: A. & M. College, MS. Date: 28 Aug. 1926 Collector: J.M. Langston. **Note:** Description of larva & adult females from Mayhew, MS, 11 Nov. 1926, M.R. Smith. **Notes on old MEM material:** Slide 1) Envelope labeled "Type m"; slide without type designation. ID on envelope & slide: *Pseudococcus difficilis* n.sp. Cover slip off slide.

**Notes on new MEM material:** Slide 1) Envelope labeled "Type"; slide without type designation. ID on envelope: *Pseudococcus difficilis*; ID on slide: *Pseudococcus* near *trifoliae* Forbes. Slide was in section of box labeled "Some Type Material". Host listed on envelope and slide is "Pecan".

**19) *Pseudococcus obesus* Lobdell 1930.** = *Dysmicoccus obesus* (Lobdell). Holotype: Mississippi State Plant Board. Paratypes: Mississippi State Plant Board, USNM. Host: Pine (*Pinus* sp.) trunk. Locality: Meridian, MS. Date: 14 & 23 Nov. 1927. Collector: M.R. Smith. **Notes on old MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: Pseudococcus obesus. Slide 2) "Paratype". Same as in slide 1. Slide 3) Envelope labeled "Paratype"; slide without type designation. ID on envelope & slide same as in slide 1. Slide 4) Envelope & slide labeled "Part of Type". ID on envelope & slide same as in slide 1. **Notes on new MEM material:** Slide 1) Envelope labeled "Part of Type"; slide without type designation. ID on envelope: *Pseudococcus obesus* n.sp.; ID on slide *Pseudococcus* sp. X. Slide was in section of box labeled "Some Type Material".

**20) *Trionymus claviseta* Lobdell 1930.** = *Ferrisia claviseta* (Lobdell). Holotype: Mississippi State Plant Board. Paratype: Mississippi State Plant Board. Host: Hackberry (*Celtis mississippiensis*) bark. Locality: Mayhew, MS. 12 Nov. 1926. Collector: M.R. Smith. **Notes on old MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope & slide: *Trionymus claviseta* n.sp. Slide 2) "Paratype". Same as in slide 1.

**Notes on new MEM material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope: *Trionymus claviseta* n.sp.; ID on slide: *Trionymus* sp. Slide was in section of box labeled "Some Type Material".

**21) *Trionymus mori* Lobdell 1930.** Types: Mississippi State Plant Board. Host: Mulberry (*Morus* sp.). Locality: West Point, MS. 7 July 1928. Collector: G.L. Bond. **Notes on new MEM material:** Slide 1) Envelope labeled "Holotype"; slide labeled "Type". ID on envelope and slide: *Trionymus mori* n.sp. Slide was wrapped together with slide of *Pseudococus eriogoni* (Ehrh.) in piece of paper with notes comparing the two species.

**22) *Trionymus rostellum* Lobdell 1930.** = *Chorizococcus rostellum* (Lobdell). Holotype: Mississippi State Plant Board. Paratypes: Mississippi State Plant Board. Host: Crab grass (?), nut grass. Locality: Houston, MS. Date: 23 Oct. 1929. Collector: M.R. Smith. **Note:** Also collected on wire grass at Eupora, MS, 19 Oct. 1929, M.R. Smith. **Notes on old MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Trionymus rostellum* n.sp. Slide 2) "Paratype". Same as in slide 1. Slide 3) "Paratype". Same as in slide 1. Slide 4) "Paratype". Same as in slide 1. Slide 5) Envelope & slide labeled "Type material". ID on envelope & slide: *Trionymus rostellum*. **Notes on new MEM material:** Slide 1) Envelope & Slide labeled "Paratype." ID on envelope & slide: *Trionymus rostellum* n. sp. Slide was in section of box labeled "Some Type Material". Slide 2) "Paratype". Same as in slide 1.

**23) *Trionymus setosus* Lobdell 1930.** Homonym. = *Ferrisia lobdellae* Varshey. Holotype: Mississippi State Plant Board. Paratypes: Mississippi State Plant Board, USNM. Host: Sweet Gum near roots. Locality: Durant, MS. Date: 18 Sep., 1926. Collector: G.R. Williams. **Note:** Description of larvae & adult female from material collected 28 September. **Notes on old MEM material:** Slide 1) Envelope labeled "Holotype"; slide without type designation. ID on envelope & slide: *Trionymus setosus* n.sp. Slide broken in two. Slide 2) Envelope labeled "Paratype"; slide without type designation. ID on envelope & slide: *Trionymus setosus* n.sp. **Notes on new MEM**

**material:** Slide 1) Envelope labeled "Paratype"; slide without type designation. ID on envelope: *Trionymus setosus* n.sp.?; ID on slide: none. Slide was in section of box labeled "SomeType Material".

**24) *Trionymus varus* Lobdell 1930.** Synonym. = *Eurycoccus jessica* (Hollinger). Holotype: Mississippi State Plant Board. Paratypes: Mississippi State Plant Board. Host: Oak (*Quercus* sp.). Locality: West Point, MS. Date: 30 Aug. 1927. Collector: M.R. Smith. **Note:** Description of 3rd(?) stage female from specimen collected on oak at Adaton, MS, 5 April 1927, M.R. Smith. **Notes on old MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Trionymus varus* n.sp. Slide 2) "Paratyp"e. Same as in slide 1. **Notes on new MEM material:** Slide 1) Envelope & slide labeled "Paratype". ID on envelope & slide: *Trionymus varus* n.sp. Slide was in section of box labeled "Some Type Material".

## Some doubtful distributional records of *Ceroplastes destructor* Newstead (Coccidae: Ceroplastinae)

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*Ceroplastes destructor* Newstead has been reliably recorded from Africa, Australia, New Zealand, and some South Pacific countries. However, there are some unreliable and doubtful records in the literature or databases; and this short note aims to clarify these records.

India: *C. destructor* Newstead was recorded as occurring in India by Avasthi and Shafee (1986) (as *Gascardia destructor*). This record was then repeated in Ben-Dov's (1993) catalogue. No specimens were examined by Avasthi and Shafee (1986) who based their record on an earlier paper and stated that "Subba Rao (1965) reported this species from India as host of an encyrtid parasite *Anicetus parvus* Compere". I think that Avasthi and Shafee misinterpreted the data of Subba Rao (1965). Subba Rao provided a key to species of *Anicetus* worldwide and described two new species from India. Subba Rao also included a "Host-parasite Index" at the end of the paper (p. 75) and listed parasites and their hosts. *C. destructor* was listed as a host of *A. parvus* Compere, which was mentioned as occurring in Africa earlier in the key (p. 72). I believe that *C. destructor* probably does not occur in India.

Florida and Mexico: Distribution Maps of Pests No. 117 published by CIE (1960) included this species in Florida and Mexico based on the record of Ebeling (1959). This probably was a misidentification of *Ceroplastes dugesii* Lichtenstein which is similar in external appearance and occurs in both Florida and Mexico among other areas (D. R. Miller & A.B. Hamon, personal communication 1999).

Colombia: *C. destructor* has also been recorded from Colombia (CABI Crop Protection Compendium, 1999) based on the EPPO PQR database, Paris, France. This record seems doubtful

(D. R. Miller, personal communication 1999).

References

**Avasthi R.K. & Shafee S.A.** 1986. Species of Ceroplastinae (Homoptera: Coccidae) from India. Journal of the Bombay Natural History Society **83:** 327-338.

**Ben-Dov, Y.** 1993. A Systematic Catalogue of the Soft Scale Insects of the World (Homoptera: Coccoidea: Coccidae) with Data on Geographical Distribution, Host Plants, Biology and Economic Importance. Flora and Fauna Handbook No. 9. Sandhill Crane Press, Inc., Gainesville, Florida. 536 pp.

**CABI Crop Protection Compendium** 1999. Global Module – 1999 edition

**Commonwealth Institute of Entomology**. 1960. Distribution Maps of Pests. Series A (Agricultural), Map. No. 117.

**Ebeling, W.** 1959. Subtropical fruit pests. Division of Agricultural Sciences, University of California, Los Angeles. 436 pp.

**Subba Rao, B.R.** 1965. A key to species of *Anicetus* Howard, 1896 (Hymenoptera: Encyrtidae) and descriptions of new species from India. Proceedings of the Royal Entomological Society of London (B) 34: 71-75.

## Hungarian Coccidology

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Three major publications have been invaluable for the preparation of this report: L.O. Howard's 1930 book on the History of Applied Entomology which contained a 5-page discussion on early Hungarian entomologists; a 25 page historical review on research in horticultural entomology by G. Balás and G. Sáringer (1982); and the 1994 book by S. Bognár on the "History of Hungarian Plant Protection from 1030 to 1980."

Considering the size of the Hungarian population compared to many other larger countries, Hungarian workers have contributed substantially to scale insect studies. Here I will discuss the major workers in chronological sequence according to the date of their first publication on scale insects. Publication dates are given to assist identification of their articles in the four bibliographies or, for recent publications in The Scale, or ScaleNet.

Although **G. Horváth** (1847-1937) was trained as a physician, his heart was in entomology. His reputation as a world renowned hemipterist-homopterist brought him the directorship of the newly established National Phylloxera Research Station in Budapest during 1880. In a few years, with his leadership, the *Phylloxera* problem was solved, so the Institute could concentrate on other entomological tasks. Among his more than 350 publications, besides his numerous papers on homopterans, such as psyllids, *Phylloxera*, and aphids we find a number of records on scale insects

in his periodical station reports (1882-1896) on pest outbreaks in Hungary. He also provided (1894) notes on scales collected from Russia. In 1896 he co-authored a book on the "Black locust scale" or European fruit lecanium, (*Parthenolecanium corni* Bouché) and its natural enemies in Hungary. Among the predators discussed was the beetle, *Anthribus nebulosus* Forst, which I introduced into North America in the late 1970s, and which has subsequently become established on spruce bud scales, especially in the northeastern states.

Among the descriptions of a number of new species of Hemiptera in 1897 he also synonymized one species of scale insects and proposed new names for two others. In 1900 Horváth published records on 55 scale insects from Hungary and in 1908 listed several scale insect genera in a discussion on the relationship between the Hemiptera-Homoptera fauna of Europe and North America.

**K. Sajó** (1851-1939) was a coworker of G. Horváth from 1880, but in 1895 he retired due to hearing problems. He published twice as many papers in retirement than before. Between 1896 and 1903 he prepared four papers on the San José scale and in 1896 discussed in detail the life history and morphology of the European fruit lecanium infesting black locust trees in Hungary. He is recognized as the first scientist in the world to have discussed, prior to 1896, the effect of climatic conditions on insects and the phenomenon of summer diapause. His observations were cited by B.P. Uvarov in 1931 in his book on "Insects and Climate", published in London. Sajó served as a good role model for many Hungarian entomologists, who after retirement from their profession, continued with entomological work as a hobby. Also, many Hungarians working in a number of professions, such as medical doctors, attorneys, engineers, teachers, priests and others, became amateur entomologists, who regularly contribute to the knowledge of Hungarian entomology and make up about 50% of the membership in the Hungarian Entomological Society.

**J. Jablonowski** (1863-1943) started his entomological career as assistant to Director G. Horváth at the National Phylloxera Research Station in Budapest in 1890. He became the director of the renamed institute: The Hungarian State Entomological Station in 1896, and served in that position until his retirement in 1928. His numerous books and research bulletins on the pests of sugar beets, hops, fruit trees and grapes, as well as on the scale insects of grapes and other cultivated plants in 1916 are still excellent references on the biology of many crop pests.

At the 4$^{th}$ International Congress of Entomology, in Ithaca, New York, in 1928, he discussed biological parallels between the European fruit lecanium and the European corn borer. In his talk, he emphasized the need for applied entomologists to master the classification and biology of the insects they study, as well as of cultivated plants, and to learn production methods of agricultural crops.

In addition, he provided detailed descriptions and life histories for the mealybug *Nipaecoccus nipae* (Maskell) in 1916 and in 1917 on the coccid *Eucalymnatus tesselatus* (Signoret). L.O. Howard in 1930, complimented him with such notes as: "To us in Washington he has always been one of the most helpful of the European workers", and maintained a personal friendship with Jablonowski.

**A. Jeszenszky** (1896-1988) initiated the first biological control initiatives in Hungary with the introduction of *Encarsia (Prospaltella) berlesei* (How.) against *Pseudaulacaspis pentagona* (Targ.) in 1926. He also published three articles on the San José scale (1931-1933).

**G. Szelényi** (1904-1982), served as Director of the Zoological Department in the Research Institute of Plant Protection during my tenure as a budding entomologist. He specialized on

proctotrupid wasps. Besides producing two bulletins on the control of scale insects (1943, 1951), he published a detailed study on the development and epidemiology of *Quadraspidiotus pyri* (Licht.) (1936), on the chalcidoid parasite of the San José scale (1934), and on other chalcidoid parasites of a number of scale species (1941).

Szelényi was also admired for some of his unconventional activities. For example, every morning he took a strenuous walk in the nearby hilly forests of Buda, where he enjoyed observing the food webs of insects and their interactions with plants. Such observations lead him to initiate studies on "Insect Population Dynamics in Agricultural Systems."

At the time of my indoctrination to scale insect studies he was the only entomologist nearby with an interest in this group. He found time from his busy work schedule to introduce me to the complicated process of mounting scales on microscope slides. In addition to his expertise in entomology and botany, he became an excellent linguist and learned several foreign languages. For our benefit, he translated Borchsenius' 1950 book on scale insects of the USSR from Russian. He also trained as a Lutheran pastor and even during the years of Communism, he quietly assisted his church with Sunday sermons.

**J. Erdös** (1900-1972), as a Roman Catholic priest, was isolated in the small village of Tompa in southern Hungary, but worked for decades in his free time, 8 to 12 hours daily, on chalcidoid wasp parasites including natural enemies of scale insects. His doctoral degree in entomology made his parishioners proud to have a scientist-priest with worldwide recognition and correspondence. He described many species and genera new to science in Latin. Erdös encouraged me to rear the chalcidoid parasites from my live scale insect samples, which was the reason for a fruitful collaboration that resulted in four publications between 1956 and 1959.

**My own work** on scale insects of Hungary started during my senior year in college, after some encouragement from G. Balás, head of the Department of Entomology at the College of Horticulture and Viticulture of the University of Agricultural Sciences in Budapest. He introduced me to collecting scale insect samples that soon resulted in the discovery of five new species to the Hungarian fauna in 1950. This event inspired me to select scale insects for a lifetime study. By 1959 I had prepared more than 1000 microscope slides from the 800+ samples collected, and published six papers on the Hungarian scale fauna. After my immigration to the United States I wrote four additional papers and two books on scale insects of Hungary and Central Europe, most co-authored with F. Kozár. More details on my work with scale insects of Hungary are provided in the 1997 and 1999 books, "Transylvanian Roots", therefore, are not repeated here.

Not too many people in the west realize the difficulties faced by scientists in Socialist and/or developing countries. Even if there were no page charges when publishing our papers, because of foreign currency shortages, we could not purchase books printed in the western countries. For my work on scale insects I badly needed the series of books published by Balachowsky and Ferris. But I could not obtain foreign currency allotments for such a purchase. With my motto, "Never give up!", I searched Budapest for people who had relatives in Paris and/or in the United States. I asked them to have their western relatives purchase the books and mail them as gifts to Budapest. Simultaneously, I placed book orders from my university with the state owned book dealership for the Ferris and Balachowsky volumes, assuring the shop that they would soon show up. The books arrived and were sold to the State Antiquariat, and to my University for Hungarian currency. This was just one example, of how we as scientists learned to survive the hardships that still exist in a

number of countries.

**F. Kozár** is now the most prolific scale worker, not only in Hungary but in Central Europe. I have worked with him on several major projects since 1975. In 1978 we co-authored a book on the scale insects of Hungary and in 1988 on the scale insects of Central Europe. He also co-authored a book in 1992 on the population dynamics of animals. His fourth book published in 1998 is the catalogue of the Palaearctic Coccoidea. Instead of citing his many papers, I will summarize some of his major projects. Among these was our collaboration in 1983 to organize the Fourth International Symposium on Scale Insect Studies in Budapest. Another time-consuming project dealt with an assessment of scale insects on fruit trees from East Central Europe to the Far East provinces of the former USSR. He also completed scale faunistic studies in national parks and nature reserves in Hungary and in more than thirty countries including most of Europe as well as Canada, South Africa and the United States.

In a number of papers he discussed the possibilities of integrated control against scale insects and the operational regularities of agro-ecosystems. During the past decade he reported on the effect of global warming on scale insects. He also organized a workshop on this topic at the last International Entomological Congress in Florence. Kozár is currently revising the family Ortheziidae and apparently will double the number of species in the family.

**G. Balás** collaborated with **G. Sáringer** in the book "Pests of Horticulture" (1982) in which 24 pages are devoted to 26 species of scale insects of economic importance for Hungarian horticulture. He published on three new scales for Hungary (1942), and was instrumental in introducing this author to scale insects.

**G. Ördögh** published numerous papers between 1976 and 1995 on scale insects of greenhouses and those infesting horticultural plants. She retired in 1996, but still writes for Hungarian journals. **G. Vinis** published six papers, half in collaboration with others between 1977 and 1981, but changed jobs and gave up her work on scales.

**L. Varjas** collaborated with F. Kozár in 1976 on a paper on juvenile hormone analysis of the San José scale. Similarly, **F. Szentkirályi** and F. Kozár, published on climatic variables affecting the swarming of male San José scales. A group of scientists at the Hungarian Plant Protection Research Institute lead by **B. Darvas** studied insect growth regulators in a number of scale insect species and published a series of articles between 1984 and 1997. B. Darvas and L. Varjas provided a comprehensive review in 1990 on growth regulators in scale insects.

**B. Nagy** and F. Kozár reported on a new scale species for the Hungarian fauna in 1948. Both **R.A. Viktorin** and **J. Walter (Drozdják)** were assistants to F. Kozár when collaborating with him on a number of papers on scale insects.

Various **scientists from outside of Hungary** contributed to our knowedge of the Hungarian scale insect fauna. **B. Zak-Ogaza** published some new records for the scale fauna of Hungary in 1966. **E. Danzig** collaborated with F. Kozár in publishing a number of papers between 1973 and 1976, based on the scale insect fauna of Hungary. **J. Koteja** and F. Kozár described a new species of scale from Hungary in 1979. **G.M. Konstantinova** collaborated with others between 1979 and 1987 and published on scales infesting orchard trees in the region that included Hungary. **D. Matile-Ferrero** and F. Kozár described two new species from Hungary in 1983.

In my 1955 article on additions to the Hungarian scale fauna, I listed 82 literature sources. Most of the early papers dealt with pest scale insects but for completeness a few are also listed here,

with their topics and the approximate years of their activities.

**M. Aczél** (1906-1958). Besides publishing new records for the Hungarian scale fauna (1930), most of his work (around 1938) dealt with scale parasitoids, *Leucopis* spp. (Diptera). **G. Bakó** (1871-1948) published on pest scale insects after 1931. **Fogarasi E. Urfiné** listed a few scale insects new to Hungary (1977). **J. Györffy**, (1882-1970), produced a series of papers between 1928 and 1942 on pest scales, but his specialization was Apioninae beetles. **J. Györfi** (1905-1965) included many records of scale insects in his publications and a book (1957) on forest pests and their natural enemies. **F. Homonnay** reported on his control experiments against San José scale crawlers in 1961. **L. Huzián** published on San José scale (1947, 1949, 1951). **Gy. Kadocsa** (1880-1962) treated scales of economic importance in about ten articles between 1921-1953. **K. Ratkovszky** published a series of papers from 1921 to1953 on the *Parthenolecanium corni* (Bouché) outbreaks and the Kermesidae complex on oaks in Hungary.

In addition to the above, other colleagues included records on Hungarian scales in monographs and species catalogs covering larger geographic areas, including Hungary. A number of non-coccidologists, including graduate students from foreign countries, authored or co-authored papers in Hungary dealing especially with scale insects of economic importance. Therefore, I would like to express my thanks to all coccidologists who contributed over a period of many years to our general knowledge of the scale insects in Hungary.

## RECENT LITERATURE

### Compiled by Karen Veilleux

**Aartrijk, J. van, Os, G. van, Bruggen, A.S. van, Ende, J.E. van den, Bastiaansen, K., Lans, A. van der, Koster, A.J., Pennock, I. & Duineveld, T.L.J.** 1999. [Plant protection research at the experimental research station for ornamental bulbs and cut flowers.] Gewasbeschermingsonderzoek op het Praktijkonderzoek bloembollen en bolbloemen (PBB). (In Dutch) *Gewasbescherming* 30: 2, 42-47.
Notes: Plant protection research at the experimental research stations for ornamental bulbs and cut flowers at Lisse and Sint Maartensbrug, Netherlands, is described, including fungal diseases (*Botrytis* spp., *Pythium* spp., *Rhizoctonia solani*, and *Fusarium oxysporum*), nematodes (*Pratylenchus penetrans, Aphelenchoides* spp., and *Ditylenchus* spp.), plant viruses, insect and mite pests (*Rhizoglyphus robini, Taeniothrips simplex [Thrips simplex], Phenacoccus* spp., *Aceria tulipae*, and *Lilioceris lilii*), bacterial diseases (*Xanthomonas hyacinthi, Erwinia carotovora, E. chrysanthemi*, and *Rhodococcus fascians*), and weeds.

**Abbas, M.S.T.** 1999. Studies on *Dicrodiplosis manihoti* Harris (Diptera, Cecidomyiidae), a common predator of mealybugs,. *Anzeiger für Schädlingskunde* 72(5): 133-134.
Notes: Biweekly samples of four species of mealybug infesting fruit and ornamentals in Salalh, Sultanate of Oman, revealed that *Dicrodiplosis manihoti* Harr. was found to associate with the *Phenacoccus manihoti*, the long-tailed mealybug, and *Nipaecoccus vastator*, citrus mealybug. The predator occurred almost all the year round and preyed on nymphs and adult females. Biological studies showed that the incubating period of the predator-egg averaged 2.8 days. The larval stage lasted 11.4 days and consumed an average of 5.6. adult females of the long-tailed mealybug. The pupal stage lasted 10.1 days. The total number of eggs deposited/female averaged 36 during her very short life span which averaged 2.3 days.

**Abd Rabou, S.** 1998a. Inundative releases of *Encarsia formosa* Gahan (Hymenoptera: Aphelinidae) for the control of *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae) on outdoor crops. *Acta Phytopathologica et Entomologica Hungarica* 33: 3-4, 389-394.
Notes: *E. formosa*, a parasitoid of the cotton whitefly, *B. tabaci*, was introduced from Italy and the UK and mass reared on *Trialeurodes vaporariorum*. Weekly inundative releases of *E. formosa* occurred between August and November, 1996, to control B. tabaci on cabbage, cucumber, cotton, sweet potato, yellow sage (*Lantana camara*), tomato, bean (*Phaseolus vulgaris*) and eggplant [aubergine] crops in 5 locations in Egypt. The rate of release was 5-8 adult females per plant. *E. formosa* established rapidly and spread over the release locations. The highest rate of parasitism (83%) was observed 11 weeks after release, on *L. camara* in Giza.

**Abdelkhalek, L., Afellah, M. & Smaili, C.** 1998. [Biology and biological control of *Planococcus citri* R. (Hom., Pseudococcidae) on citrus in the Loukos region of Morocco.] Bioecologie et lutte biologique contre *Planococcus citri* R. (Pseudococcidae) sur agrumes dans la region du Loukos au Maroc. (In French with summary in English.) *Mededelingen Faculteit Landbouwkundige en*

*Toegepaste Biologische Wetenschappen Universiteit Gent* 63: 2b, 483-488.
Notes: In the Loukos area in the north of Morocco, *Planococcus citri* is a major pest of citrus orchards. A two-year study was undertaken on Maroc Late citrus cultivar to study the bioecology of *P. citri*. It was found that *P. citri* has 6 to 8 overlapping generations annually. High population levels occurred during June-December. The predator *Cryptolaemus montrouzieri* and the parasitoid *Leptomastix dactylopii* were released for control of the pest.

**Abo, M.E. & Sy, A.A.** 1998. Rice virus diseases: Epidemiology and management strategies. *Journal of Sustainable Agriculture* 11(2-3): 113-134.
Notes: There are now over 30 viruses reported to infect rice through experimental tests and in nature. However, only 25 are of any direct economic impact to rice production. While most of them are transmitted by either plant or leaf hoppers, rice chlorotic streak virus (RCSV) is transmitted by the rice mealybug. The underlying causes and management strategies are discussed.

**Acheche, H., Fattouch, S., M'Hirsi, S., Marzouki, N. & Marrakchi, M.** 1999. Use of optimised PCR methods for the detection of GLRaV3: A closterovirus associated with grapevine leafroll in Tunisian grapevine plants. *Plant Molecular Biology Reporter* 17(1): 31-42.
Notes: A report of a modification and optimisation of a previously published procedure for the detection of GLRaV3 in infected grapevine plants. GLRaV3 RNA was successfully detected not only in total crude nucleic acid extracts of infected grapevine tissues but also in viruliferous mealybug extracts by IC-RT-PCR. This detection was rapid, sensitive and specific without occurrence of any background. A comparative ELISA, RT-PCR and IC-RT-PCR assays were carried out and revealed the greater sensitivity and specificity of PCR techniques. GLRaV3 is normally transmitted by *Planococcus ficus, P. citri, Pseudococcus longispinus, P. calceolariae, Ceroplastes rusci* and *Pulvinaria vitis*.

**Alvarez, J.M., Van Driesche, R. & Cornell, J.** 1999. Effect of *Encarsia* sp. nr. *diaspidicola* (Hymenoptera : Aphelinidae) parasitism on *Cybocephalus* sp. nr. *nipponicus* (Coleoptera : Cybocephalidae) egg laying choices. *Biological Control* 15(1): 57-63.
Notes: The beetle *Cybocephalus* sp. nr. *nipponicus* Endrody-Younga (Coleoptera: Cybocephalidae) and the wasp *Encarsia* sp. nr. *diaspidicola* (Silvestri) (Hymenoptera: Aphelinidae) were introduced from Korea and China into the United States as part of a biological co ntrol project of euonymus scale *Unaspis euonymi* (Comstock). The ability of *C.* sp. nr. *nipponicus* to discriminate between parasitized and unparasitized scales in choosing scales for oviposition is reported. Beetles avoided ovipositing in previously parasitized scales as soon as two days after parasitism. The effects of host age, density, and sex on parasitism levels by *E.* sp. nr. *diaspidicola* were also measured.

**Ambe, J.T., Ntonifor, N.N., Awah, E.T. & Yaninek, J.S.** 1999. The effect of planting dates on the incidence and population dynamics of the cassava root scale, *Stictococcus vayssierei*, in Cameroon. *International Journal of Pest Management* 45(2): 125-130.
Notes: A study on the influence of planting dates on the incidence of the cassava root scale, *Stictococcus vayssierei*, was conducted using an improved and a popular local cassava variety from each of two participating villages in the rain forest of Cameroon. Monthly planting of each variety

from April to October of 1995 and *S. vayssierei* sampling from one month after each planting until 12 months after planting was done. *S. vayssierei* attacked both cassava varieties in each village. The pest usually occurred in clusters or aggregations on the subterranean parts of the plants. The highest root scale densities were ca 75 and 51 individuals per plant during the long dry and rainy seasons, respectively. Generally, higher *S. vayssierei* densities were recorded during the dry season irrespective of the village. Planting in August-September predisposes the early bulking stages of the crop to high root scale pressures in the dry season which can have serious repercussions on cassava storage root yield. The onset of the main rainy season (April/May) was the most appropriate period for planting cassava to enable the more susceptible early growth stages of the crop to avoid the period of high root scale infestations. These results highlight the possibility of using cultural practices in managing *S. vayssierei*.

**Anitha, B., Arivalagan, M., Sundari, M.S.N. & Durairaj, G.** 1999. Effect of alkaloid abrine, isolated from *Abrus precatorius* Linn. seeds on mealy bug, *Maconellicoccus hirsutus* Green. *Indian Journal of Experimental Biology* 37: 4, 415-417.
Notes: Dose-dependent depletion of free and bound sugars in *M. hirsutus* was observed due to action of abrine, a major constituent of *A. precatorius* seeds. A significant reduction in protein content (53.57%) was also observed. However, lipid contents increased in the initial concentrations and with increased dosages the contents decreased. This increase in lipid content in the initial concentrations of 5 and 10 ppm may be an adaptation to overcome toxic stress. The observed reduction in free sugars, bound sugars and protein and also lipid in higher concentrations suggests that abrine could have a drastic effect on the population density of this insect.

**Annecke, D.P.** 1998. Soft brown scale: *Coccus hesperidum* L. Pages 125-128. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus Pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Historical review, host plants, economic importance, life history, habits and behaviour, seasonal history, biological control, control measures and integrated control.

**Annecke, D.P.** 1998a. Soft green scale: *Pulvinaria aethiopica* (De Lotto) (9=*Coccus aethiopicus* De Lotto). Pages 128-129. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus Pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Brief field description, distribution, natural enemies, chemical control.

**Arlian, L.G., Morgan, M.S. & Houck, M.A.** 1999. Allergenicity of the mite *Hemisarcoptes corremani*. *Annals of Allergy Asthma & Immunology* 83(6, pt.1): 529-532.
Notes: A researcher experienced allergic symptoms while working with the astigmatid mite *Hemisarcoptes cooremani* cultured on scale insects, a predator of scale insects that often parasitize perennial vascular plants in orchards, gardens, and ornamental nurseries worldwide. We investigated the possible allergenicity of *H. cooremnni* and the cross-reactivity between it and other allergy-causing astigmatid mites. SDS-PAGE and immunoblotting of proteins in an *H. cooremani* extract showed the reference serum contained IgE directed at 16-kD and 19-kD proteins. Results indicated

that an extract of the mite *H. cooremani* contained at least two prominent IgE binding proteins that were not present in the other astigmatid mites. Thus, *H. cooremani* is the source of unique allergenic proteins and allergy to this mite may develop in orchard and ornamental nursery workers and gardeners.

**Asplanato, G. & Garcia Mari, F.** 1998. [Distribution of California red scale *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae) in orange trees.] Distribución del piojo rojo de California *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae) en árboles de naranjo. (In Spanish with summary in English.) *Boletín de Sanidad Vegetal, Plagas* 24: 3, 637-646.
Notes: California Red Scale, *A. aurantii*, population density was studied in different parts of the tree canopy in a Navel orange [*Citrus sinensis*] orchard at Montevideo, Uruguay. Six trees were sampled in May 1997, and 4 strata were considered: wood, green branches, leaves and fruits. In each strata, the surface area was measured and *A. aurantii* population density and parasitism were estimated. The total surface area of a single tree was approximately 160 m2, leaves forming 75% of that area. Green branches formed 17% of the remaining surface, whereas wood and fruits formed only 6% and 3%, respectively. The greatest population density of *A. aurantii* per surface unit was found on fruits and leaves, followed by thin wood branches. The mean total number of live *A. aurantii* per tree was >400,000. Leaves harboured >85% of the *A. aurantii* population within a tree, fruits contained 9% and wood represented 2% of the total. *Aphytis chrysomphali* mainly parasitized *Aonidiella aurantii* located on fruits and leaves. The parasite *Encarsia perniciosi* was found in all strata, although preferentially on fruits and green branches. It was concluded that the main *A. aurantii* population reserve was found on the leaves. Lignified thin branches formed a secondary, and less abundant, population reserve.

**Bahlmann, C. & Lunderstadt, J.** 1998. [Faunal and silvicultural survey of a natural canopy gap in a mixed beech forest.] Faunistische und waldbauliche Momentaufnahme in einer naturlich entstandenen Bestandeslucke in einem Kalkbuchenwald. (In German with summary in English.) *Forstarchiv* 69: 4, 129-135.
Notes: In the southern Weser hills, Germany, a survey was carried out in a 135-year-old mixed beech (*Fagus sylvatica*) stand which originated from storm damage following beech scale [*Cryptococcus fagisuga*] infestation and successive pathogens. The survey aimed to evaluate the processes of biomass decomposition (decomposition of woody biomass) and of biomass accumulation (through natural regeneration) as related to space, time, and material. The state of a dead tree stem (of about 3.5 m height) was classified in sections by visual and mechanical means and related to colonizing fauna. The position, height and collar diameter of natural regeneration was recorded on 2-m wide strips arranged in N-S and E-W directions through the gap. A distinct mosaic structure was observed both for accumulation and for decomposition processes. Promoted by high relative humidity, the dead beech stem was in a progressive state of decomposition which was highly differentiated on a small scale. The stem was colonized by members of 10 animal orders, especially Coleoptera (35%), Isopoda (18%) and Oligochaeta (17%). Only slightly specialized forest soil decomposers had migrated into the stem. Forest natural regeneration was dominated by maple [*Acer* sp.] and ash [*Fraxinus* sp.]; only a small proportion was beech. On a small scale, a differentiated vertical and horizontal structure had been formed, light being the decisive stand factor. The results

showed clearly that seven years after the storm, natural stand regeneration was already in the logarithmic phase of growth, whilst decomposition of the beech stem was already slowing down. Both processes were interlinked - e.g., a cool humid microclimate, which had been generated by the shading of the natural regeneration, promoted the decomposition processes of the dead stem.

**Baldanza, F., Gaudio, L. & Viggiani, G.** 1999. Cytotaxonomic studies of *Encarsia* Förster (Hymenoptera : Aphelinidae). *Bulletin of Entomological Research* 89(3): 209-215.
Notes: A cytotaxonomic study was carried out on 13 species of *Encarsia* Förster, known to parasitize aleyrodids and diaspidids. Diaspid hosts include *Aonidia lauri, Aspidiotus nerii, Dynasidiotus britannicus, Leucaspis pusilla, Pseudaulacaspis pentagona* and *Pulvinaria mesembryanthemi.*

**Baskaran, R.K.M., Lakshmi, L.G. & Uthamasamy, S.** 1999. Comparative biology and predatory potential of Australian ladybird beetle (*Cryptolaemus montrouzieri*) on *Planococcus citri* and *Dactylopius tomentosus*. *Indian Journal of Agricultural Sciences* 69(8): 605-606.

**Bedford, E.C.G.** 1998. Family Diaspididae: Armoured scale insects: Red scale: *Aonidiella aurantii* (Maskell). Pages 132-144. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Historical review, distribution, host plants, economic importance, life history, seasonal history, dispersion and resident populations, biological control, natural enemies introduced for biological control, chemical control and integrated control.

**Bedford, E.C.G.** 1998a. Other scale insects of minor importance. Pages 158-160. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus Pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Brief reviews of *Icerya seychellarum, Saissetia oleae, S. somereni, Saissetia* spp., *Coccus celatus, Protopulvinaria pyriformis, Parlatoria ziziphi, Parlatoria pergandii, Aspidiotus nerii, Chrysomphalus pinnulifer, Chrysomphalus diversicolor* and *Ischnaspis longirostris.*

**Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A.** 1998. Citrus Pests in the Republic of South Africa 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Reviews literature on citrus pests, pioneers of citrus entomology, the citrus industry and citrus areas in South Africa, the pest status in different citrus areas, losses due to insect pests, pesticides and new approaches to pest control, emphasizing IPM. Extensive review of pest species includes Margarodidae (*Icerya purchasi*), Pseudococcidae (*Planococcus citri, Paracoccus burnerae, Nipaecoccus viridis, Pseudococcus longispinus, Ferrisia virgata*), Coccidae (*Cribrolecanium andersoni, Coccus hesperidum, Pulvinaria aethiopica, Ceroplastes (=Gascardia) brevicauda, C. (=G.) destructor*), Diaspididae (*Aonidiella aurantii, Chrysomphalus aonidum, Lepidosaphes beckii, L. gloverii*), and minor pests (*Icerya seychellarum, Saissetia oleae, Saissetia somereni, Coccus celatus, Protopulvinaria pyriformis, Parlatoria ziziphi, Parlatoria pergandii, Aspidiotus nerii, Chrysomphalus diversicolor, C. pinnulifer, Ischnaspis longirostris*).

**Bellotti, A.C., Smith, L. & Lapointe, S.L.** 1999. Recent advances in cassava pest management. *Annual Review of Entomology* 44: 343-370.
Notes: Cassava (*Manihot esculenta*) occupies a uniquely important position as a food security crop for smallholder farmers in areas of the tropics where climate, soils, or societal stresses constrain production. Given its reliability and productivity, cassava is the most important locally produced food in a third of the world's low-income, food-deficit countries. It is the fourth most important source of carbohydrates for human consumption in the tropics, after rice, sugar, and maize. World production of cassava from 1994-1996 averaged 166 million tons/year grown on 16.6 million hectares (ha), for an average yield of 9.9 tons/ha. Approximately 57% is used for human consumption, 32% for animal feed and industrial purposes, and 11% is waste. Africa accounts for 51.3% of the production; Asia, 29.4%; and Latin America, 19.3%. The area planted to cassava in Africa, Asia, and Latin America is 10.3, 3.7, and 2.6 million ha, respectively. Mealybugs discussed, among other pests.

**Ben-Dov, Y.** 1999. A note on *Ferrisicoccus* Ezzat & McConnell (Hem., Coccoidea, Pseudococcidae). *Bulletin de la Société Entomologique de France* 104(4): 380.
Notes: *Ferrisicoccus cameronensis* and *F. celmisicola* are moved to *Dysmicoccus*.

**Ben-Dov, Y. & Matile-Ferrero, D.** 1999. Nomenclature of the oleander scale (Hemiptera, Coccoidea, Diaspididae). (In English with summary in French.) *Revue Française d'Entomologie* 21(1): 5-8.
Notes: Discussion of the nomenclatural inconsistency of *Aspidiotus hederae* as a result of the formation of nomenclatural artifacts involving the binomens *A. hederae, Chermes hederae, A capparis* and *A. osmanthi*.

**Bento, J.M.S., de Moraes, G.J., C. Bellotti, A., Castillo, J.A., Warumby, J.F. & Lapointe, S.L.** 1999. Introduction of parasitoids for the control of the cassava mealybug *Phenacoccus herreni* (Hemiptera: Pseudococcidae) in northeastern Brazil. *Bulletin of Entomological Research* 89(5): 403-410.
Notes: The mealybug *Phenacoccus herreni* Cox & Williams causes considerable damage to cassava *Manihot esculenta* Crantz. Field surveys conducted between 1988 and 1994 indicated the mealybug was present in 57 municipalities in six States in north-eastern Brazil, in some places reaching high levels of infestation. Several native natural enemy species were found associated with the pest in Brazil. Exotic encyrtid parasitoids were imported and released in fields in the States of Bahia and Pernambuco. *Apoanagyrus diversicornis* (Howard) was introduced from Colombia, and *Acerophagus coccois* Smith, and *Aenasius vexans* (Kerrich) were introduced from Venezuela. By the end of 1996, a total of 35,930 parasitoids had been released. In Bahia, *Apoanagyrus diversicornis* was recovered 130, 234, 304 and 550 km from its release site after 6, 14, 21 and 33 months, respectively. *Acerophagus coccois* was recovered at 80 km from its release site nine months after release. *Aenasius vexans*, however, did not disperse at all despite being consistently recovered at its release site. In Pernambuco, 9010 parasitoids were released from October, 1995 onwards. *Acerophagus coccois* and *Aenasius vexans* were recovered up to 40 km from the release sites after three and five months of their initial releases, respectively. The establishment and dispersal of these

parasitoids are discussed.

**Berdysh, Y.I., Zhidovkin, A.M. & Shishkov, S.N.** 1998. [Preparation No. 30 makes a comeback.]. (In Russian.) *Zashchita i Karantin Rastenii* No. 6, 29.
Notes: Preparation No. 30, a mineral oil, was shown to be effective against the California scale [*Quadraspidiotus perniciosus*], a dangerous quarantine pest, on apple in the northern Caucasus, Russia, in experiments carried out from 1993. The preparation has been used in orchards in the region for more than 35 years.

**Berlinger, M.J., Segre, L., Podoler, H. & Taylor, R.A.J.** 1999. Distribution and abundance of the oleander scale (Homoptera : Diaspididae) on jojoba. *Journal of Economic Entomology* 92(5): 1113-1119.
Notes: The oleander scale, *Aspidiotus nerii*, is a polyphagous, cosmopolitan species almost always present on jojoba, *Simmondsia chinensis*, in its native Sonora desert and on plants introduced to Israel's Negev desert. Monthly samples of oleander scale taken at an experimental field at Omer, in the northern Negev, showed that the overall population of the scale has two prominent peaks; one in spring and the other in autumn. There was a marked reduction of the population in the period May-August when jojoba fruits ripen. Data on the abundance of immature stages suggested three generations annually. Comparison of scale densities on male and female jojoba plants showed no difference in overall density. However, the sex ratio of 2nd instars heavily favored females on male plants. This difference was significant in 8 of 13 mo, as was a weighted average over the whole period. The distribution of male and female 2nd instars on the upper and lower side of leaves differed significantly in 7 of 12 mo, although not when the whole year was considered. Analysis of the spatial distribution of scales by Taylor's power law showed that the scale distribution is highly aggregated on jojoba. On irrigated and fertilized plants the scale density was very high, whereas on untreated plants the scale was almost absent, suggesting that cultivation is responsible for the large oleander scale populations on jojoba. Despite its high density on jojoba, oleander scale has not emerged as an economic pest in either Israel or the United States. A conjecture is offered to explain this.

**Bernal, J.S., Luck, R.F. & Morse, J.G.** 1998. Sex ratios in field populations of two parasitoids (Hymenoptera: Chalcidoidea) of *Coccus hesperidum* L. (Homoptera: Coccidae). *Oecologia* 116: 510-518.
Notes: Several assumptions and predictions of host-quality-dependent sex allocation theory were studied with data obtained for the parasitoid *Metaphycus stanleyi* on its host, brown soft scale (*Coccus hesperidum*) in a California citrus grove and in the laboratory. Scales ceased growing after parasitization by *M. stanleyi*. Thus, parasitoid fitness gains with host size and adult size were similar in males compared to females. Females consistently emerged from larger hosts than males. Mean host sizes of females versus males, and of solitary versus gregarious parasitoids, varied with the available host size distribution. Only females emerged from hosts in the upper size range, and a variable ratio of males and females emerged from hosts in the lower size range. It was concluded that the sex ratio of field populations of *M. stanleyi* is driven largely by the available size distribution of *C. hesperidum*. In addition, predictions resulting from theoretical analyses of sex allocation in

autoparasitoids were tested with data obtained on *Coccophagus semicircularis* parasitizing brown soft scale in the field. The sex ratio of *C. semicircularis* was consistently and strongly female biased (ca. 90% females). Based on available theoretical analyses, it is suggested that this sex ratio pattern may have resulted from a very low encounter rate of secondary hosts coupled with a strong time limitation in *C. semicircularis* females. This explanation was the most plausible, given constraints stemming from the detection of secondary hosts, their variable location within primary hosts, and their handling times. Finally, the size of hosts which yielded single versus multiple parasitoids, and the sizes of these parasitoids, were compared. These comparisons suggested that: (1) *M. stanleyi* females gauge host sizes precisely, and in terms of female offspring; thus a fitness penalty is not incurred by females which share a host, while males benefit from sharing a host, and; 2) instances where multiple *C. semicircularis* emerged from a single host were probably the result of parasitism by different females, or during different encounters by a single female.

**Bernal, J.S., Luck, R.F. & Morse, J.G.** 1999. Host influences on sex ratio, longevity, and egg load of two *Metaphycus* species parasitic on soft scales: implications for insectary rearing. *Entomologia Experimentalis et Applicata* 92(2): 191-204.
Notes: *Metaphycus flavus* and *M. stanleyi* (Hymenoptera: Encyrtidae) are currently being screened for use as augmentative biological control agents of citrus-infesting soft scales (Homoptera: Coccidae). Two factors were investigated, host quality-dependent sex allocation and local mate competition, which likely influence these parasitoid's sex allocation strategies and are therefore of interest for their mass-rearing. The results of these studies suggested that, under the mass-rearing protocol that is envisioned for these parasitoids, offspring sex ratios in both *M. flavus* and *M. stanleyi* are dominated by host quality (= size) influences, but not by interactions with other females. These results indicated that host size strongly influences offspring sex ratios and brood sizes; larger hosts led to more female offspring and larger broods. In contrast, increasing the number of parental females did not lead to fewer female offspring as expected under local mate competition. Additionally, within-brood sex ratios did not vary with brood size; this result is inconsistent with expected sex ratios due to local mate competition. Other results also indicated that host quality was a dominant influence on *M. flavus*' and *M. stanleyi*'s sex ratios. Larger hosts led to a larger size in the emerging wasps, and larger wasps had greater egg loads and lived longer than smaller wasps. However, wasp longevity, and the influence of wasp size on longevity were mediated by a wasp's diet. *Metaphycus flavus* females lived the longest when they had access to hosts, honey, and water, followed by honey and water, and shortest when they had access to water alone; *M. stanleyi* females lived longest with honey and water, followed by hosts, honey, and water, and shortest with water alone. Greater wasp size led to greater longevity in females only when they had access to food (honey, or hosts and honey). Finally, other results suggested that both *M. flavus* and *M. stanleyi* are facultatively gregarious. Wasp size did not decrease with brood size as expected under superparasitism. Overall, the results of these studies suggested that holding newly emerged females of both *M. flavus* and *M. stanleyi* for several days in the presence of an appropriate food source before field release could enhance a female's performance as an augmentative biological control agent. It increases their initial life expectancy following release, and maximizes the females' egg load (both *Metaphycus* species) and resources for replacing oviposited eggs (*M. flavus* only).

**Bernal, J.S., Luck, R.F. & Morse, J.G.** 1999a. Augmentative release trials with *Metaphycus* spp. (Hymenoptera: Encyrtidae) against citricola scale (Homoptera : Coccidae) in California's San Joaquin Valley. *Journal of Economic Entomology* 92(5): 1099-1107.
Notes: In recent years, citricola scale, *Coccus pseudomagnoliarum* (Homoptera: Coccidae), has re-emerged as an important pest of citrus in California's San Joaquin Valley. This research seeks a biological control solution to citricola scale's pest status as part of an evolving, ecologically based integrated pest management (IPM) program for citrus. Augmentative release trials against citricola scale involving four species of *Metaphycus* - *M. flavus, M. helvolus, M. luteolus*, and *M. stanleyi* are reported. The parasitoids are released against sleeve-caged citricola scales in a San Joaquin Valley citrus grove. Releases were made on three dates (hereinafter "early," "intermediate," and "late" release dates), each date representing scales of different size, all between 1 and 1.5 mm in length. Two to four of the parasitoid species were released on any of the dates. Relative to a control (no parasitoid release), the *M. flavus* treatments (two densities were released) provided the greatest degree of reduction in scale numbers in the early release (from >3,600 to <5 per cage), while *M. helvolus* had an intermediate effect. In the intermediate release, *M. flavus* again provided the greatest reduction in scale numbers (from 2,000 to 6 per cage), followed by *M. luteolus*, whereas *M. stanleyi* did not differ from the control. In the late release, all parasitoid treatments (*M. flavus, M. helvolus, M. luteolus* and *M. stanleyi*) provided similar degrees of reduction in scale numbers (from approximate to >1,150 to approximate to >6 per cage) relative to the control. The relevance of citricola scale's size at the time of parasitoid release to the results obtained with each of the parasitoid treatments on each of the release dates is discussed. In addition, we discuss the perceived impact of hyperparasitism by a facultative autoparasitoid, *Coccophagus lycimnia*, on our results. It is concluded that citricola scale's size at the time of release is particularly important for deciding which parasitoid(s) to release, and that *M. flavus* and *M. luteolus* are the most promising parasitoids, among those currently available to us, for further research toward developing augmentative biological control tactics against citricola scale.

**Beuning, L.L., Murphy, P., Wu, E., Batchelor, T.A. & Morris, B.A.M.** 1999. Molecular-based approach to the differentiation of mealybug (Hemiptera: Pseudococcidae) species. *Journal of Economic Entomology* 92(2): 463-472.
Notes: The rDNA internal transcribed spacer (ITS) region of 4 mealybug species, *Pseudococcus viburni, P. longispinus, P. calceolariae* and *P. similans*, was isolated by polymerase chain reaction (PCR) amplification, cloned, and sequenced. In this region of the genome there were numerous differences; including nucleotide substitutions, insertions, or deletions between *P. viburni, P. longispinus* and *P. calceolariae* whereas *P. calceolariae* and *P. similans* were very similar. Based on sequence differences between the ITS regions, PCR primers are designed to be able to differentiate the four mealybug species and that correlated with morphological differences found between adult females of these species. The PCR amplification by using the species-specific primers enabled the differentiation of not only adult females but also eggs, juveniles, and adult males, which was not previously possible by using conventional identification methods.

**Blank, R.H., Gill, G.S.C. & Dow, B.W.** 1999. Armoured scale (Hemiptera : Diaspididae) distribution in kiwifruit blocks with reference to shelter. *New Zealand Journal of Crop and*

*Horticultural Science* 27(1): 1-12.
Notes: Armoured scale insect (*Hemiberlesia rapax; H. lataniae; Aspidiotus nerii* Hemiptera: Diaspididae) leaf infestations were monitored from rows of kiwifruit (*Actinidia deliciosa* (A.Chev.) C.F. Liang et A.R. Ferguson var. deliciosa) vines in three blocks at each of 11 sites, at 3-8 times from December until May. The relationship of scale leaf infestation with distance across kiwifruit blocks (scale distribution) was analysed using different regression models. Scale distributions were best described using linear models for 26 kiwifruit blocks and for seven blocks using quadratic models. Scale distributions derived using live scale followed similar patterns to those derived from total scale. Overall 53% of sites or blocks had significant linear or quadratic scale distributions. Kiwifruit blocks with high scale infestations invariably had significant scale distributions whereas those with low infestations had non-significant distributions. The finding of significant relationships using regression models with parallel lines or curves for different sampling times at some sites, showed scale distributions hold throughout the season. In the simplest situation scale infestations were highest in kiwifruit rows adjacent to alternative host plants and declined linearly away from the scale source. These findings were consistent with the hypothesis that scale distributions were caused by the aerial dispersal of crawlers from alternative host plants.

**Blumberg, D., Ben-Dov, Y., Gross, S., Drishpoun, Y. & Mendel, Z.** 1999. Outbreaks and biological control of the citriculus mealybug *Pseudococcus cryptus* Hempel in Israel in the past and present revaluation [reevaluation?] and current situation. (In Hebrew with summary in English.) *Alon Hanotea* 53(4): 155-160.
Notes: *P. cryptus* was first discovered in Israel in 1937 and very rapidly became a serious pest of citrus. Since the early '40s the population has sharply decreased, probably as a result of the introduction of the parasitoid *Clausenia purpurea*. Newly developed citrus varieties are most susceptible to *P. cryptus* outbreaks.

**Bongiorni, S., Cintio, O. & Prantera, G.** 1999. The relationship between DNA methylation and chromosome imprinting in the coccid *Planococcus citri*. *Genetics* 151: 4, 1471-1478.
Notes: The phenomenon of chromosome, or genomic, imprinting indicates the relevance of parental origin in determining functional differences between alleles, homologous chromosomes, or haploid sets. In mealybug males (Homoptera, Coccoidea), the haploid set of paternal origin undergoes heterochromatization at midcleavage and remains so in most of the tissues. This different behaviour of the two haploid sets, which depends on their parental origin, represents one of the most striking examples of chromosome imprinting. In mammals, DNA methylation has been postulated as a possible molecular mechanism to differentially imprint DNA sequences during spermatogenesis or oogenesis. The role of DNA methylation in the imprinting of whole haploid sets as it occurs in coccids is examined. The DNA methylation patterns at both the molecular and chromosomal level in *P. citri* were studied. In both males and females the paternally derived haploid set is hypomethylated with respect to the maternally derived one. Therefore, in males, it is the paternally derived hypomethylated haploid set that is heterochromatized. The data suggested that the two haploid sets are imprinted by parent-of-origin-specific DNA methylation with no correlation with the known gene-silencing properties of this base modification.

**Boyer, F.D. & Ducrot, P.H.** 1999. Total synthesis of the enantiomers of *Aspidiotus nerii* sex pheromone. *Comptes Rendus de l'Academie des Sciences Serie II Fascicule C-Chimie* 2(1): 29-33.
Notes: The synthesis of all possible isomers of the female sex pheromone of *Aspidiotus nerii* is described using as key step an intramolecular ester enolate alkylation reaction for the formation of the cyclobutane ring with a good control of the relative configurations of the asymmetric centers. The configurations of the stereogenic centers of the natural pheromone are determined by comparison of the biological activities of the synthetic compounds with the natural pheromone.

**Boyer, F.D. & Ducrot, P.H.** 1999a. Syntheses of cyclobutane derivatives: Total synthesis of (+) and (-) enantiomers of the oleander scale *Aspidiotus nerii* sex pheromone. *European Journal of Organic Chemistry* (5): 1201-1211.
Notes: Synthesis of both enantiomers of the *Aspidiotus nerii* sex pheromone and their diastereomers has been achieved using, as a key step, an intramolecular ester enolate alkylation reaction for the formation of the cyclobutane ring with a good control of the relative configurations of the asymmetric centers. Stereoselective synthesis of a number of other trisubstituted cyclobutane derivatives also proves the versatility of the methodology used for the synthesis of the *Aspidiotus nerii* sex pheromone.

**Briddon, R.W., Phillips, S., Brunt, A. & Hull, R.** 1999. Analysis of the sequence of *Dioscorea alata* bacilliform virus; Comparison to other members of the badnavirus group. *Virus Genes* 18(3): 277-283.
Notes: The complete nucleotide sequence of the genome of *Dioscorea alata* bacilliform virus (DaBV) has been determined from cloned fragments. Features of the genome confirm DaBV to be a pararetrovirus of the genus *Badnavirus* which is more similar to other mealybug transmitted badnaviruses, in particular cacao swollen shoot virus. Sequence variability between cloned fragments suggests that the genetic variability of the virus may be quite high (up to 11% nucleotide sequence variation for some small regions of the genome) although the overall variability detected was 4.2% at the nucleotide level.

**Brink, T.** 1998. White powder scale: *Cribrolecanium andersoni* (Newstead). Pages 121-124. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus Pests in the Republic of South Africa 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Historical review, distribution, host plants, economic importance, life history, seasonal history, natural enemies, chemical and integrated control.

**Bruwer, I.J.** 1998. Long mussel scale: *Lepidosaphes gloverii* (Packard). Pages 153-157. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus Pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Historical review, distribution, host plants, economic importance, life history, seasonal history, natural enemies and biological control, control measures and future research.

**Buglia, G., Predazzi, V. & Ferraro, M.** 1999. Cytosine methylation is not involved in the heterochromatization of the paternal genome of mealybug *Planococcus citri*. *Chromosome research*

7(1): 71-73.
Notes: The characteristics which allow *P. citri* to be studied easily as a model system for the phenomena of heterochromatization and genomic imprinting are identified. The possible presence of cytosine methylation is investigated, both at DNA and chromosome levels.

**Burban, C., Petit, R.J., Carcreff, E. & Jactel, H.** 1999. Rangewide variation of the maritime pine bast scale *Matsucoccus feytaudi* Duc. (Homoptera : Matsucoccidae) in relation to the genetic structure of its host. *Molecular Ecology* 8(10): 1593-1602.
Notes: The bast scale *Matsucoccus feytaudi* is a specific pest of maritime pine, but the damage inflicted by the insect on the host trees is variable, ranging from no apparent effect to severe decline of the maritime pine stands. Rangewide variation of mitochondrial DNA among *M. feytaudi* populations was analysed by polymerase chain reaction-restriction fragment length-single-strand conformation polymorphism (PCR-RFLP-SSCP) analysis and the results compared with the genetic information already available for its host. Three main nonoverlapping lineages can be distinguished in *M. feytaudi*. The phylogeography of the pest population is clearly related to the history of its host. Most local associations could result from common evolution while others must be interpreted as intraspecific host shifts. Because the distribution of cultivated tree species is greatly influenced by humans, much may be learned concerning their genetic structure from the indirect study of their specific pests.

**Cabaleiro, C., Segura, A. & Garcia-Berrios, J.J.** 1999. Effects of grapevine leafroll-associated virus 3 on the physiology and must of *Vitis vinifera* L. cv. Albarino following contamination in the field. *American Journal of Enology and Viticulture* 50(1): 40-44.
Notes: An experimental vineyard that was healthy when planted, but in which a number of GLRaV-3 infected plants were detected two years after grafting, was studied during its first three productive years. The sugar content of the must of GLRaV-3 infected plants was an average 1 degrees Brix lower than that of healthy plants, their titratable acidity was higher and their pH lower, especially in years with adverse weather conditions. Although the development of the vines during the first productive years was not affected by the virus, the lower net photosynthesis in leaves with symptoms of leaf roll may affect the yield of the vines in the long term. Virus transmitted by *Planococcus citri*.

**Caltigirone, L.E.** 1999. Adaptations of insects to modes of life. Pages 201-230. *in* Huffaker, C.R. & Gutierrez, A.P., Eds., Ecological Entomology. 2nd ed. New York: John Wiley & Sons. 756 pp.
Notes: *Aonidiella aurantii* given as an example of scramble competition. *Icerya purchasi* is mentioned as an example of an adaptation in reproduction in which both eggs and sperm are produced in the same individual (hermaphrodite) in which fertilization takes place. The occasional male (as a result of an unfertilized egg) is capable of copulating with hermaphrodites, but hermaphrodites are incapable of fertilizing one another. Another adaptation mentioned is the parasitization of *Coccophagoides utilis*, an endoparasite of the olive scale, *Parlatoria oleae*, in which mated females search for scales into which they lay fertilized eggs that develop into females.

**Camporese, P. & Pellizzari-Scaltriti, G.** 1998. [Observations on the biology of *Ceroplastes japonicus* in the urban environment.] Osservazioni sul ciclo biologico di *Ceroplastes japonicus* in

ambiente urbano. (In Italian with summary in English.) *Informatore Fitopatologia* 48: 11, 42-50.
Notes: Notes are given on the geographic distribution, biology, food plants and natural enemies of *C. japonicus* in its native area (China, Korea and Japan) and in Italy. The biology and phenology of *C. japonicus* was studied on different host plants at a road junction in Padova, Italy, in 1990-91. The coccid was found on the following tree species: *Acer saccharinum, A. pseudoplatanus, Liquidambar styraciflua, Salix babylonica, Ilex aquifolium, Hedera helix* var. Gloire de Marengo and *Ulmus minor*. The results showed that the host plant has little influence on the phenology of *C. japonicus* but can affect the fecundity of the females and the migration from the leaves to twigs. The pest had one generation a year, overwintering in the adult female stage. Preliminary trials on the biological control of *C. japonicus* using the coccinellid *Chilocorus kuwanae* were conducted in 1994. In cages, the coccinellid successfully controlled the coccid on *Euonymus japonicus*, which is only lightly infested by the pest in Italy. However, on laurel (*Laurus nobilis*), which is among the most frequently and heavily infested tree species, control was unsuccessful because the host plant was repellent to the predator.

**Canovai, R. & Raspi, A.** 1999. [First occurrence of *Rhyzobius forestieri*, an active predator of the coccid *Ceroplastes japonicus* in Tuscany.] Primo ritrovamento in Toscana di *Rhyzobius forestieri*, attivo predatore del coccide *Ceroplastes japonicus*. (In Italian with summary in English.) *Informatore Fitopatologia* 49: 1-2, 41-43.
Notes: During research to identify natural enemies of *Ceroplastes japonicus*, recently introduced, accidentally, into Central-Northern Italy, the coccinellid *Rhyzobius forestieri* was sighted within the urban area of Pisa. In July 1997 larvae and adults of this coccinellid (of Australian origin) were observed on laurel [?*Laurus* sp.] hedges feeding on *C. japonicus*. In 1981, Pope indicated that *R. ventralis*, widely used in biological control, actually consisted of two distinct species, *R. ventralis* and *R. forestieri* . *R. ventralis* was introduced into Italy (Campania and Sicily) over 80 years ago by Silvestri (1908) and Martelli (1913), but no other sightings have been reported since that time. The sighting of *R. forestieri* in Tuscany is of considerable importance, not only because this is a spontaneous presence rather than the result of its introduction, but also because this coccinellid was found as part of an abundant population preying on a coccid of exotic origin.

**Cesnik, R. & Bettiol, W.** 1998. [Phytopathogenic potential of *Colletotrichum gloeosporioides*, the biocontrol agent of *Orthezia praelonga* (Homoptera, Ortheziidae).] Potencial fitopatogenico de *Colletotrichum gloeosporioides*, agente de controle biologico de *Orthezia praelonga*. (In Portuguese with summary in English.) *Laranja* 19: 2, 261-268.
Notes: Strains of *Colletotrichum gloeosporioides [Glomerella cingulata]* isolated from *Orthezia praelonga* and from plant hosts showed pathogenicity when inoculated on injured fruits (banana, loquat fruit, avocado, snap bean [*Phaseolus vulgaris*], and pepper [*Capsicum annuum*]). Two effective *Orthezia* controlling isolates (CTAA1 and CTAA2) did not cause lesions on orange fruits (cv. Pera and Valencia) even after inoculation on injured orange peel, whereas isolates from orange flowers showing symptoms of post bloom fruit drop caused lesions as large as 4.0 cm diameter and, in some cases, complete rotting of the fruit. All *G. cingulata* isolates were pathogenic toward acid lime, orange, and tangerine (cv. Cravo and Ponkan). No rotting was observed on uninjured citrus fruits immersed in suspensions of conidia of any *G. cingulata* isolates.

**Chai, X.M.** 1998. [Is it *Matsucoccus matsumurae* (Kuwana) or *Matsucoccus liaoningensis*?]. (In Chinese with summary in English.) *Journal of Zhejiang Forestry Science and Technology* 18: 5, 80-82.
Notes: [Matsucoccus sp., widely distributed in China and Japan, should be *Matsucoccus matsumurae* (Kuwana).

**Chandrababu, A., Gautam, R.D. & Garg, A.K.** 1999. Biology of ladybird beetle, *Brumoides suturalis* (Fabricius) on aphid and mealybugs. *Annals of Plant Protection Sciences* 7: 1, 13-18.
Notes: The biology of the predatory coccinellid Brumoides suturalis was studied using *Ferrisia virgata, Planococcus pacificus [P. minor], Maconellicoccus hirsutus* and *Aphis craccivora* as prey, at 25±2°C and RH 65±5% RH. The duration of the pre-copulation stage, mating, pre-oviposition stage, oviposition, post-oviposition stage, and male and female life span, was 1-3 days, 52-76 minutes, 3-5.6 days, 25-35 days, 2-4.5 days, 32-37.5 days and 38-43 days, respectively. Fecundity was 494-627 eggs/female while the average oviposition rate was 15-21 eggs/day per female. The relative size of eggs, larvae, pupae and adults is given.

**Charles, J.G., Allan, D.J., Wearing, C.H., Burnip, G.M. & Shaw, P.W.** 1998. Releases of *Hemisarcoptes coccophagus* Meyer (Acari: Hemisarcoptidae), a predator of armoured scale insects, in the South Island. *New Zealand Entomologist* 21: 93-98.
Notes: *H. coccophagus* was released into apple [*Malus pumila*], pear [*Pyrus* sp.] and plum [*Prunus* sp.] trees infested with *Quadraspidiotus perniciosus [Diaspidiotus perniciosus], Q. ostreaeformis [D. ostreaeformis]* and/or *Lepidosaphes ulmi* in Nelson, Mid-Canterbury and Central Otago (New Zealand) between 1991 and 1997. *H. coccophagus* were recovered from only one property in Nelson (on *Q. perniciosus* on pear) up to 12 months after the initial release, but were not recovered 6 years later. *H. coccophagus* developed successfully on *Q. perniciosus* under laboratory conditions. Possible reasons for the apparent failure of *H. coccophagus* to establish are discussed.

**Chen, D.L.** 1998. [Study on bionomics of four ladybird beetles preying on *Aulacaspis rosarum*.]. (In Chinese with summary in English.) *Wuyi Science Journal* 14: 106-111.
Notes: *Chilocorus kuwanae, Chilocorus hupehanus, Chilocorus circumdatus* and *Telsimia nigra centralis* are all natural enemies of *Aulacaspis rosarum*, preying on the pest although they differ in morphology and other biological characteristics. On the basis of average consumption rate, *C. circumdatus* ranks first, *C. hupehanus* second and *C. kuwanae* third.

**Chen, Y., Chen, X.M., Wang, Z.L., Ye, S.D., Wang, S.Y. & Mao, Y.F.** 1998. [Studies on secreting wax of Chinese white wax scale. II. The comparison of secreting wax on different host plants.]. (In Chinese with summary in English.) *Forest Research* 11: 3, 285-288.
Notes: Wax secretion by *Ericerus pela* was studied on *Ligustrum lucidum, Fraxinus chinensis* and *L. quiboni* in the Kunming area, China. The average amount of wax secreted by males and females differed on different hosts, but the wax secreting period was not affected by host. On the basis of the amount of wax secreted by males and females and the secreting wax period, *L. lucidum* was the best host for *E. pela* in the Kunming area.

**Chen, X.M., Chen, Y., Zhou, C.H., Wang, Z.L. Ye, S.D. & Wang, S.Y.** 1998. Studies on wax secretion of Chinese white wax scale (*Ericerus pela* Chavannes). I: The comparison of wax secretion of different geographic varieties. (In Chinese with summary in English.) *Forest Research* 11: 34-38.
Notes: Wax secretion from *E. pela* from 3 different regions in China was compared. The differences in secretion levels between the 3 groups were related to the activities of esterase and peroxidase levels.

**Chiavarino, A.M., Rosato, M., Rosi, P., Poggio, L. & Naranjo, C.A.** 1998. Meiotic localization of the genes controlling B chromosome transmission rate in maize (*Zea mays* ssp. *mays*, Poaceae). *American Journal of Botany* 85(11): 1581-1585.
Notes: In previous papers we found that the frequency of B chromosomes in native races of maize varies considerably in different populations. Moreover, we found genotypes that control high and low transmission rates (TR) of B chromosomes in the Pisingallo race. In the present work crosses were made to determine whether the genes controlling B-TR are located on the normal chromosome set (As) or on the B chromosomes (Bs). We made female f.0B X male m.2B crosses between and within high (H) and low (L) B-TR groups. The Bs were transmitted on the male side in all cases. The mean B-TR from the progeny of f.0B (H) X m.2B (H) and f.0B (H) X m.2B (L) crosses was significantly higher than that from f.0B (L) X m.2B (L) and f.0B (L) X m.2B (H) crosses. The results show that the B-TR of the crosses corresponds to the H or L B-TR of the 0B female parents irrespective of the Bs of the male parent. This indicates that B-TR is genetically controlled by the 0B female parent and that these genes are located on the A chromosomes. *Pseudococcus affinis* mentioned as an example of a species demonstrated in previous research to have genetic control of transmission rate.

**Choi, K.S., Lee, S.G., Shin, S.C., Park, J.D. & Lee, S.M.** 1998. [Within-tree distribution of the black pine bast scale, *Matsucoccus thunbergianae*, intermediate nymphs on 10-15 year old Japanese black pines.]. (In Korean with summary in English.) *Journal of Forest Science* No. 57, 146-150.
Notes: The spatial distribution of *Matsucoccus thunbergianae* intermediate nymphs on the Japanese black pine (*Pinus thunbergii*) was studied at two locations in the southern coastal province of the Korea Republic. Using one tree as a sample unit, Taylor's power law analysis indicated that *M. thunbergianae* intermediate nymphs were distributed in clumped spatial patterns on the stem;, with 78.8-80.7% of all nymphs distributed on the stem, and 19.3-21.2% on the branches in late February. The lower (56.8-57.4%) part of the stem had significantly more intermediate nymphs than the upper part (14.6-14.7%) and the twigs (27.9-28.5%).

**Cilliers, C.J.** 1998. Wax scales on citrus. Pages 129-131. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: *Ceroplastes (=Gascardia) brevicauda* and *C. (=G.) destructor* reviewed. Distributions and host plants, life histories, seasonal histories, biological control by indigenous natural enemies.

**Cilliers, C.J.** 1998a. Circular purple scale: *Chrysomphalus aonidum* (L.) (=Chrysomphalus ficus Ashmead). Pages 145-149. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus

Pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Distribution, host plants, economic importance, life history, seasonal history, biological chemical and integrated control.

**Cooper, D.D. & Cranshaw, W.S.** 1999. The natural enemy complex associated with pine needle scale, Chionaspis pinifoliae (Fitch) (Homoptera : Diaspididae), in north central Colorado. *Journal of the Kansas Entomological Society* 72(1): 131-133.
Notes: Surveys of the natural enemy complex associated with pine needle scale, *Chionaspis pinifoliae* (Fitch) were conducted 1993-1995 in the northern Front Range area of north central Colorado. Four species of endoparasitoids were recovered from pine needle scale in Colorado: *Coccophagus flavifrons* Howard, *Coccobius varicornis* (Howard), *Prospaltella bella* (Gahan) and an *Encarsia* sp., with *C. flavifrons* and *C. varicornis* being most abundant. May surveys of average percent parasitism by all species, at all sites, averaged 14, 18.3, and 28 percent in 1993, 1994, and 1995 respectively. Also recovered from less than one percent of laboratory reared samples was a secondary hyperparasite, *Marietta pulchella* (Howard). Two species of predatory coccinellids were observed in association with north central Colorado pine needle scale colonies. By far the most abundant was *Coccidophilus atronitens* (Casey). During May surveys predation of pine needle scale by this species averaged 13.3, 8.7, and 14.7 percent in 1993, 1994, and 1995, respectively. Very rarely, and only in association with very high scale populations, the twice stabbed lady beetle, *Chilocorus stigma* (Say), was observed. Predaceous mites (*Hemisarcoptes* sp.) were present at all sites, producing approximately 3 percent mortality of pine needle scale in the 1994 survey.

**Coronado Blanco, J.M., Ruiz Cancino, E. & Trjapitzin, V.A.** 1998. [New record of *Plagiomerus diaspidis* Crawford in Tamaulipas, Mexico, on the scale *Diaspis echinocacti* (Bouche).] Nuevo registro de *Plagiomerus diaspidis* Crawford en Tamaulipas, Mexico, sobre la escama *Diaspis echinocacti* (Bouche). (In Spanish with summary in English.) *Acta Zoologica Mexicana Nueva Serie* No. 75, 203-204.
Notes: The encyrtid *Plagiomerus diaspidis* is recorded for the first time from Tamaulipas, Mexico. This species was found attacking *Diaspis echinocacti* on *Opuntia engelmannii* on 13 February 1998.

**Cranshaw, W., Gerace, D. & Demirel, N.** 1998. Control of hawthorn mealybug, 1997. Pages 359-360. *in* Saxena, K.N., Arthropod Management Tests, Vol. 23. Lanham, MD: Entomological Society of America.
Notes: Chemical control substances evaluated against *Phenacoccus dearnessi*.

**Cunningham, C.J.** 1999. New mealybug threatens valley grapes. *California Grower* 23(1): 25-26.
Notes: The vine mealybug is a newly observed pest of grapes in the San Joaquin Valley of California.

**Cunningham, G.P. & Harden, J.** 1999. Sprayers to reduce spray volumes in mature citrus trees. *Crop Protection* 18: 4, 275-281.
Notes: It was investigated whether lower volume pesticide spraying with an air-assisted low-profile

sprayer and air-assisted sprayers fitted with tower air conveyors (air-towers) could replace conventional high volume pesticide spraying. Biological efficacy was determined by assessing *Aonidiella aurantii* and *Planococcus citri* control using Supracide 400 (methidathion). The biological efficacy of the oscillating boom sprayer (OBS) on *A. aurantii* was matched by the Barlow tower at 6,000 litres ha-1 and the Silvan tower at 500 litres ha-1. The Barlow tower at 6,000 litres ha-1 produced a greater reduction in fruit infected with *P. citri* in the calyx than the OBS at 10,000 litres ha-1 and all other sprayer treatments. The reduction in insecticide dose rate by using lower spray volumes with registered rates based on volume of spray volume resulted in the pests not being controlled in some of the lower volume treatments.

**D'Almeida, Y.A., Lys, J.A., Neuenschwander, P. & Ajuonu, O.** 1998. Impact of two accidentally introduced *Encarsia* species (Hymenoptera : Aphelinidae) and other biotic and abiotic factors on the spiralling whitefly *Aleurodicus dispersus* (Russell) (Homoptera : Aleyrodidae), in Benin, West Africa. *Biocontrol Science and Technology* 8(1): 163-173.
Notes: In early 1993, the spiralling whitefly, *Aleurodicus dispersus* (Russell), was observed in Benin for the first time, inflicting damage to ornamental and shade trees and cassava. The parasitoids *Encarsia ?haitiensis* Dozier and *E. guadeloupae* Viggiani were observed in the second half of 1993. They were known to have the same host in the Pacific region, and were thought to have been introduced accidentally. The impact of these parasitoids was quantified using four surveys from 1993 to 1995 (on 2541 trees in 537 localities) and by population studies on guava. In 1993, *A. dispersus* occurred mostly in towns in the southern part of Benin; penetration into farmland was observed later. *E. ?haitiensis* was more abundant and widespread than *E. guadeloupae*, and by 1995 it had been recovered from most (84%) of the infested localities. On guava trees, the annual peaks of *A. dispersus* population declined by ca. 80% between 1993 and 1996. During the same period parasitism rates increased. Econometric multiple regression analyses based on 996 infested trees demonstrated that *A. dispersus* population densities, the proportion of infested trees and damage scores all declined significantly with increasing duration of the presence of the parasitoids, indicating their impact. Other variables were also significantly related to *A. dispersus* levels. The cassava and mango mealybugs are also mentioned as recent invaders into West Africa.

**Daane, K.M. & Caltagirone, L.E.** 1999. A new species of *Metaphycus* (Hymenoptera : Encyrtidae) parasitic on *Saissetia oleae* (Olivier) (Homoptera : Coccidae). *Pan-Pacific Entomologist* 75(1): 13-17.
Notes: A new encyrtid species of the *zebratus*-group of *Metaphycus is described: Metaphycus hageni*. This parasitoid was reared from black scale, *Saissetia oleae*, collected on olives near Almunecar, Spain. This species is similar to *M. lounsburyi*, but can be distinguished by the relative length of the ovipositor, the shape of the male genitalia, and the shape of the antennal club in both females and males. Characters that differentiate *M. hageni* from closely related species are given.

**Danzig, E.M.** 1998. A revision of mealybugs (Homoptera, Pseudococcidae) with mushroom glands of the fauna of Russia and adjacent countries. *Entomological Review* 77(1): 106-133.
Notes: [Originally published in Russian in Entomologicheskoe Obozrenie 77(1): 106-133.] Species reviewed include *Atrococcus altaicus, A. fuscus, A. achilleae, A. saxatilis, A. parvulus, A.*

*arakelianae, A. paludinus, A. indigens, A. bejbienkoi, A. pauperculus*, new sp., *Spilococcus artemisiphilus, S. mongolicus, S. furcatispinus, S. flavus, S. expressus, S. erianthi, S. halli, S. nanae, S. jailensis* and *S. vashlovanicus*, new sp.; illustrations; keys provided to 13 species of *Atrococcus* and 11 species of *Spilococcus*.

**Danzig, E.M.** 1999. [Mealybugs of the genus *Puto* Signoret (Homoptera, Pseudococcidae) of Russia and neighboring countries.]. (In Russian.) *Entomologicheskoe Obozrenye* 78: 79-91.
Notes: Key to 12 species of *Puto* provided: *P. megriensis, kondarensis, superbus, borealis, caucasicus, tubulifer, orientalis, graminis, pini, pilosellae, vaccinii*. Four poorly known species are redescribed and figured. Lectotypes of 8 nominal species are designated. New synonymy is established: *P. superbus* (Leon.) = *kiritshenkoi* (Borchs.), syn. n.; *P. pilosellae* (Sulc) = *ferrisi* (Kir.), *clematidis* (Matesova), syn. n.

**De Villiers, J.F.** 1998. Citrus mussel scale: *Lepidosaphes beckii* (Newman) [=*Cornuaspis beckii* (Newman)]. Pages 149-153. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Historical review, economic importance, distribution, host plants, life history, seasonal history, feeding habits, biological, chemical and integrated control.

**Dentener, P.R., Lewthwaite, S.E., Maindonald, J.H. & Connolly, P.G.** 1998. Mortality of twospotted spider mite (Acari : Tetranychidae) after exposure to ethanol at elevated temperatures. *Journal of Economic Entomology* 91(3): 767-772.
Notes: Mortality responses were determined for twospotted spider mite, *Tetranychus urticae* Koch, on apples to immersion in ethanol solutions at 20 degrees C (nondiapausing and diapausing mites), and 30, 40, and 45 degrees C (diapausing mites only). At 20 degrees C, nondiapausing *T. urticae* were more susceptible to ethanol immersion than the diapausing form. Increasing immersion times from 10 to 1,200 a significantly increased mite mortality for nondiapausing *T. urticae* but did not affect diapausing *T. urticae*. Increasing immersion temperatures for diapausing *T. urticae* from 20 to 40 degrees C did not change the ethanol concentration required to achieve 99% (LC99) mortality. Raising the immersion temperature from 40 to 45 degrees C only increased diapausing mite mortality at immersion times >800 s. Immersion of diapausing *T. urticae* for >600 s at 20 degrees C in 70% ethanol achieved 99% mortality and was more effective than immersion at 30-45 degrees C. Hot water immersion in addition to ethanol emersion also controls insect pests such as mealybugs.

**Devasahayam, S., Koya, K.M.A. & Verghese, A.** 1998. IPM in spices - challenges for the future. *Advances in IPM for horticultural crops: Environmental implications and thrusts*. 157-164.
Notes: [Proceedings of the First National Symposium on Pest Management in Horticultural Crops, Bangalore, India, 15-17 October 1997.] The major insect pests infesting spices in India include, pollu beetle (*Longitarsus nigripennis*) and scale insects (*Lepidosaphes piperis* and *Aspidiotus destructor*) on black pepper; cardamom thrips (*Sciothrips cardamomi*), shoot and capsule borer (*Conogethes punctiferalis*) and root grub ( *Basilepta fulvicorne [Basilepta fulvicornis*]) on cardamom; shoot borer

(*Conogethes punctiferalis*) and rhizome scale (*Aspidiella hartii*) on ginger and turmeric, cinnamon butterfly (*Chilasa clytia*) and leaf miner (*Conopomorpha civica*) on cinnamon; stem borer (*Sahyadrassus malabaricus* ) on clove; aphids (*Hyadaphis coriandri* and *Myzus persicae*) and seed midge (*Systole albipennis*) on coriander, cumin, fennel and fenugreek. Information available on the management of major insect pests of spices through cultural, biological and chemical means and use of resistant cultivars and scope and challenges in the adoption of IPM strategies are highlighted.

**DiCello, M.C., Myc, A., Baker, J.R. & Baldwin, J.L.** 1999. Anaphylaxis after ingestion of carmine colored foods: Two case reports and a review of the literature. *Allergy and Asthma Proceedings* 20(6): 377-382.
Notes: Two patients with adverse food reactions to foods colored with carmine [*Dactylopius coccus*] dye are presented, along with a review of the medical literature addressing adverse reactions to carmine colorant. This review summarizes the mounting evidence suggesting that adverse reactions to carmine colorant are the result of an IgE mediated mechanism.

**Dunkelblum, E.** 1999. Scale Insects. Pages 251-276 *in* Hardie, J. & Minks, A.K., Eds., Pheromones of Non-Lepidopteran Insects Associated with Agricultural Plants. Oxon, UK & New York: CABI Publishing.
Notes: Review of literature of pheromones of scale insects; mentions *Aonidiella aurantii, A. citrina, Aspidiotus nerii, Matsucoccus feytaudi, M. josephi, M. matsumurae, M. resinosae, M. thunbergianae, Planococcus citri, P. ficus, Pseudaulacaspis pentagona, Pseudococcus calceolariae, P. comstocki, Quadraspidiotus perniciosus* and *Q. zonatus*.

**Easton, E.R. & Pun, W.W.** 1999. Observations on twelve families of Homoptera in Macau, Southeastern China, from 1989 to the present. *Proceedings of the Entomological Society of Washington* 101(1): 99-105.
Notes: The insect species found in present day Macao are largely those feeding upon small numbers of remnant agricultural plantings or on those plants representing the subtropical evergreen broad leaf forest or remnants of the tropical monsoon rainforest as agricultural crops are only grown on a small scale. Records of 37 species of Homoptera of the Aleyrodidae, Aphididae, Cicadellidae, Cicadidae, Coccidae, Delphacidae, Diaspididae, Flatidae, Fulgoridae, Margarodidae, Pseudococcidae and Psyllidae are listed for the Portuguese territory of Macao of which 27 are new records.

**El-Kareim, A.I.A.** 1998. Swarming activity of the adult males of Parlatoria date scale in response to sex pheromone extracts and sticky color traps. *Archives of Phytopathology and Plant Protection* 31: 3, 301-307.
Notes: Adult females of *Parlatoria blanchardi [P. blanchardii]* were shown in the laboratory to release sex pheromone when they were about 10 days old. Parthenogenesis was not detected. In response to sex pheromone in date palm orchards in Egypt in 1993, males showed a morning-crepuscular pattern of activity. Pheromone-baited blue and white sticky traps attracted more males than those of any other colour tested. Winged males predominated in spring, and wingless ones in the summer generation. Generally, wingless individuals were more abundant at the end of each generation. In a trial with blue traps in the field, the reduction of numbers of *P. blanchardii* reached

39%, as compared with control trees without traps.

**Elder, R.J. & Bell, K.L.** 1998. Establishment of *Chil ocorus* spp. (Coleoptera : Coccinellidae) in a *Carica papaya* L. orchard infested by *Aonidiella orientalis* (Newstead) (Hemiptera : Diaspididae). *Australian Journal of Entomology* 37(4): 362-365.
Notes: Releases of two coccinellid predators, (*Chilocorus baileyi* (Blackburn) and *Chilocorus circumdatus* Gyllenhal, of oriental scale (*Aonidiella orientalis*) onto papaya resulted in successful establishment of the predators with a new generation being produced. Both coccinellids took five weeks from egg to adult in the field. Use of the coccinellids offers a potential control method for this scale on the few occasions when the established parasitoids fail to control the scale and scale numbers become large on limited numbers of papaya trees.

**Eppler, A.** 1998. Little cherry disease in Northern Germany. *Mededelingen Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen Universiteit Gent* 63: 3a, 867-868.
Notes: [Proceedings, 50th international symposium on crop protection, Gent, 5 May 1998. Part III.] A brief review of the cause, spread, transmission and resistance to little cherry disease in Northern Germany is presented. The disease is thought to be caused by a virus (possibly a clostero-like virus), however Kochs postulates have not been fulfilled. Vectors implicated include *Phenacoccus aceris, Macrosteles fascifrons, Scaphytopius acutus* and *Psammotettix lividellus*.

**Erol, T. & Yasar, B.** 1999. [Investigations on natural enemies, some biological characteristics and population fluctuations of *Lepidosaphes ulmi* (L.) (Homoptera, Diaspididae) and *Palaeolecanium bituberculatum* (Targ. and Tozz.) harmful to apple trees in Van Province. (In Turkish with summary in English.) *Turkish Journal of Agriculture and Forestry* 23: 2, 151-164.
Notes: [Original title: Van ili elma agaclariinda zararlii *Lepidosaphes ulmi* (L.) (Homoptera, Diaspididae) ile *Palaeolecanium bituberculatum* (Targ. and Tozz.) (Homoptera, Coccidae)'un populasyon degisimleri, bazii biyolojik ozellikleri ve dogal dusmanlarii uzerinde arastiirmalar.] A study was carried out from 1991 to 1993, in Van province (Erciis, Edremiit, Gevas), Turkey, with the aim to determine population fluctuations, some biological characteristics and natural enemies of *Lepidosaphes ulmi* and *Palaeolecanium bituberculatum* which are pests of apple trees. Samples were collected periodically every 15 days from 7 trees (variety Starking) in orchards in Gevas, Edremiit and Erciis. *L. ulmi* and *P. bituberculatum* overwintered as eggs on apple trees in Van province. They reproduced sexually and had one generation a year. The average number of eggs laid per female for *L. ulmi* and *P. bituberculatum* were determined as 50 and 259 eggs, respectively. The mobile nymphs of the two species, which were the most susceptible sta ge to insecticides, were found in orchards in May. *Aphytis mytilaspidis* and *Hemisarcoptes malus* were found to be the most effective natural enemies of *L. ulmi*. The parasitoid *Coccophagus palaeolecanii* was obtained from *P. bituberculatum*, but its population was very low.

**Farooq Ahmad, K.** 1998. Artificial infestation of *Lepidosaphes ulmi* (L.) (Diaspididae: Hemiptera): a new rearing technique of mussel scale on apple fruit. *Sarhad Journal of Agriculture* 14: 5, 509-513.
Notes: Mussel scale *Lepidosaphes ulmi* was successfully reared on apple fruit (especially cv.

Granny Smith) under insectary conditions. Greater numbers of gravid females were recorded from Granny Smith than MacIntosh. Most gravid females were collected near the calyx. A significant correlation was found between body measurements and the number of the eggs laid with respect to apple cultivar. Almost all insects collected from MacIntosh were devoid of eggs.

**Feng, R.Y. & Liang, E.Y.** 1998. [The occurrence regularity and control of pineapple powdery scale.]. (In Chinese.) *South China Fruits* 27: 5, 28-29.
Notes: *Dysmicoccus brevipes* is an important pest of pineapple growing in the Zhanjiang area of Guangdong, China. It usually attacks the leaves, causing them to become a yellow to reddish-purple colour, then droop and wither. Its occurrence was closely related to heavy rainfall, which could reduce its harmfulness; the optimum temperature for its occurrence was 20-25°C. Different pineapple varieties have different resistance to this pest. The local varieties Yunnan Qianyan and Huangjin are highly resistant. Furadan [carbofuran] at 3%, omethoate at 40% and methamidophos at 50% are effective for its control.

**Fernandez, M., Burgos, T., Val, I del & Proenza, M.A. 1998.** [Causes of mortality of *Pinnaspis strachani* C. (Homoptera: Diaspididae) on grapefruits on Isla de la Juventud. Part II.] Causas de mortalidad de *Pinnaspis strachani* C. en el cultivo del toronjo en la Isla de la Juventud. Parte II. (In Spanish with summary in English.) *Revista de Protección Vegetal* 13: 3, 179-188.
Notes: The incidence and effectiveness of the natural enemies of *Pinnaspis strachani* and their spatial distribution were studied on grapefruits on Isla de la Juventud, Cuba, during May 1990-September 1992. The pest and some natural enemies were distributed in patches, except for *Chilocorus cacti* and *Chrysopa* sp. in the dry season. Synchronous population fluctuations among *P. strachani* and *Chrysopa* sp. were incongruently negative, while *C. cacti* was asynchronous as compared to the pest.

**Ferrari, M., Bondavalli, R., Catellani, A., Fontani, A. & Barani, A.** 1999. [New technique for the control of *Eupulvinaria hydrangeae* on street trees of lime.] Nuova tecnica di contenimento di *Eupulvinaria hydrangeae* su alberatura stradale di tiglio. (In English with summary in Italian.) *Informatore Fitopatologia* 49: 3, 56-58.
Notes: The effectiveness of a single autumn treatment, consisting of a mixture of white oil at 2 kg/100 litres + chlorpyrifos-ethyl (22.1%) at 150 ml/100 litres + fluvalinate (10%) at 100 ml/100 litres, against *Eupulvinaria hydrangeae [Pulvinaria hydrangeae]* on lime (*Tilia* spp.) was assessed at Montecchio Emilia, Reggio Emilia, Italy, in 1994-95. The autumn treatment was highly effective and more ecologically compatible than the classic spring-summer treatments, which are harmful to beneficial organisms. Furthermore, the efficacy of the treatment at leaf fall tended to increase over the winter as a result of stress effects, which made the species more sensitive to low temperatures.

**Ferraro, M., Buglia, G. & Predazzi, V.** 1998. Analysis of methylcytosine distributi on along the chromosomes of *Planococcus citri* (Homoptera, Coccoidea). *Cytogenetics and Cell Genetics* 81(2): p.45, Suppl.

**Fisher, B.L. & Robertson, H.G.** 1999. Silk production by adult workers of the ant *Melissotarsus*

*emeryi* (Hymenoptera, Formicidae) in South African fynbos. *Insectes Sociaux* 46(1): 78-83.
Notes: In montane fynbos in South Africa *Melissotarsus emeryi* Forel was found nesting in live wood of *Leucospermum praemorsum* (Meisn.) E. Phillips, in association with armored scale insects (Diaspididae). A loose network of silken material was found along gallery tunnels and was combined with wood particles to seal cracks in tunnel walls and to close exit holes. Our observations reveal that the silk is produced by adult workers from glands located in cuticular depressions on the ventral portion of the anterior margin of the hypostoma. Silk was applied in nest construction with the aid of modified protarsi in the form of "silk brushes." *M. emeryi* is the only adult Formicidae known to produce silk and is the only record of silk production at any life stage in the Myrmicinae. We discuss silk production in *Melissotarsus* in relation to nest construction, defense, and diaspidid symbionts.

**Fitzgibbon, F., Allsopp, P.G., De Barro, P.J. & Hogarth, D.M.** 1999. Chomping, boring and sucking on our doorstep - the menace from the north. *Proceedings of the 1999 Conference of the Australian Society of Sugar Cane Technologists* 149-155.
Notes: [Conference held at Townsville, Queensland, Australia, 27-30 April 1999.] In a pest risk analysis undertaken for the Australian Quarantine and Inspection Service's Northern Australia Quarantine Strategy, 213 species of insects and mites were identified as pests of sugarcane in areas to the north of Australia. The potential for incursion and establishment into Australia was determined for all species, and dossiers were prepared on the 39 species most likely to invade. Of these, the importance of 20 was rated high, 11 were rated medium-high, 3 were rated medium and 5 were rated low. Eleven delphacids, 2 cicadellids (*Cicadulina mbila* and *Pyrilla perpusilla*), 12 moth borers (Pyralidae, Noctuidae and Olethreutidae), 9 scarabaeids, the coccid *Pulvinaria iceryi [Saccharipulvinaria iceryi]*, the diaspidid *Aulacaspis tegalensis*, the aleyrodid *Aleurolobus barodensis*, the aphid *Ceratovacuna lanigera* and the curculionid *Rhynchophorus ferrugineus* were identified as having potential for introduction and establishment.

**Foldi, I.** 1998. [Remarks on the tribes Monophlebulini and Llaveiini with descriptions of two new genera (Hemiptera: Coccoidea: Margarodidae).] Remarques sur les Monophlebulini et les Llaveiini. Description de deux nouveaux genres (Hemiptera: Coccoidea: Margarodidae). (In French with summary in English.) *Annales de la Société Entomologique de France* 34(3): 309-320.
Notes: Two new genera, *Gullania* and *Hodgsonius*, are described to take two new species, *G. solomonensis* from the bark of an unknown species of tree in the Solomon Islands and *H. cassicola* from the branches of *Cassia siamea* in Venezuela. Their descriptions are presented within the framework of a world revision of the Margarodidae sensu Morrison, 1928. *Gullania* is considered to belong to the Monophlebulini and has crenulated pores, perforated cicatrices and large invaginated intersegmental lines. *Hodgsonius* appears to belong to the Llaveiini and has large conical spines on the perianal lobes and multilocular tubular pores with a very broad and deeply invaginated central opening. The characteristics of the tribes and the diagnostic value of the morphological characters used in the descriptions are discussed and a key to the placement of the two new genera is proposed.

**Foldi, I.** 1999. [Morphological diversity in the margarodid male scale insects: the examples of *Neomargarodes erythrocephala* Green and *Stigmacoccus asper* Hemper (Hemiptera: Coccoidea: Margarodidae).]. (In French with summary in English.) *Annales de la Société Entomologique de*

*France* 35(3/4): 319-327.
Notes: [Original title: Diversité morphologique chez les cochenilles mâles des Margarodidae: l'exemple de *Neomargarodes erythrocephala* Green and *Stigmacoccus asper* Hempel (Hemiptera: Coccoidea).] Descriptions and illustrations of males of these two species. Both males have antennae unique in structure for scale insects: those of *N. erythrocephala* are branched while those of *S. asper* are pectinate. Other characters are: *N. erythrocephala* has broad wings with large alar setae, a strongly serrate distal half of the costal margin and the tibia, tarsus and claw of the prothoracic legs fused; and *S. asper* has composite wax glands. Both species possess an eversible endosome bearing a large number of spines or setae on their external surface as numerous margarodids. Morphological comparison shows that these structures and their positions on the endosome vary from one species to another and thus have a diagnostic value.

**Foldi, I. & Delplanque, A.** 1998. [The Homoptera: Sternorhyncha. II. The Cochenilles.] Les Homopteres: Sternorhyncha. II. Les Cochenilles. Pages 197-203 *in* Delplanque, A., Ed., [Insects Associated with Poplars.] Les insectes associés aux peupliers. Editions Memor. 350 pp. + 71 plates.
Notes: Life history and general appearance of 17 scale insects of poplar including Ortheziidae, Pseudococcidae, Coccidae and Diaspididae.

**Franke, I.H., Fegan, M., Hayward, C., Leonard, G., Stackebrandt, E. & Sly, L.I.** 1999. Description of *Gluconacetobacter sacchari* sp nov., a new species of acetic acid bacterium isolated from the leaf sheath of sugarcane and from the pink sugarcane mealy bug. *International Journal of Systematic Bacteriology* 49: 1681-1693, Part 4.
Notes: A new species of the genus *Gluconacetobacter*, for which the name *Gluconacetobacter sacchari* sp. nov. is proposed, was isolated from the leaf sheath of sugar cane and from the pink sugarcane mealy bug, *Saccharicoccus sacchari*, found on sugar cane growing in Queensland and northern New South Wales, Australia,

**Franke, I.H., Fegan, M., Hayward, C., Leonard, G. & Sly, L.I.** 2000. Molecular detection of *Gluconacetobacter sacchari* associated with the pink sugarcane mealybug *Saccharicoccus sacchari* (Cockerell) and the sugarcane leaf sheath microenvironment by FISH and PCR. *FEMS Microbiology Ecology* 31(1): 61-71.
Notes: Molecular tools for the detection of the newly described acetic acid bacterium *Gluconacetobacter sacchari* from the pink sugarcane mealybug, *Saccharicoccus sacchari* Cockerell (Homoptera: Pseudococcidae), and in the sugarcane leaf sheath microenvironment were developed. *G. sacchari* specific 16S rRNA-targeted oligonucleotide primers were designed and used in PCR amplification of *G. sacchari* DNA directly from mealybugs, and in a nested PCR to detect low numbers of the bacteria from sugarcane leaf sheath fluid and cane internode scrapings. A sensitivity level of detection of 40-400 cells/reaction was obtained using PCR from exponentially grown bacterial cultures and of 1-10 cells in cane internode scrapings and leaf sheath fluid samples using nested PCR. The specificity of the primer set was demonstrated by the lack of amplification product formation in PCR by closely related acetic acid bacteria, including *Gluconacetobacter liquefaciens*, and *Gluconacetobacter diazotrophicus*. A Cy3 labeled probe for *G. sacchari* was designed and shown to be specific for the species. Investigation of the mealybug microenvironment by whole cell

fluorescent in situ hybridization revealed that *G. sacchari* appears to represent only a minor proportion of the population of the microbiota in the mealybugs tested. This study has shown the usefulness of 16S rRNA-based molecular tools in the identification and detection of *G. sacchari* from environmental samples and will allow these tools to be used in further ecological research.

**Fukatsu, T. & Nikoh, N.** 2000. Endosymbiotic microbiota of the bamboo pseudococcid *Antonina crawii* (Insecta, Homoptera). *Applied and Environmental Microbiology* 66(2): 643-650.
Notes: This research characterized the intracellular symbiotic microbiota of the bamboo pseudococcid *Antonina crawii* by performing a molecular phylogenetic analysis in combination with in situ hybridization. Almost the entire length of the bacterial 16S rRNA gene was amplified and cloned from *A. crawii* whole DNA. Restriction fragment length polymorphism analysis revealed that the clones obtained included three distinct types of sequences. Nucleotide sequences of the three types were determined and subjected to a molecular phylogenetic analysis. The first sequence was a member of the gamma subdivision of the division Proteobacteria (gamma-Proteobacteria) to which no sequences in the database were closely related, although the sequences of endosymbionts of other homopterans, such as psyllids and aphids, were distantly related. The second sequence was a beta-Proteobacteria sequence and formed a monophyletic group with the sequences of endosymbionts from other pseudococcids. The third sequence exhibited a high level of similarity to sequences of *Spiroplasma* spp. from ladybird beetles and a tick Localization of the endosymbionts was determined by using tissue sections of *A. crawii* and in situ hybridization with specific oligonucleotide probes. The gamma- and beta-Proteobacteria symbionts were packed in the cytoplasm of the same mycetocytes (or bacteriocytes) and formed a large mycetome (or bacteriome) in the abdomen. The spiroplasma symbionts were also present intracellularly in various tissues at a low density. It was observed that the anterior poles of developing eggs in the ovaries were infected by the gamma- and beta-Proteobacteria symbionts in a systematic way which ensured vertical transmission. Five representative pseudococcids were examined by performing diagnostic PCR experiments with specific primers; the beta-Proteobacteria symbiont was detected in all five pseudococcids, the gamma-Proteobacteria symbiont was found in three, and the spiroplasma symbiont was detected only in *A. crawii*.

**Garcia, D.** 1998. Interaction between juniper *Juniperus communis* L. and its fruit pest insects: pest abundance, fruit characteristics and seed viability. *Acta Oecologica, Oecologia Applicata* 19: 6, 517-525.
Notes: The relationships between the fruit features of Juniperus communis and the presence of fruit pests were studied in Sierra Nevada, SE Spain. The abundance of two insect species - a pulp-sucking scale (*Carulaspis juniperi*) and a seed-predator wasp (*Megastigmus bipunctatus*) - was surveyed with respect both to fruit characteristics and to viability of seeds contained therein. Seed-predator pressure was not significantly related to any fruit characteristics. However, pulp suckers tended to be more abundant in plants with low pulp:seed ratios and high fruit-water content. In addition, fruits with high levels of pulp sucker attack tended to have a higher water content. A multi-factor ANOVA, considering the identity of the plant and the attack of the different pests as factors, showed that plant identity accounted for most of the variation in fruit characteristics. The viability of seeds tended to be lower in plants strongly attacked by both pests. Fruits attacked by seed predators showed

significantly lower proportions of viable and unviable seeds than did unattacked fruits. Seed viability was also lower in those fruits heavily attacked by pulp suckers, but this pattern was strongly mediated by plant identity. Pest activity was clearly associated with a direct decrease in juniper reproductive capacity. This loss involved a reduction of the viable-seed number, mainly related to the seed predator, as well as a reduction of fruit attractiveness to frugivorous dispersers, related to the pulp sucker.

**Gaume, L., McKey, D. & Terrin, S.** 1998. Ant-plant-homopteran mutualism: how the third partner affects the interaction between a plant-specialist ant and its myrmecophyte host. *Proceedings of the Royal Society of London. Series B, Biological Sciences* 265: 1396, 569-575.
Notes: By estimating relative costs and benefits, the role of the homopteran partner in the protection mutualism between the myrmecophyte *Leonardoxa africana* T3, the ant *Aphomomyrmex afer*, and sap-sucking homopterans tended by ants in the trees swollen hollow twigs was studied in Cameroon. The ants obtained nest sites and food from their host plant (food was obtained either directly by extrafloral nectar or indirectly via homopterans). *Aphomomyrmex* workers patrolled young leaves of *L. africana* T3 and protected them against phytophagous insects. Because ants tended, either solely or primarily, coccids in some trees and pseudococcids in others, experiments were conducted to determine whether the nature of the interaction was dependent on the identity of the third partner. Firstly, the type of homopteran affected the benefits to the tree of maintaining a large ant colony. Larger colony size (relative to tree size) conferred a greater protection against herbivory; this relationship was more pronounced for trees whose ants tended pseudococcids than for those in which ants tended coccids. Secondly, for trees (and associated ant colonies) of comparable size, homopteran biomass was much larger in trees harbouring coccids than in trees with pseudococcids. Thus, the cost to the tree of maintaining ants may be greater when ants are associated with coccids. The net benefits to the plant of maintaining ants appeared to be much greater with pseudococcids as the third partner. To explore how the type of homopteran affects functioning of the system, resources (nest sites, extrafloral nectar, and homopterans) likely to limit ant colony size were determined. In trees where ants tended coccids, ant colony biomass was strongly dependent on the number of extrafloral nectaries. In contrast, in trees whose ants tended only pseudococcids, colony biomass was not related to the number of nectaries, and was most strongly determined by the volume of available nest sites. A hypotheses to explain how the type of homopteran affects functioning of this symbiosis are presented and the implications of this study for the evolutionary ecology of ant-plant-homopteran relationships are discussed.

**Gibbs, J.N., MacAskill, G.A., Lonsdale, D., Rose, D.R. & Tilbury, C.A.** 1998. The health of non-woodland trees in England in 1998. *Arboriculture Research and Information Note* 147/PATH/98.
Notes: Reports of pests, diseases and disorders of trees received through the Amenity Tree Health Monitoring Scheme or obtained from other sources are reviewed. The only scale mentioned, *Pulvinaria regalis*, or horse chestnut scale, was reported on *Tilia, Acer, Aesculus* and *Ulmus*. Range given.

**Githure, C.W., Zimmermann, H.G. & Hoffmann, J.H.** 1999. Host specificity of biotypes of *Dactylopius opuntiae* (Cockerell) (Hemiptera : Dactylopiidae): prospects for biological control of

*Opuntia stricta* (Haworth) Haworth (Cactaceae) in Africa. *African Entomology* 7(1): 43-48.
Notes: *Opuntia stricta* (Haworth) Haworth and *Opuntia ficus-indica* (L.) Miller are the most prominent of the cactus weeds that have become invasive in several countries in Africa. Recent confirmation that there are at least two distinct biotypes of *Dactylopius opuntiae* (Cockerell), each specific to particular groups of *Opuntia* species, has enhanced prospects of *O. stricta* being controlled biologically with no threat to *O. ficus-indica*. The 'stricta' biotype has been used with considerable success for biological control of *O. stricta* in Australia for over 60 years. To corroborate the contention that the 'stricta' biotype of *D. opuntiae* could be used specifically to control *O. stricta*, with no threat to tree-like *opuntias*, the development and survival of the insects was monitored on several cultivars of *O. ficus-indica*.

**Golan, K. & Lagowska, B.** 1998. [Occurrence of scale insects on ornamental conifers.] Wystepowanie czerwcow na ozdobnych roslinach iglastych. (In Polish.) *Ochrona Roslin* 42: 7, 4-6.
Notes: The occurrence, harmfulness, food plants and control of the 11 species of scale insect known to infest ornamental conifers in Poland are described. They are mainly controlled using Actellic [pirimiphos-methyl], Ultracid [methidathion] and Anthio [formothion]. Species mentioned include *Carulaspis juniperi, Insulaspis newsteadi, Lepidosaphes ulmi, Leucaspis pini, Nuculaspis abietis, Parthenolecanium corni, P. fletcheri, P. pomericanum, Physokermes piceae* and *Planococcus vovae*.

**Gonzalez-Hernandez, H., Johnson, M.W. & Reimer, N.J.** 1999. Impact of *Pheidole megacephala* (F.) (Hymenoptera : Formicidae) on the biological control of *Dysmicoccus brevipes* (Cockerell) (Homoptera: Pseudococcidae). *Biological Control* 15(2): 145-152.
Notes: Two held experiments designed as the biological check method (interference) and the paired-cage technique (exclusion) were used to evaluate the effectiveness of natural enemies in maintaining low densities of the pink pineapple mealybug, *Dysmicoccus brevi pes* (Cockerell), in pineapple plantings in Hawaii. In the biological check method, the treatments were ant-free plots and ant-infested plots. The numbers of *D. brevipes*, parasitized mealybugs, and immature and adult predators on the aerial parts of the plants were recorded. Results in the biological check method suggested that *Anagyrus ananatis* Gahan was responsible for the decline of *D. brevipes* densities in the absence of ants. In a second study combining the paired-cage technique and the biological check method, the treatments included mealybug-infested potted pineapple plants with no ants or mealybug natural enemies, ants but no natural enemies, natural enemies but no ants, and ants and natural enemies. This experiment showed that in the absence of the big-headed ant, *Pheidole megacephala*, *D. brevipes* densities were greatly reduced by natural enemies and probably by the lack of sanitation or other ant activity. A laboratory study also was conducted to evaluate the impact of *P. megacephala* on oviposition and predation by *A. ananatis* and the coccinellid *Nephus bilucernarius*, respectively. These laboratory studies indicated that *P. megacephala* significantly decreased mealybug mortality induced by *A. ananatis* and *N. bilucernarius* adults via interference with natural enemy searching behavior.

**Gonzalez-Hernandez, H., Reimer, N.J. & Johnson, M.W.** 1999. Survey of the natural enemies of *Dysmicoccus* mealybugs on pineapple in Hawaii. *Biocontrol Dordecht* 44(1): 47-58.
Notes: Surveys for mealybugs, associated natural enemies and ants were conducted in abandoned

pineapple fields on the Hawaiian islands of Oahu and Maui from July 1992 to November 1993. Whole plant samples were taken, and mealybugs and ants found were identified. Mealybug-infested plant parts were isolated and held until natural enemies emerged from parasitized host material. At sample sites where only *Dysmicoccus brevipes* was present, its densities ranged from a mean of 23 to 157 mealybugs per plant, while in areas with mixed populations of this mealybug and *Dysmicoccus neobrevipes* Beardsley, densities ranged from a mean of 23 to 118 mealybugs per plant. Ants were present at all sample sites and on all dates. *Pheidole megacephala* (F.) was the most common ant species found. *Anagyrus ananatis* Gahan was the most common parasitoid reared. However, it attacked only *D. brevipes*, the dominant mealybug in the pineapple fields surveyed. Percent parasitization of *D. brevipes* by *A. ananatis* in the presence of ants ranged from 0.3 to 9.9%. Percent parasitization of *D. brevipes* and *D. neobrevipes* per plant by *Euryrhopalus propinquus* Kerrich ranged from 0.05 to 2.2%. Mean densities of the predators *Lobodiplosis pseudococci* (Felt), *Nephus bilucernarius* Mulsant and *Sticholotis ruficeps* Weise ranged from 0.05 to 5.75, 0.1 to 1.8, and 0.05 to 0.2 individuals per plant, respectively.

**Granara de Willink, M.C.** 1999. [Soft scale insects of Argentina (Homoptera: Coccoidea: Coccidae)] Las cochinillas blandas de la República Argentina (Homoptera: Coccoidea: Coccidae). (In Spanish with summary in English.) *Contributions on Entomology, International* 3(1): 1-183.
Notes: 57 species in 26 genera are included, three of which are reported as new to science: *Differococcus, Magnococcus* and *Peculiaricoccus*. Fourteen new species are described: *Akermes xylosma, Alichtensia ultima, Cryptinglisia patagonica, Eulecanium cordoi, Magnococcus berberis, M. cestri, Mesolecanium obvius, Peculiaricoccus elionurus, Pendularia paraguariensis, Philephedra ferelutea, Pseudokermes correntinus, P. eugenium, P. geoffroeum* and *Stictolecanium entrerrianum*. New combinations, synonymies and first records for Argentina are also included. The taxonomic position and characterization of the Coccidae family is given. Descriptions and illustrations of all species, based on the morphological characteristics of the adult female, are included. A key for all genera and species present in Argentina, and an actualized list of the host plants is presented.

**Gross, S., Dreishpoun, Y., Blachinski, D., Shmueli, S., Steinberg, S. & Mendel, Z.** 1999. [Cork scars on fruits of the citrus variety 'Sweetie' as related to infestation by the citrus mealybug.]. (In Hebrew with summary in English.) *Alon Hanotea* 53(11): 463-468.
Notes: *Planococcus citri* is a major pest of grapefruit and pomelo varieties. Describes damage and chemical control techniques.

**Grove, T.** 1999. The white powdery scale, *Cribrolecanium andersoni*, on citrus. (In English with summary in Afrikaans.) *Neltropika Bulletin* No. 303, 38-40.
Notes: The distribution of *C. andersoni*, including its distribution in South Africa, is discussed. *C. andersoni* populations increased following the replacement of conventional pest control with integrated pest management programmes. *C. andersoni* is described and its habitats and the damage caused to citrus crops are discussed. *Euxanthellus philippiae, Metaphycus* sp., *Coccophagus pulvinariae, Neastymachus* spp., *Tetrastichus* sp. and *Coccophagus* sp. have been found to parasitize *C. andersoni* and chrysopid larvae are predators. In some cases, natural enemies have provided adequate *C. andersoni* control. Chlorpyrifos, dimethoate, methomyl, phenthoate and profenofos are

effective full cover sprays, while methamidophos can be used as a stem treatment.

**Gu, D.X. & Chen, Y.G.** 1998. Life tables of *Hemiberlesia pitysophila* Takagi and its parasitism rate by *Coccobius azumai* Tachikawa. (In Chinese with summary in English.) *Natural Enemies of Insects* 20: 4, 156-163.
Notes: *Coccobius azumai* was introduced from Japan where it successfully controls the pest *Hemiberlesia pitysophila*. Three experimental sites [in China] where the parasitoids were released in 1989, 1990 and 1991 and one control site were chosen to construct life tables of the pest. From the life tables it was shown that the key factor controlling the pest was parasitism of the female adults by the parasitoid in the release sites. The parasitism rate ranged from 3.3 to 12.04% (average 7.78%).

**Gullan, P.J.** 1999. A new genus of subcortical coccoids (Hemiptera: Coccoidea: Eriococcidae) on *Eucalyptus*. *Memoirs of Museum Victoria* 57(2): 241-250.
Notes: A new genus of Eriococcidae (Hemiptera: Coccoidea), *Subcorticoccus* gen. nov., is described for three new species of scale insects collected under eucalypt bark in southeastern Australia, *S. beardsleyi* sp. nov. occurs on *Eucalyptus macrorhyncha* near Melbourne, Victoria, whereas both *S. huonamnis* sp. nov. and *S. murrindindi* sp. nov. feed on *E. regnans* in Tasmania and Victoria, respectively. The adult females of all three species and the first-instar nymph of *S. beardsleyi* are described and illustrated. *Subcorticoccus* appears to be morphologically most similar to the Australian genus *Phacelococcus* Miller.

**Gutierrez, A.P.** 1999. Modeling tritrophic field populations. Pages 647-679. *in* Huffaker, C.B. & Gutierrez, A.P., Ecological Entomology. 2nd ed. New York: John Wiley & Sons. 756 pp.
Notes: *Phenacoccus manihoti* mentioned on *Manihot esculenta*.

**Gutierrez, A.P., Yaninek, J.S., Neuenschwander, P. & Ellis, C.K.** 1999. A physiologically-based tritrophic metapopulation model of the African cassava food web. *Ecologically Modelling* 123(2-3): 225-242.
Notes: The metapopulation dynamics of the African cassava food web is explored using a physiologically based tritrophic model. The interacting species are cassava, cassava mealybug (*Phenacoccus manihoti*) and its natural enemies (two parasitoids, a coccinellid predator and a fungal pathogen), and the cassava green mite and its natural enemies (two predators and a fungal pathogen). The same model simulates the mass number dynamics of each plant or animal species in each patch and the movement of animals between patches. Movement is based on species specific supply-demand relations. The pathogen mortality rate is a simple function of rainfall intensity. The within-patch species composition, their initial densities, and the initial values of edaphic variables may be assigned stochastically. Sensitivity, graphical and multiple linear regression analyses are used to summarize the effects of spatial and resource heterogeneity on species dynamics. Important plant level effects on higher trophic levels are demonstrated, and recommendations are made as to the appropriate model for different ecological studies.

**Hattingh, V. & Cilliers, C.J.** 1998. Australian bug: *Icerya purchasi* Maskell. Pages 108-112 *in*

Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus Pests in the Republic of South Africa. 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Historical review, host plants, economic importance, life history, seasonal history, and biological and chemical control.

**Hattingh, V., Cilliers, C.J. & Bedford, E.C.G.** 1998. Family Pseudococcidae: Mealybugs: Citrus mealybugs. Pages 112-121. *in* Bedford, E.C.G., Van den Berg, M.A. & De Villiers, E.A., Eds., Citrus Pests in the Republic of South Africa 2nd ed. Nelspruit: Institute for Tropical and Subtropical Crops. 288 pp.
Notes: Economic importance, seasonal history, biological and chemical control, and integrated control. Key to five species (*Nipaecoccus viridis, Pseudococcus longispinus, Paracoccus burnerae, Planococcus citri, Ferrisia virgata, Pseudococcus calceolariae*). Life histories, feeding habits, and minor species (*Pseudococcus calceolariae, P. elisabethae, Delottococcus elisabethae, Allococcus elisabethae* and *Ferrisia malvastra*.

**Hawkins, B.A., Mills, N.J., Jervis, M.A. & Price, P.W.** 1999. Is the biological control of insects a natural phenomenon?. *Oikos* 86(3): 493-506.
Notes: Classical biological control (natural enemy introductions) has long served as a paradigm for the role of predators and parasitoids in insect herbivore population dynamics. These observations question the widely held view that there is no fundamental difference between successful biological control and the action of native natural enemies ('natural control'). Two aspects of biological control are examined: (1) control against insect herbivores occupying habitats that have been substantially simplified in diversity and structure, and (2) the enemy-herbivore-plant food web in biological control systems that is composed entirely of exotic species that share few evolutionary or ecological links with the native biota, further simplifying the web in which the enemies operate. Using the insect life table literature, we found no differences in the frequencies of all types of natural enemies acting as key factors in the dynamics of exotic and native insect populations. However, top-down control, when it occurs, is more frequently due to a single parasitoid species for exotic insect herbivores on exotic plants in cultivated habitats, whereas for native insect herbivores on native plants in natural habitats it is more frequently due to a suite of generalist predators. We also found from the historical record of biological control that success rates are substantially greater in exotic, simplified, managed habitats than in natural habitats, particularly when involving parasitoids. We suggest that biological control is not strictly a 'natural' phenomenon, because it overestimates the extent to which parasitoids exert top-down control on insect populations, and it results most often from the formation of a single strong link in simplified food webs, in contrast to the 'natural control' that results from multiple links in more complex food webs. The cassava mealybug is mentioned as being successfully controlled by *Apoanagyrus lopezi* across the central African cassava belt, but control was far less effective in Malawi where the poor nutrient content of the soil reduced the size of individual mealybugs and consequently the sex ratio (proportion of females in the progeny) of the parasitoid population.

**Hayashi, T., Kikuchi, O.K. & Dohino, T.** 1998. Electron beam disinfestation of cut flowers and their radiation tolerance. *Radiation Physics and Chemistry* 51(2): 175-179.

Notes: Effects of electron beams on spider mite and flour beetle were slightly smaller than those of gamma-rays at equal doses. Electron beams at 400 Gy killed or sterilized all the pests for cut flowers tested; spider mite, mealybug, leaf miner, thrips and cutworm. Carnation, alstromeria, gladiolus, tulip, statice, stock, dendrobium, prairie gentian, oncidium, campanula, gloriosa, fern, gypsophila, freesia, lobelia, triteleia and gerbera were tolerant to electron beams at 400-600 Gy, while chrysanthemum, rose, lily, calla, antherium, sweet pea and iris were intolerant. Radiation-induced deterioration of chrysanthemum could be prevented by post-irradiation treatment with commercial preservative solutions or sugar solutions.

**Heng-Moss, T.M., Baxendale, F.P. & Riordan, T.P.** 1998. *Rhopus nigroclavatus* (Ashmead) and *Pseudaphycus* sp. (Hymenoptera: Encyrtidae): Two parasitoids of the buffalograss mealybugs, *Tridiscus sporoboli* (Cockerell) and *Trionymus* sp. *Journal of the Kansas Entomological Society* 71(1): 85-86.
Notes: Two encyrtid parasitoids, *Rhopus nigroclavatus* (Ashmead) and *Pseudaphycus* sp. were reared from the buffalograss feeding mealybugs, *Tridiscus sporoboli* (Cockerell) and *Trionymus* sp. In a rearing study, parasitism of adult female mealybugs by these two para sitoids was 29.64%, with an average emergence of 1.92 parasitoids per mealybug. The identification of these two encyrtid parasitoids provides a valuable first step for the development of a biological control program for managing mealybug infestations.

**Heng-Moss, T.M., Baxendale, F.P., Riordan, T.P. & Young, L.J.** 1999. Influence of *Rhopus nigroclavatus* (Hymenoptera : Encyrtidae) on the mealybugs *Tridiscus sporoboli* and *Trionymus* sp. (Homoptera: Pseudococcidae). *Environmental Entomology* 28(1): 123-127.
Notes: This research investigated parasitism of the buffalograss mealybugs *Tridiscus sporoboli* (Cockerell) and Trionymus sp. by *Rhopus nigroclavatus* (Ashmead) through rearing and dissection studies, paired comparison tests, and a field survey. Rates of parasitism reported in this article reflect combined parasitism of the 2 mealybug species. In the rearing study, parasitism of adult female mealybugs by *R. nigroclavatus* was 48.6%, with an average emergence of 1.77 parasitoids per parasitized mealybug. A maximum of 7 *R. nigroclavatus* adults emerged from a single mealybug female. Mealybug dissections documented parasitism rates by *R. nigroclavatus* of 78.5, 67.5, and 4.3%, respectively, for adult females, 3rd and 4th (male pupae) instars, and 1st- and 2nd-instar mealybugs. Results revealed the preference of *R. nigroclavatus* for adult female mealybugs and later instars, and suggested a potential regulating effect of *R. nigroclavatus* on buffalograss mealybug populations. Paired comparison tests with and without *R. nigroclavatus* demonstrated the effectiveness of this parasitoid as a biological control agent for buffalograss mealybugs under greenhouse conditions. Significant differences were detected in the number of nonparasitized mealybugs between treatments containing only mealybugs and treatments containing both mealybugs and parasitoids. Sticky trap captures in the field suggested a functional relationship between the seasonal abundance of *R. nigroclavatus* and its mealybug hosts.

**Hillocks, R.J., Phiri, N.A. & Overfield, D.** 1999. Coffee pest and disease management options for smallholders in Malawi. *Crop Protection* 18(3): 199-206.
Notes: The main source of income for up to 9000 smallholders in northern Malawi is coffee, yields

of which are affected by insect pests, namely white stem borer (*Monochamus leuconotus*) and green scale (*Coccus alpinus*), and diseases - coffee berry disease (Colletotrichum kahawae) and leaf rust (*Hemileia vastatrix*). Economic liberalisation in Malawi has removed subsidies from inputs and without credit schemes from the Smallholder Coffee Authority the use of commercial pesticides and fertiliser on coffee by smallholders has declined. Smallholder coffee in Malawi has been of high quality and if this can be maintained, there is potential for increased productivity. Pest and disease management will be an important part of the improved management systems which will be needed if coffee yields are to increase. This paper describes the main pest management problems facing smallholders and some of the management options available to them using data collected in a survey of smallholder coffee, conducted as part of a project to collect baseline data for the development of an IPM programme.

**Hirokado, M., Kimura, K., Suzuki, K., Sadamasu, Y., Katsuki, Y., Yasuda, K. & Nishijima, M.** 1999. Detection method of madder color, cochineal extract, lac color, Carthamus yellow and Carthamus red in processed foods by TLC. *Journal of the Food Hygienic Society of Japan* 40(6): 488-493.
Notes: Thin-layer chromatography (TLC) methods were developed to detect Ave kinds of natural colors in processed foods. Cochineal extract, lac color and carthamus yellow were extracted from samples. The proposed method was successfully applied to the detection of natural colors in 30 kinds of commercial processed foods whose labels indicated them to contain natural color.

**Hoffmann, J.H., Moran, V.C. & Zimmermann, H.G.** 1999. Integrated management of *Opuntia stricta* (Haworth) Haworth (Cactaceae) in South Africa: an enhanced role for two, renowned, insect agents. *African Entomology* Jun 1999: 15-20.
Notes: The increasing importance of *Opuntia stricta* (Haworth) Haworth (Cactaceae) as an invasive weed in many parts of South Africa has resulted in the initiation of a biological control campaign against the weed. Two herbivorous insect species, *Cactoblastis cactorum* (Bergroth) (Lepidoptera: Phycitidae) and *Dactylopius opuntiae* (Cockerell) (Homoptera: Dactylopiidae) have attacked *O. stricta* in South Africa since their successful introduction into the country during the 1930s for biological control of a related weed species, *Opuntia ficus-indica* (L.) Miller. Both *C. cactorum* and *D. opuntiae* played a central role in the highly successful biological control campaign against *O. stricta* in Australia, but neither species has been effective on *O. stricta* in South Africa. Predation seems to have prevented *C. cactorum* from becoming abundant enough to have a major impact on the weed and the biotype of *D. opuntiae* initially introduced into South Africa for *O. ficus-indica* performs poorly on *O. stricta*. The efficacy of the biological control programme against *O. stricta* has been enhanced by: (i) the development of integrated control procedures which use herbicides together with *C. cactorum*, and (ii) the introduction of a different biotype of *D. opuntiae* that is compatible with *O. stricta*.

**Hoffmann, C. & Schmutterer, H.** 1999. [The European peach scale *Parthenolecanium persicae* - a new pest of grapevine in southwestern Germany.]. (In German.) *Anzeiger für Schädlingskunde* 72(2): 52-54.
Notes: In 1998, a survey of scale insects infesting grapevine (*Vitis vinifera*) in southwestern

Germany yielded four species, namely *Heliococcus bohemicus, Parthenolecanium corni, P. persicae* and *Pulvinaria vitis*. *P. persicae* is recorded for the first time in Germany. The last surveys on scale insects in southwestern Germany were conducted by WUNN (1925, 1926) but at this time *P. persicae* was not discovered yet in this region. Most probably the thermophilus species emigrated from Switzerland and spread northwards into the Rhine valley during the last two or three decades of years. *P. persicae* is attacked by four species of parasitoids and a hyperparasitoid. The most common species is the encyrtid *Blastothrix hungarica*.

**Hohn, H., Hopli, H.U. & Graf, B.** 1998. [Branch sampling studies 1997/98 in apple trees.] Astprobenuntersuchungen 1997/98 an Apfelbaumen. (In German with summary in French.) *Obst- und Weinbau* 134: 129-131, 133.
Notes: Monitoring of insect and mite pests in apples was studied in 4 areas of Switzerland in 1997-98, with special reference to the use of branch samples. The results for 1998 on the incidence of pests are compared with a 5-year average for 1994-98. Coccidae infestations decreased, aphid infestation stabilized at a medium level and red spider mite (*Tetranychus urticae*) infestations increased.

**Hohn, H., Hopli, H.U. & Graf, B.** 1999. [Varying trends in studies of branch samples in 1998/99.]. (In German.) *Obst- und Weinbau* 135: 5, 117-120.
Notes: Some 400 branch samples from apple trees in 120 orchards in German-speaking Switzerland were evaluated for 9 insect pests. Egg deposits of red mites [*Panonychus ulmi*], aphids and scales were less than in preceding years. Small increases were observed for woolly apple aphid [*Eriosoma lanigerum*], codling moth [*Cydia pomonella*] and oyster scale insects [*Quadraspidiotus*]. Significant differences were found between for different crop protection treatments.

**Houck, M.A.** 1999. Phoresy by *Hemisarcoptes* (Acari : Hemisarcoptidae) on *Chilocorus* (Coleoptera : Coccinellidae): influence of subelytral ultrastructure. *Experimental & Applied Acarology* 23(2): 97-118.
Notes: The non-phoretic stages of mites of the genus *Hemisarcoptes* are predators of the family Diaspididae. The heteromorphic deutonymph (hypopus) maintains a stenoxenic relationship with beetles of the genus *Chilocorus*. The mites attach to the subelytral surface of the beetle elytron during transport. There is variation in mite density among species of *Chilocorus*. Both *Hemisarcoptes* and *Chilocorus* have been applied to biological control programmes around the world. The objective of this study was to determine whether subelytral ultrastructure (spine density) plays a role in the evolution of symbiosis between the mite and the beetle. The subelytral surfaces of 19 species of *Chilocorus* and 16 species of *Exochomus* were examined. Spine density was determined for five subelytral zones: the anterior pronotal margin, medial central region, caudoventral tip, lateral distal margin and epipleural region. Spine density on the subelytral surface of *Chilocorus* and *Exochomus* was inversely correlated with the size of the elytron for all zones except the caudoventral tip. This suggests that an increase in body size resulted in a redistribution of spines and not an addition of spines. The pattern of spine density in *Exochomus* and *Chilocorus* follows a single size-density trajectory. The pattern of subelytral ultrastructure is not strictly consistent with either beetle phylogeny or beetle allometry. The absence of spines is not correlated with either beetle genus or size and species of either *Chilocorus* or *Exochomus* may be devoid of

spines in any zone, irrespective of body size. A general difference between species of *Chilocorus* and *Exochomus* is the fact that while spine density in *Chilocorus* is clinal relative to the size gradient, *Exochomus* is dichotomous and likely to have either many spines or no spines in a particular zone. No species of *Chilocorus* was completely devoid of spines. Five species of *Exochomus* had no spines at all, thus making it difficult to interpret the primary function of the subelytral spines in a general way. Within the genus *Chilocorus*, spine density may play a synergistic role in host association. Based on morphological evidence alone, these findings lead to the hypothesis that the species of *Chilocorus* that would be most conducive to biological control application in conjunction with *Hemisarcoptes* would be *Chilocorus cacti, Chilocorus distigma, Chilocorus fraternus, Chilocorus orbus, Chilocorus tristis* and, to a lesser extent, *Chilocorus bipustulatus*. Scale insect pests targeted for biological control are *Aonidiella aurantii, Aspidiotus destructor, Asterolecanium* sp., *Carulaspis minima, Icerya purchasi, Parlagena bennetti, Parlatoria blanchardii, Planococcus kenyae, Pseudaulacaspis pentagona, Quadraspidiotus perniciosus* and *Selenaspidus articulatus.*

***Houck, M.A. & O'Connor, B.M.*** *1998. Morphological variation in Hemisarcoptes* (Acari: Hemisarcoptidae): application of multivariate morphometric analyses. *Annals of the Entomological Society of America* 91(3): 335-349.
Notes: Mites of the genus *Hemisarcoptes* were collected from four geographically isolated portions of their distribution: California, France, New York and Texas. An analysis of variance, a principal component analysis (PCA), a discriminant function analysis, an analysis of allometric relationships among characters, and a vector analysis were used to interpret morphological differences among females and males, within and among localities. Adults differed significantly in total body length. Females from new York were significantly smaller than females from Texas and California, while males from France were significantly larger than males from Texas. In the principle component analysis, females were completely separable from males on PCI, a general-size vector with females being larger. Females from Texas were distinguished from all other females on PC2 (the primary shape vector). Female mites from France, New York, and California were separable on size and shape when Texas females were removed from the analysis. Mites from California were separable by the shape vector component. Within-gender discrimination of females and males from all four localities was attained via discrimination. Allometric coefficients in the midventral and anal-genital area were highly negatively allometric with size for males and highly positively allometric for females. Females from New York have a relatively disproportional expansion of this area, which could be correlated with egg size.

**Howard, F.W., Hamon, A., McLaughlin, M., Weissling, T. & Yang, S.L.** 1999. *Aulacaspis yasumatsui* (Hemiptera: Sternorrhyncha: Diaspididae), a scale insect pest of cycads recently introduced into Florida. (In English with summary in Spanish.) *Florida Entomologist* 82(1): 14-26.
Notes: Observations on this pest native to southeast Asia. Host plants include *Cycas, Dioon, Encephalartos, Microcycas,* and *Stangeria*. Biology; illustrations.

**Huang, J. & Polaszek, A.** 1998. A revision of the Chinese species of *Encarsia* Forster (Hymenoptera: Aphelinidae): parasitoids of whiteflies, scale insects and aphids (Hemiptera :

Aleyrodidae, Diaspididae, Aphidoidea). *Journal of Natural History* 32(12): 1825-1966.
Notes: The species of *Encarsia* Forster (Hymenoptera: Aphelinidae) known from China are revised. This study is based largely on newly-collected material from Fujian and Guangdong provinces in mainland China, and from the island of Taiwan. A total of 76 species are treated, including 29 new species, one new combination and 16 new records for China. All species are fully described or diagnosed, and illustrated. Three new specific synonymies are proposed and two lectotypes are designated. Four species are described from males only, three belonging to the perflava-group (ancistrocera, echinocera, viggianii), having modified antennae, and one (magnivena) in the strenua-group having very unusual fore wings. A key to the Chinese species of *Encarsia*, based largely on females, is provided.

**Huffaker, C.B. & Gutierrez, A.P.** 1999. Ecological Entomology 2nd ed. New York: John Wiley and Sons. 756 pp.
Notes: Entirely rewritten by a variety of new authors, this second edition contains 20 chapters in five parts: Part I: Introduction (Introduction to ecological entomology; The concept of the ecosystem); Part II: Basic biological and ecological adaptations, properties, behaviours, and processes (Growth and development of insects; The food of insects; Reproduction in insects; Adaptations to hazardous seasonal conditions: dormancy, migration, and polyphenism; Adaptations of insects to modes of life; and Biogeography and evolutionary history: wide-scale and long-term patterns in insects); Part III: Natural control of insect populations (Dynamics and regulation of insect populations; Weather and insects; Interspecific competition in insects; Dynamics of insect predator-pray interactions; Insect invasions and community assembly; Migration and movement; and Mathematical models for age-structured population dynamics); Part IV: Roles or effects of insects in ecosystems (Insect diversity and trophic complexity of communities; Insects on flowers; and The influence of insects on plant populations and communities); and Part V: Application of ecology to insect population management (Modelling tritrophic field populations; and Applications of ecology for integrated pest management). An index and list of contributors are included. Scale species discussed include *Aonidiella aurantii, Carulaspis visci, Dactylopius opuntiae, Icerya purchasi, Lepidosaphes newsteadi, Nuculaspis californica, Parlatoria oleae* and *Phenacoccus manihoti.*

**Indian Lac Research Institute.** 1998. Annual report 1997-98. (In English with summary in Hindi.) *Annual Report of the Indian Lac Research Institute, Entomology Division* No. 1997-98, 69 pp.
Notes: This annual report includes sections on research accomplishments in lac production; improvements in lac cultivation techniques; management of pests of lac insects [*Kerria* spp.] and host plants; propagation and management of lac host plants; lac processing and product development; improvement in the method of preparation of lac dye and aleuritic acid; synthesis of bioactive compounds from aleuritic acid; polyblends of shellac with synthetic resins/polymers; development of lac based wood and metal lacquer; technology transferred; and education and training. Lists of publicity; publications; ongoing projects; committees; symposia and conferences; and personnel are also presented.

**Itakura, Y., Ueno, E., Ito, Y., Oka, H., Ozeki, N., Hayashi, T., Yamada, S., Kagami, T., Miyazaki, Y., Otsuji, Y., Hatano, R., Yamada, E. & Suzuki, R.** 1999. Analysis of lac and

cochineal colors in foods using reversed-phase thin-layer chromatography scanning densitometry. *Journal of the Food Hygienic Society of Japan* 40(3): 183-188.
Notes: A technique for the analysis of lac and cochineal colors using reversed-phase TLC and scanning densitometry is described. The technique involves the following three steps: 1) clean-up of the colors with a C18 cartridge, 2) separation of the colors by reversed-phase C18-TLC using methanol-0.5 mol/L oxalic acid (5.5:4.5) as a solvent system, and 3) measurement of visible absorption spectra of the colors using scanning densitometry without isolation of the colors. In order to investigate the capability of the present method, 122 commercial foods were analyzed, and their chromatographic behaviors and spectra were observed. The separation and the spectra obtained were not affected by coexisting substances in the foods and the spots always gave the same Rf values and spectra as the standards, with good reproducibility. The present method is considered to be useful for the rapid analysis of lac and cochineal colors in foods.

**Itioka, A. & Inoue, T.** 1999. The alternation of mutualistic ant species affects the population growth of their trophobiont mealybug. *Ecography* 22(2): 169-177.
Notes: Many species of honeydew-producing Homopteran insects have mutualistic relationships with ants which defend them against their natural enemies in return for honeydew. In many cases of this type of mutualism (trophobiosis), a particular homopteran can associate with a range of mutualistic ant species. We studied the influence of alternation of two ant species, *Lasius niger* and *Pristomyrmex pungens*, both of which are mutualistic Partners of the citrus mealybug *Pseudococcus citriculus*, on population growth of their trophobiont mealybug. The growth rate of the mealybug population was significantly higher with attendance by either ant species than without it throughout the year. However, in the field, the mealybug population was significantly larger on trees where a *L. niger* colony made its territory than on trees where a *P. pungens* colony made its territory. When the attending ant species changed from *L, niger* to *P. pungens* the mealybug population significantly decreased compared with the population that *L. niger* continued to attend. In contrast, the mealybug population increased following the reverse shift, from *P. pungens* to *L. niger*. These results indicate that, for the mealybug, *L. niger* is a more effective mutualistic partner than *P. pungens*. This deviation was due to a difference in attack behavior by the two ant species. Behavioral responses by attending ants to artificial models of natural enemies were more aggressive in *L. niger* than in *P. pungens*. The territories of the two ant species were completely separated, and territory takeovers of one ant species by the other were occasionally observed. These facts suggest that interspecific competition between the two ant species is an important factor in determining the spatial distribution of the two species. Thus, we conclude that interspecific competition between the two ant species indirectly affects the population growth of their common trophobiont mealybug.

**Jahn, G.C. & Beardsley, J.W.** 1998. Presence/absence sampling of mealybugs, ants, and major predators in pineapple. *Journal of Plant Protection in the Tropics* 11: 1, 73-79.
Notes: To investigate the interspecific associations of gray pineapple mealybugs (*Dysmicoccus neobrevipes*), big-headed ants (*Pheidole megacephala*) and predators, ants were eradicated from half of a pineapple field near Honolua on the island of Maui, Hawaii. *P. megacephala* had a positive association with *D. neobrevipes*, and a negative association with predators. Mealybugs had a negative association with predators. The results of this study support the hypothesis that *P.*

*megacephala* protect *D. neobrevipes* from predation.

**Jaiswal, A.K., Sharma, K.K. & Agarwal, S.C.** 1999. A modified and upgraded device of insect-separation for managing the insect pests of lac. *National Academy Science Letters-India* 22(5-6): 106-110.
Notes: An indigenous device for automatic separation of predators, parasitoids of lac insects, and parasitoids of lac predators was modified and upgraded. This upgraded version retrieves more parasitoids of lac predators than earlier device. Scraped lac kept in a container and the side meshed unit made up of plastic pipes retrieve cent per cent parasitoids of lac predators viz., *Agathis coryphe, Brachymeria tachardiae, Elasmus claripennis* and *Pristomerus sulci* while in case of *Bracon greeni* and *Apanteles tachardiae* it could do so to the extent of 82% and 96% respectively. These species therefore, could be released in nature to augment their natural population and check predators of lac insect, *Kerria lacca*.

**James, D.G., Stevens, M.M., O'Malley, K.J. & Faulder, R.J.** 1999. Ant foraging reduces the abundance of beneficial and incidental arthropods in citrus canopies. *Biological Control* 14(2): 121-126.
Notes: The abundance of non-pest arthropods in ant-free or ant-infested ( *Iridomyrmex rufoniger* gp. spp.) citrus tree canopies was evaluated monthly in a 2-year study (September 1994-August 1996) in southern New South Wales, Australia. Limb tap samples from ant-free trees yielded a total of 4029 beneficial arthropods (predatory beetles, bugs and mites, lacewings, spiders, parasitic wasps) and 3650 other non-pest arthropods (mainly beetles, psocids, cockroaches) compared to 1839 and 2300, respectively, from ant-infested trees. The largest differences occurred during spring (September-November) of both years (1994 and 1995) and summer (December-February) of the second year (1995) when there were 2.8- to 4-fold more beneficial arthropods in the ant-free tree samples. No differences occurred during summer, autumn, and winter of the first year and autumn and winter of the second year. Other non-pest arthropods were 1.6- to 6.2-fold more abundant in ant-free citrus during spring and 2.3- to 3.9-fold more abundant in autumn with no difference in summer and winter. Most taxonomic groupings of beneficials showed ant-related population reductions during spring and some (e.g., spiders and predatory mites) were more abundant on ant-free trees throughout spring-autumn in the second year. These data suggest that canopy-foraging by honeydew-seeking ants reducing the abundance of natural enemies is the major cause of outbreaks of soft and armored scales on citrus in southern New South Wales.

**Jansen, M.G.M.** 2000. The species of *Pulvinaria* in the Netherlands (*Hemiptera: Coccidae*). (In English with summary in Dutch, Flemish.) *Entomologische Berichten* (Amsterdam) 60: 1-11.
Notes: The occurrence of the species of the soft scale genus *Pulvinaria* in The Netherlands is discussed. Four species occur in the open, one is native (*Pulvinaria betulae*)and three are introduced and established (*P. floccifera*, *P. hydrangeae* and *P. regalis*). Two species are only known from interceptions during import inspections and from greenhouses (*P. mesembryanthemi* and *P. psidii*). A key to the species is given.

**Jenser, G., Balázs, K., Erdélyi, C., Haltrich, A., Kozár, F., Markó, V., Rácz, V., Samu, F. &**

**Brown, M.W.** 1999. Changes in arthropod population composition in IPM apple orchards under continental climatic conditions in Hungary. *Ecosystems and Environment* 73: 2, 141-154.
Notes: [Special issue. Ecosystem approaches to managing insect pests of fruit. Papers presented at the XX International Congress of Entomology Symposium and related poster papers, 25-31 August 1996, Florence, Italy. Agriculture.] The effects of broad spectrum and selective insecticides on the structure of phytophagous and zoophagous communities were investigated in a controlled experiment carried out in an apple orchard in Hungary in 1992-94. Following the cessation of intensive use of broad spectrum insecticides and the regular application of selective insecticides (mainly insect growth regulator compounds) a characteristic succession was observed in the arthropod populations in apple orchards. The IPM strategy was developed against the arthropods occurring at a high population density in the apple orchards previously treated with broad-spectrum insecticides for many years (e.g. *Phyllonorycter blancardella, Leucoptera malifoliella, Panonychus ulmi*). After the regular application of selective insecticides the population density of the pests *Stephanitis pyri, Dysaphis devecta*, and *Quadraspidiotus perniciosus* increased, thus further improvement in the IPM programme is still required.

**Jin, C.G., Lang, X.J., Liu, J. & Zhang, M.** 1998. [Preliminary discussion on the late nt menace of serious pests to pine forests in Hangzhou and countermeasures.]. (In Chinese with summary in English.) *Journal of Zhejiang Forestry Science and Technology* 18: 5, 58-61.
Notes: Since the 1950s *Dendrolimus punctatus, Matsucoccus matsumurae* and *Bursaphelenchus xylophilus* have continuously endangered *Pinus* forests in Hangzhou, Zhejiang, China. The occurrence, causes and countermeasures against these pest problems are discussed.

**Johnson, D.T., Lewis, B.A. & Whitehead, J.D.** 1999. Grape scale (Homoptera: Diaspididae) biology and management on grapes. *Journal of Entomological Science* 34(2): 161-170.
Notes: Grape scale, *Diaspidiotus uvae* is a pest of grapes, *Vitis* spp., in the south central United States. This study compared Julian days and cumulative degree-days (DD at base 10 degrees C accumulated after 1 April) to grape scale biology and control in Arkansas.

**Karaca, I.** 1998. Parasitization efficacy of *Aphytis melinus* DeBach (Hymenoptera: Aphelinidae) as affected by host size and size distribution of *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae) in a lemon orchard. *Turkiye Entomoloji Dergisi* 22: 2, 101-108.
Notes: *Aonidiella aurantii* is a major pest of citrus in the east Mediterranean region of Turkey. *Aphytis melinus* is the most common natural enemy of *A. aurantii*. In this study, host size and host size distribution of *A. aurantii* were examined on mature lemon trees to determine possible causes on efficacy of *A. melinus* observed in field. *A. aurantii* density was significantly higher on fruits (1.00/cm2) than on leaves (0.61/cm2), twigs (0.05/cm2) or trunks (0.01/cm2). Virgin females tended to be larger on fruits than on other plant parts, while size of second stage larvae was not affected by plant part. Significantly more *A. aurantii* were parasitized by *A. melinus* on fruits (12.6%) and leaves (8.6%) than on twigs (1.0%); none of the individuals on trunks were parasitized. Distribution analyses of *A. aurantii* scale cover size showed two distinct groups of host sizes; the larval stages ranging between 0.06-0.30 mm2 and the virgin females being 0.30-0.70 mm2 in size. About 54.2% of the total *A. aurantii* population comprised of individuals smaller than 0.30 mm2 and only 9.5%

of them were parasitized. *A. aurantii* individuals larger than 0.40 mm2 were preferred for parasitization, but constituted only 20.4% of total population of which 52.3% were parasitized by *A. melinus*.

**Kattari, D., Heimpel, G.E., Ode, P.J. & Rosenheim, J.A.** 1999. Hyperparasitism by *Ablerus clisiocampae* Ashmead (Hymenoptera : Aphelinidae). *Proceedings of the Entomological Society of Washington* 101(3): 640-644.
Notes: *Ablerus clisiocampae* (Hymenoptera: Aphelinidae) is known as a parasitoid both of diaspidid scale insects and lepidopteran eggs. Although it has been suspected that *A. clisiocampae* is a secondary (hyper) parasitoid of diaspidid scale insects, direct evidence of hyperparasitism has been lacking. We used observation and rearing data from field-collected material to demonstrate hyperparasitism of three species of diaspidid scale insects, and primary parasitism of two species of parasitoid wasps by *A. clisiocampae. Ablerus clisiocampae* was found feeding on *Aphytis aonidiae* (Hymenoptera: Aphelinidae) attacking San Jose scale (*Quadraspidiotus perniciosus*) and *Comperiella bifasciata* (Hymenoptera: Encyrtidae) attacking California red scale (*Aonidiella aurantii*) and yellow scale (*A. citrina*). *Ablerus clisiocampae* were associated with pupal *Aphytis aonidiae* and pupal and pharate adult *C. bifasciata*. All *Ablerus clisiocampae* reared for this study were females.

**Kfoury, L. & El Amil, R.** 1998. [Pests in Lebanese citrus orchards in 1997.] Les insectes ravageurs des agrumes au Liban: la situation en 1997. (In French with summary in English.) *Phytoma* No. 508, 38-39.
Notes: A survey carried out on the Lebanese coast showed that citrus orchards support a certain number of insects, classified as potential and non-potential pests. Among the potential pests were the diaspidids *Aonidiella aurantii* and *Lepidosaphes beckii*, the coccids *Saissetia oleae* and *Ceroplastes floridensis*, the aphids *Aphis gossypii* and *Aphis citricola [A. spiraecola]*, the tephritid *Ceratitis capitata* and the gracillariid *Phyllocnistis citrella*.

**Khan, A.A., Avesi, G.M., Masud, S.Z. & Rizvi, S.W.A.** 1998. Incidence of mealy bug *Dismycoccus brevipes* (Cockerell) on pineapple. (In English with summary in Turkish.) *Turkish Journal of Zoology* 22: 2, 159-161.
Notes: *Dismycoccus brevipes [Dysmicoccus brevipes]* infestation is reported for the first time from Pakistan. Pineapple ratoon, crownlet, slip and sucker plants were infested. A total of 3464 pseudococcids were collected from these plants, with a mean of 43.3 bugs/plant. Two-thirds (2291) of the population was found on the roots, while one-third (1173) were recovered from the leaf bases.

**Khosla, S., Augustus, M. & Brahmachari, V.** 1999. Sex-specific organisation of middle repetitive DNA sequences in the mealybug *Planococcus lilacinus*. *Nucleic Acid Research* 27(18): 3745-3751.
Notes: Differential organisation of homologous chromosomes is related to both sex determination and genomic imprinting in coccid insects, the mealybugs. This report identifies two middle repetitive sequences that are differentially organised between the two sexes and also within the same diploid nucleus. These two sequences form a part of the male-specific nuclease-resistant chromatin (NRC) fraction of a mealybug *Planococcus lilacinus*. To understand the phenomenon of differential

organisation the components of NRC have been analysed by cloning the DNA sequences present, deciphering their primary sequence, nucleosomal organisation, genomic distribution and cytological localisation. The middle repetitive sequences within NRC are presumed to be functionally significant and the probable involvement in male-specific chromatin organisation is discussed.

**Kishi, Y. & Ogura, T.** 1998. [Outbreaks of *Matsucoccus matsumurae* (Hemiptera: Margarodidae) in [on *Pinus* spp.] Japan and its chemical control.]. (In Japanese.) *Journal of the Japanese Forestry Society* 80: 3, 236-238.

**Klein, H.** 1999. Biological control of harrisia cactus exceeding all expectations. *Plant Protection News* 54: 2-3.
Notes: The mealybug *Hypogeococcus festerianus* has been found to successfully control harrisia cactus in South Africa.

**Klein, H.** 1999. Biological control of three cactaceous weeds, *Pereskia aculeata* Miller, Harrisia martinii (Labouret) Britton and *Cereus jamacaru* De Candolle in South Africa. *African Entomology* (Jun 1999) 3-14.
Notes: Some of South Africa's most successful biological control programmes have involved cactaceous weeds, many of which were reviewed in 1991. This review deals with three species, previously considered to be of minor importance, which have been the focus of biocontrol efforts because of their increasing importance. The programme against *Harrisia martinii* (Labouret) Britton (=*Eriocereus martinii* (Labouret) Riccobono) has been successful and the weed can be completely controlled by the mealybug *Hypogeococcus festerianus* (Lizer y Trelles) (Pseudococcidae) and the stem-boring beetle *Alcidion cereicola* Fisher (Cerambycidae) if the insects are regularly redistributed to uncontaminated or new infestations. Both of these insects also attack the related *Cereus jamacaru* De Candolle in the field and have controlled the weed successfully in at least one area where both insects are present. However, it needs to be determined whether the insects can be successfully integrated with the current chemical control programme against *C. jamacaru*.

**Konar, A.** 1998. Seasonal incidence of mealybug species on mandarin orange in Darjeeling, West Bengal. *Horticultural Journal* 11: 2, 105-110.
Notes: A total of four species of mealybugs (*Drosicha stebbingi, Icerya purchasi, Labioproctus polei* and *Planococcus citri*) were observed on mandarin oranges in Darjeeling, West Bengal, India.

**Kosztarab, M.** 1999. [Transylvanian Roots: An Instructive Biography of a Hungarian-American Emigrant] (In Hungarian) Budapest: Püski Publ.. 228 pp.
Notes: This translated edition of the original work in English contains two new chapters: Our First Vacation in America and How I Found America. Scale work is mentioned in four of the chapters.

**Kosztarab, M. & Rhoades, M.H.** 1999. Disjunct distribution and endemism in the Appalachian scale insect fauna (Homoptera: Coccinea). Pages 121-124. *in* Eckerlin, R.P., Ed., Proceedings of the Appalachian Biogeography Symposium Special Publication Number 7 (Virginia Museum of Natural History). 257 pp.

Notes: Apparent disjunct distribution was noted for eight species representing five families: Margarodidae (*Xylococcus betulae*), Pseudococcidae (*Peliococcus flaveolus, P. serratus, Phenacoccus minimus* and *Puto kosztarabi*), Cryptococcidae (*Cryptococcus williamsi*), Kermesidae (*Allokermes nivalis*) and Diaspididae (*Abgrallaspis oxycoccus*). Endemism to the Appalachians was found in Ortheziidae (*Newsteadia americana*), Pseudococcidae (*Dysmicoccus patulae, Peliococcus saratogensis, Phenacoccus hortonorum, Puto kosztarabi, Trionymus lowryi*), Kermesidae (*Kermes prinus, Nanokermes folium*) and Eriococcidae (*Acanthococcus chilos*).

**Koteja, J.** 1998. Essays on coccids (Homoptera): sudden death in amber?. *Polskie Pismo Entomologiczne* 67: 185-218.
Notes: In amber, not only organisms, but also events are fossilized, called "in action inclusions" here. Among scale insect inclusions hatching and moulting specimens have been found, attempts at piercing the resin, sperm ejected into the resin, males with everted endophalus and various forms of syninclusions - specimens of different animal groups entombed with coccids in the same amber piece (e.g. phoretic mites), of different coccid taxa or of the same species (mother with her children, specimens in copula). The origin of various "in action inclusions" and their scientific value are discussed. It has been concluded that trouble understanding the actual nature of such inclusions arise from the poor knowledge of recent phenomena.

**Koteja, J.** 1999. *Eomatsucoccus andrewi* sp. nov. (Hemiptera : Sternorrhyncha : Coccinea) from the Lower Cretaceous of southern England. *Cretaceous Research* 20(6): 863-866.
Notes: *Eomatsucoccus andrewi* sp. nov. (Hemiptera: Sternorrhyncha: Coccinea: Matsucoccida) has been established on the basis of a wing impression from the Lower Weald Clay (Hauterivian, Lower Cretaceous) at Keymer Tileworks, West Sussex, southern England. It differs from the other two Lower Cretaceous species, *E. sukachevae* Koteja and *E. popovi* Koteja, in wing size (c. 3.3 mm long) and shape (gradually tapering towards apex). The taxonomy and palaeontology of the matsucoccids are discussed.

**Koutek, B., Streinz, L. & Romanuk, M.** 1998. Syntheses of insect sex pheromones. A review of the literature 1990-1998. *Collection of Czechoslovak Chemical Communications* 63(7): 899-954.
Notes: The term "insect sex pheromones" denotes compounds used for chemical communication between sexual partners in the insect kingdom, including pine bast scales. The aim of this review covering the literature 1990-1998 is to survey papers on their syntheses. A review with 201 references.

**Kozár, F.** 1998. *Ortheziola saringeri* sp. n. (Homoptera: Coccoidea, Ortheziidae) from Africa. *Acta Phytopathologica Academiae Scientiarum Hungaricae* 33(3-4): 335-339.
Notes: A new species *Ortheziola saringeri* is described from Africa. The new data indicate that this group needs further study in different regions in Africa.

**Kozár, F. & Miller, D.R.** 2000. World revision of *Ortheziola* Šulc (Homoptera: Coccoidea: Ortheziidae) with descriptions of eleven new species. *Systematic Entomology* 25: 15-45.
Notes: Soil samples and museum collections were analysed from all zoogeographic regions of the

world. From this material eleven new species of *Ortheziola* are described from Africa and the U.K., five additional species are redescribed and a key is presented for the identification of all sixteen species. A slightly modified concept of the genus is presented and several new characters are given as diagnostic of the genus. A phylogenetic hypothesis is given based on analysis of the morphological features of adult females. Results show that *Ortheziola* is most diverse in eastern Africa where relatively more advanced species occur. Basal species occur primarily in western Africa and Asia.

**Kreiter, P., Marro, J.P., Dijoux, L. & Tourniaire, R.** 1998. [The Japanese citrus f ruit scale, *Unaspis yanonensis*, is still causing problems on the French Riviera.] La cochenille japonaise des agrumes, *Unaspis yanonensis*: sur la Côte d'Azur, le problème n'est toujours pas resolu. (In French with summary in English.) *Phytoma* No. 508, 32-33.
Notes: *Unaspis yanonensis* is still the cause of widespread damage to citrus fruit on the French Riviera. During recent years, beneficial insects have been released, with apparent effectiveness. In 1997, samples were collected in order to draw up a list of parasitoids. The list contained many different species, but the species which had been released in greatest numbers (*Aphytis yanonensis*) could not be found. It would therefore seem that the species cannot survive from one year to the next and that in order for effectiveness to be ensured, renewed release of this particular parasitoid is required.

**Krishnamoorthy, A. & Rajagopal, D.** 1998. Effect of insecticides on the California red scale, *Aonidiella aurantii* (Maskell) and its natural enemies. *Pest Management in Horticultural Ecosystems* 4: 2, 83-88.
Notes: A number of insecticides was evaluated against *Aonidiella aurantii* in a citrus orchard in Bangalore, Karnataka, India. The effect of insecticides on the activity of two natural enemies, *Aphytis melinus* and *Chilocorus nigrita*, under field conditions was also assessed. Monocrotophos (0.08%), dimethoate (0.07%), chlorpyrifos (0.10%) and neem oil (2%) when applied once, gave only initial control of the scale. The population increased after 14 days of treatment. However, when applied twice at 14-day intervals, the scale was kept under control. All treatments were significantly superior to the control. Application of concentrated monocrotophos (36%) and dimethoate (35%) @ 10 ml/tree as a band on the tree trunk resulted in excellent control of the scale and other insect pests for 6-8 months. A delayed but severe phytotoxic effect was observed. All insecticides except neem oil were highly toxic to the natural enemies. Levels of chlorpyrifos were safe to natural enemies after 7 days of treatment.

**Kumar, M.V.S. & Chakraborty, N.** 1999. New record of a native predator, *Nephus* sp. on *Maconellicoccus hirsutus* (Green). *Journal of Advanced Zoology* 20(1): pp. 56-58.
Notes: The pink mealy bug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococicdae) is one of the major pest of mulberry plant, *Morus alba* L. causing "Tukra" (Figures. 1 & 2) with the characteristic symptoms like crinkling, curling and dark green leaves at the apices, bushy top due arrest of linear growth with thickening and twisting of affected shoots leading to considerable loss of leaf yield both quantitatively and qualitatively (2,5,6,8,9,11,12). Feeding silkworm with Tukra affected leaf causes significant decline in economic characters of silkworm rearing like larval weight,

cocoon weight, shell weight, silk ratio and effective rate of rearing(10).

**Labanowski, G.** 1998. [The cranberry scale - a new pest of Benjamin fig.] Czerwiec kalinowy - nowy szkodnik figowca benjaminskiego. (In Polish.) *Ochrona Roslin* 42: 12, 12-13.
Notes: *Lichtensia viburni* was found in a consignment of *Ficus benjamina* arriving in Poland from the Netherlands in 1997. Notes are given on its host plants, morphology and biology, and the male and female are illustrated.

**Lagowska, B. & Golan, K.** 1998. [The harmfulness of scale insects in orchards.] Szkodliwosc czerwcow w sadach. (In Polish.) *Ochrona Roslin* 42: 6, 21-23.
Notes: This article describes the distribution, biology, damage and control of scale insects in Poland. A survey of fruit orchards in the Lublin area of Poland in 1990-94 identified a 2-fold increase in the frequency of scale insect attack compared to 1980-82. The survey identified 11 species belonging to 3 families: *Phenacoccus aceris* (Pseudococcidae); *Eulecanium tiliae, E. douglasi, Palaeolecanium bituberculatum, Parthenolecanium corni, Pulvinaria vitis* and *Sphaerolecanium prunastri* (Coccidae); and *Lepidosaphes ulmi, Quadraspidiotus ostreaeformis, Q. perniciosus* and *Q. pyri* (Diaspididae). *P. corni* and *L. ulmi* were considered the worst pest problem.

**Lale, N.E.S.** 1998. Neem in the Conventional Lake Chad Basin area and the threat of Oriental yellow scale insect (*Aonidiella orientalis* Newstead) (Homoptera: Diaspididae). *Journal of Arid Environments* 40: 2, 191-197.
Notes: The extent of the threat posed to neem (*Azadirachta indica*) plantations by *Aonidiella orientalis*, its origin and spread in the Chad Basin (extending across parts of Niger, Nigeria, Chad and Cameroon), and strategies for control of this pest are examined.

**Lambdin, P.L.** 1999. New pit scales species of *Polea* (Hemiptera: Asterolecaniidae). *Annals of the Entomological Society of America* 92(2): 188-192.
Notes: The adult female and male of a new species of pit scale, *Polea martini*, are described and illustrated with measurements included for the various morphological structures. *P. martini* was collected on *Calophyllum* sp. in Borneo. This new species is morphologically similar to *P. selangorae* based on the lack of large 8-shaped pores on the venter, the appearance and number of multilocular pore clusters on submargin, and the shape of the anal ring and number of anal ring setae. A key to the species of *Polea* is also presented.

**Lambdin, P.L. & Grant, J.F.** 1999. Rare, Threatened, and Endangered (RTE) Terrestrial Invertebrate Survey (Final Baseline Inventory Report) Atlanta: CH2MHill. 65 pp.
Notes: Scales mentioned include *Chionaspis pinifoliae* and *Allokermes galliformis*.

**Latorre, B.A. & Zoffoli, J.P.** 1998. Phytosanitary status of pear in Chile with special reference to the phytopathological situation. *Acta Horticulturae* No. 475, 439-448.
Notes: [Proceedings of the VIIth International Symposium on Pear Growing, Talca, Chile, 19-22 January 1997.] European pear (*Pyrus communis*) and Asian pear (*P. pyrifolia*) are cultivated in the Central Valley, Chile. The most important pests are *Cydia pomonella, Quadraspidiotus perniciosus,*

*Pseudococcus affinis [P. viburni], Panonychus ulmi* and *Tetranychus urticae*. The main diseases of European pear are scab (*Venturia pirina*) and bacterial blossom blast (*Pseudomonas syringae* pv. *syringae*). Fire blight (*Erwinia amylovora*) is not known to occur in Chile. Asian pears are affected by bacterial blossom blast, but scab (*V. pirina*) is still unknown in Chile. Seasonal control programs are needed for controlling these pests and diseases. Post-harvest losses due to grey mould (*Botrytis cinerea*) and blue mould (*Penicillium expansum*) are usually very significant.

**Lehane, R.** 1998. Breadfruit pest succumbs to a ladybird beetle. *Partners in Research for Development* No. 11, 25-31.
Notes: A biological control programme against breadfruit mealybug (*Icerya* sp.), which attacks many plants but is most harmful to breadfruit, in the South Pacific conducted by scientists of national programmes in collaboration with Australian scientists is described. The origin, spread, current distribution, host range and life history of the mealybug is described, together with the damage it inflicts and its socioeconomic impact. Reasons for the failure of earlier attempts to control it by importing *Rodolia cardinalis* and *R. pumila* are discussed. Research in northern Australia involving climate matching and searching for predators that kept the mealybug under control there identified *R. limbata* as a promising candidate. Rearing methods were developed and the beetle was introduced in the Federated States of Micronesia in 1994 and Kiribati in 1995. Dramatic reductions in mealybug numbers were recorded following releases and damage to trees was markedly reduced. Further distribution of the predator and monitoring are continuing, and it is being introduced in other countries of the region including the Marshall Islands.

**Ling, K.S., Zhu, H.Y., Drong, R.F., Slightom, J.L., McFerson, J.R. & Gonsalves, D.** 1998. Nucleotide sequence of the 3 '-terminal two-thirds of the grapevine leafroll-associated virus-3 genome reveals a typical monopartite closterovirus. *Journal of General Virology* 79: 1299-1307, Part 5.
Notes: The RNA genome of grapevine leafroll-associated closterovirus-3 (GLRaV-3) was cloned as a cDNA generated from GLRaV-3-specific dsRNA, and a partial genome sequence of 13 154 nucleotides (nt) including the 3' terminus was determined. Phylogenetic analysis using various gene sequences (HEL, RdRp, HSP70 and CP) clearly demonstrated that GLRaV-3, a mealybug-transmissible closterovirus, is positioned independently from aphid-transmissible monopartite closteroviruses (beet yellows, citrus tristeza and beet yellows stunt) and whitefly-transmissible bipartite closterovirus (lettuce infectious yellows, LIYV). However, another alleged mealybug-transmissible closterovirus, little cherry virus, was shown to be more closely related to the whitefly-transmissible LIYV than to GLRaV-3.

**Liu, H.Q., Zhang, C.H., Cai, J., Shi, L., Li, L. & Chen, Y.P.** 1998. [The study of tropical climate (Jinghong, Yunnan) influence white wax scale.]. (In Chinese.) *Forest Research* 11: 5, 508-512.
Notes: Jinghong City in Yunnan Province, China, belongs to the tropical monsoon climate. In order to study the ecological adaptation of the white wax scale (*Ericerus pela*) and expand white wax production in the area, different host trees were planted in Jinghong and white wax scales were bred on the trees in 1992-96. The results show that high temperature, drought and intense sunshine were unfavourable to the growth and development of the white wax scale. Female white wax scales could

be reproduced, with a normal sex ratio, but the next generation of brood was small, the quantity of eggs was few. It is concluded that this tropical region is not suitable for producing a brood insect base. However, male insects secreted wax normally.

**Lizzio, S., Siscaro, G. & Longo, S.** 1998. [Analysis of the key factors of mortality of *Aonidiella aurantii* (Maskell) in Sicilian citrus groves.] Analisi dei principali fattori di mortalita di *Aonidiella aurantii* (Maskell) in agrumeti della Sicilia. (In Italian with summary in English.) *Bollettino di Zoologia Agraria e Bachicoltura. Milano* 30: 2, 165-183.
Notes: The spread of *Aonidiella aurantii* throughout Italian citrus groves over the past 10 years led to studies on the key factors of its mortality. The latter were determined by means of multiple linear regression analysis. Field investigations were carried out in two citrus orchards in Sicily with different infestation levels, cultivars and mesoclimatic conditions. Low temperatures were more effective than the higher ones in containing populations of the pest, while relative humidity had no influence. Among its natural enemies, *Aphytis melinus* and *Chilocorus bipustulatus* were the most effective. *A. melinus* was the most important regulating factor of *A. aurantii* populations at any host density level. However, the predator *C. bipustulatus* was effective only at high prey population levels, causing in this case a rapid decline of the scale population.

**Lo, P.L. & Chapman, R.B.** 1998. The role of parasitoids and entomopathogenic fungi in mortality of third-instar and adult *Ceroplastes destructor* and *C. sinensis* (Hemiptera: Coccidae: Ceroplastinae) on citrus in New Zealand. *Biocontrol Science and Technology* 8: 4, 573-582.
Notes: The incidence of parasitism and disease in third-instar and adult *Ceroplastes destructor* and *C. sinensis* on citrus in Northland, New Zealand, was measured from 1991-94. Both species were parasitized by female *Euxanthellus philippiae*. Female *E. philippiae* were hyper-parasitized by males of their own species and by *Coccidoctonus dubius*. Male *E. philippiae* were also tertiary parasitoids of *C. dubius*. *E. philippiae* was found in third-instar and adult *C. sinensis*, but was virtually restricted to third-instar *C. destructor*. Parasitoid phenology varied according to the instar and species of the host. Two fungal pathogens, *Verticillium lecanii* and *Fusarium* spp., were identified from both *C. destructor* and *C. sinensis*. Disease was a greater mortality factor than parasitism in *C. destructor*, whereas the opposite applied to those *C. sinensis* for which the cause of death could be identified. Disease levels were underestimated, particularly in *C. destructor*. Mortality from parasitism and disease did not act in a density-dependent manner.

**Loch, A.D. & Zalucki, M.P.** 1998. Outbreaks of pink wax scale, *Ceroplastes rubens* Maskell (Hemiptera: Coccidae), on umbrella trees in south-eastern Queensland: Patterns of parasitisation. *Australian Journal of Entomology* 37(4): 328-334.
Notes: The degree and distribution of parasitisation in relation to densities of pink wax scale, *Ceroplastes rubens*, on *Schefflera actinophylla* were investigated to determine whether scale outbreaks could be attributed, in part, to low levels of parasitisation. Rates of parasitisation were independent of or inversely dependent on host density, and highly variable, especially at low densities. The absence of density dependent parasitisation may occur as a result of (i) non-aggregation by parasitoids; (ii) aggregation by parasitoids where parasitisation is limited by intrinsic or extrinsic factors; and/or (iii) high rates of hyperparasitisation.

**Luck, R.F., Jiang, G. & Houck, I.A.** 1999. A laboratory evaluation of the astigmatid mite *Hemisarcoptes cooremani* Thomas (Acari : Hemisarcoptidae) as a potential biological control agent for an armored scale, *Aonidiella aurantii* (Maskell) (Homoptera : Diaspididae). *Biological Control* 15(2): 173-183.
Notes: The host stage and species utilized by a parasitic mite, *Hemisarcoptes cooremani* Thomas (Acari: Hemisarcoptidae), was studied to evaluate the mite's potential as an augmentative biological control agent against California red scale, *Aonidiella aurantii* (Maskell) (Diaspididae: Homoptera). We compared how readily the mite established on five oleander scale, *Aspidiotus nerii* (Bouche), stages and eight red scale stages using no-choice experiments in which mites were offered a single scale stage and species. We also offered the mite a choice between two stages of the same species, a choice between oleander and red scale in the same stage, and a choice between oleander and red scale in the same two stages. We found that few mites established on scales younger than second molt, but they readily established on the older oleander scale stages. They accepted gravid and parturient female red scale less readily than they did the same oleander scale stages. We suspect that the heavily scleratized body of California red scale attached to the cover in these stages prevented the mite from gaining access to the scale body on which to feed. Our results suggest that red scale is a poor-quality host for the mite. Consequently, this predator/parasitoid is unlikely to be an effective augmentative biological control agent against *A. aurantii* in California's San Joaquin Valley. The younger stages provide insufficient resources for the mite to develop and reproduce and the older stages are too difficult to feed on.

**Mani, M. & Krishnamoorthy, A.** 1998. Regulation of *Rastrococcus iceryoides* (Green) on guava. *Insect Environment* 4: 3, 71.
Notes: *Rastrococcus iceryoides* was recorded as a new pest of guava in India in December 1996, infesting the shoots and fruits. The pest was heavily parasitized by *Praleurocerus viridis*, which was thought to be responsible for its disappearance in December-January.

**Mani, M., Krishnamoorthy, A. & Verghese, A.** 1998. Suppression of the soft green scale *Coccus viridis* (Green) (Coccidae: Homoptera) on acid lime in India. *Advances in IPM for horticultural crops: Environmental implications and thrusts.* 210-212.
Notes: [Proceedings of the First National Symposium on Pest Management in Horticultural Crops, Bangalore, India, 15-17 October 1997.] In a field study in 1994/95 in Karnataka in an acid lime (*Citrus aurantiifolia*) orchard, predators *Chilocorus nigrita, Chilocorus circumdatus* and *Cryptolaemus montrouzieri*, and parasitoid *Encyrtus lecaniorum* suppressed the infestation by *Coccus viridis*.

**Maribashetty, V.G., Reddy, G.S. & Verghese, A.** 1998. *Cryptolaemus montrouzieri* - an effective predator of *Maconellicoccus hirsutus* (Green) on mulberry and its impact on silkworm rearing. *Advances in IPM for horticultural crops* 222-224.
Notes: Proceedings of the First National Symposium on Pest Management in Horticultural Crops: environmental implications and thrusts, Bangalore, India, 15-17 October 1997. *Bombyx mori*, fed on mulberry leaves affected by 'tukra' disease (transmitted by *Maconellicoccus hirsutus*) performed poorly compared with feeding healthy mulberry leaves from plots where the predator beetles

*Cryptolaemus montrouzieri* were released two weeks before leaf harvest.

**Martinez, M. de los A. & Suris, M.** 1998. [Biology of *Planococcus minor* Maskell (Homoptera: Pseudococcidae) under laboratory conditions.] Biología de *Planococcus minor* Maskell (Homoptera: Pseudococcidae) en condiciones de laboratorio. (In Spanish with summary in English.) *Revista de Protección Vegetal* 13: 3, 199-201.
Notes: The biology of *Planococcus minor* was studied in the laboratory at 26.4±0.3°C and 69.1±7.7% RH. Fertility and eclosion were 75.6%. The incubation period was 3.5 days. The duration of development was shorter in females (19.12 days) than in males (22.6 days). The duration of the reproductive period was 14.9 days, with a mean fecundity of 219 eggs. The life cycle, longevity and generation time were of 50, 31 and 41 days, respectively. Mortality was 70% and sex ratio was 0.82.

**Matile-Ferrero, D.** 1998. [*Stricklandina* as a new name replacement for *Stricklandiella* Matile-Ferrero & Le Ruyet, 1986.] *Stricklandina* nouveau nom de remplacement pour *Stricklandiella* Matile-Ferrero & Le Ruyet, 1986 (Hemiptera, Coccoidea, Pseudococcidae). (In French.) *Revue Française d'Entomologie* 20(4): 173.
Notes: *Stricklandiella williamsi* is the type-species for this genus.

**Matile-Ferrero, D. & Ben-Dov, Y.** 1999. *Bimillenia*, a new genus of mealybugs associated with ants in the Mediterranean basin (Hemiptera, Coccoidea, Pseudococcidae). (In English with summary in French.) *Bulletin de la Société Entomologique de France* 104(2): 109-111.
Notes: Description of new genus and type species, *Ripersia plagiolepicola*, now new combination *Bimillenia plagiolepicola*.

**Matile-Ferrero, D. & Étienne, J.** 1998. [New introduction of *Paracoccus marginatus* into Guadaloupe and St. Barthelemy, in the French Caribbean. *Paracoccus marginatus* Williams & Granara de Willink, nouvelle introduction en Guadeloupe et à Saint-Barthélemy (Hemiptera, Pseudococcidae). (In French with summary in English.) *Revue Française d'Entomologie* 20(4): 142.
Notes: This species also distributed in Belize, Costa Rica, Guatemala and Mexico. Hosts include *Cajanus cajan, Carica papaya, Jatropha integerrima, Hibiscus rosa-sinensis, Malpighia glabra, Malvaviscus arboreus, Teramnus labialis, Cestrum nocturnum, Pachystachys lutea, Hibiscus rosa-sinensis, Rosa* sp., and *Plumeria alba*. *Maconellicoccus hirsutus* also mentioned as a recent introduction.

**Miller, D.R. & Gimpel, M.E.** 1999. New combinations, new synonymy, and homonomy in the Eriococcidae, new homonomy and synonymy in the Cerococcidae, and transfer of *Cancerococcus* Koteja to the Margarodidae (Hemiptera: Coccoidea). *Proceedings of the Entomological Society of Washington* 101(1): 212-218.
Notes: A database and catalog of the eriococcid and cerococcid scale insects of the world is nearly complete and soon will be in press and placed on the World Wide Web. Before this is done, new combinations and other taxonomic changes need to be validated in print. This publication includes *Neokaweckia* Tang and Hao as a new synonym of *Eriococcus*, proposal of *Neotrichococcus* as a new name for *Trichococcus* Borchsenius, and new combinations in the family Eriococcidae; a new

homonym and synonym in the Cerococcidae; and transfer of *Cancerococcus* from Eriococcidae to Margarodidae.

**Miller, D.R., Gullan, P.J. & Williams, D.J.** 1998. Family placement of species previously included in the scale insect genus *Sphaerococcus* Maskell (Hemiptera: Coccoidea). *Proceedings of the Entomological Society of Washington* 100: 286-305.
Notes: The genus "*Sphaerococcus*" Maskell includes many rotund scale insects that do not seem to fit elsewhere; family placement of many species into Pseudococcidae is questionable or unknown; purpose of paper is to provide correct family placement of each species described in this genus; 12 taxa are transferred to new families; five new combinations and one new synonymy.

**Miller, R.H. & Jones, M.J.** 1998(1997). Fluctuation in a population of ground pearls, *Porphyrophora tritici* (Bodenheimer) (Homoptera: Margarodidae), in barley in northern Syria. *Rachis* 16: 84-88.
Notes: A barley field on an ICARDA research farm near the village of Bouider, 60 km southeast of Aleppo, Syria, was 95% infested with *P. tritici* during spring 1987. Annual rainfall in this area is about 220 mm, falling during October to April. Information is presented on the plant infestation and population composition (first instar nymphs and second instar cysts) of *P. tritici* on the barley landrace Arabi Abiad, grown on this field during the 1987-88 and 1988-89 seasons after cultivation by disc to a depth of about 10 cm. During the 1987-88 season, number of plants infested by *P. tritici* decreased from about 35% in January to <5% in May; no infestation was observed during 1988-89. The effects on insect infestation of the farming systems involving barley in Syria's marginal rain-fed areas, and particularly grazing by sheep, are mentioned.

**Morgan, D.J.W. & Hare, J.D.** 1998. Volatile cues used by the parasitoid, *Aphytis melinus*, for host location: California red scale revisited. *Entomologia Experimentalis et Applicata* 88(3): 235-245.
Notes: *Aphytis melinus* DeBach (Hymenoptera: Aphelinidae) is a biological control agent of diaspidid scale insects. The parasitoid has a narrow host range but its hosts are polyphagous. We determined the source of volatile cues the wasp uses to locate its few host species when those hosts occur on more than one host plant species. We addressed four questions in regard to the use of volatile cues in host location of California red scale, *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae): (1) Does *A. melinus* us e volatile cues to assist in host location? (2) Are these cues innately recognized or learned? (3) Are cues produced by female California red scale, or from other sources? (4) Are the cues specific to the host or host plant? These questions were tested through the use of a Y-tube olfactometer. Female *A. melinus* used volatile cues to orient toward both infested and uninfested host plant material. Wasps learned these cues by associating odors from the host plant with host presence. They had no innate preferences for scale insect or host plant volatile stimuli. Contrary to previous studies, we found no evidence of orientation toward the female-produced sex pheromone of California red scale, nor to volatile cues from the attacked host stage. Wasps given experience with scale insects growing on lemon fruit subsequently oriented toward lemon and orange fruit and leaves. The scale species with which the wasp was given experience did not affect this preference. Wasps given experience with California red scale growing on squash did not orient toward infested lemon fruit. The host ranges of the parasitoid and its hosts are used to explain the

adaptive value for the evolution of learned rather than fixed responses to cues used in foraging behavior.

**Mourad, A.K. & Zanuncio, J.C.** 1998. Population dynamics of *Parlatoria blanchardi* (Targ.) (Homoptera: Diaspididae) on two date palm varieties in Egypt. *Mededelingen Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen Universiteit Gent* 63: 2a, 389-395.
Notes: The seasonal abundance of the scale insect, *P. blanchardii*, attacking date trees (Zaghloul and Semmany varieties) in the El-Beheira Governorate (at two sites, Idko and Rashid) in Egypt, was studied. For each 10-year-old tree, 10 leaflets were sampled with samples taken once monthly. The pre-adult stages and adults were surveyed between September 1994 and August 1995. Monthly infestation rates by *P. blanchardii* on leaflets were recorded. Leaves of Zaghloul and Semmany at Idko were more susceptible to *P. blanchardii* infestation. The scale preferred the upper surface of leaves and there were four generations per year at both sites. It is concluded that parasitization by *Aphytis* sp. has an important role in regulating the population dynamics of *P. blanchardii*.

**Mourikis, P.A., Tsourgianni, A., Chitzanidis, A. & Kester, D.** 1998. Pistachio nut insect pests and means of control in Greece. *Acta Horticulturae* No. 470, 604-611.
Notes: [Proceedings of the second international symposium on pistachios and almonds, Davis, California, USA, 24-29 August 1997.] The major and minor insect pests attacking pistachio trees in Greece are described. *Capnodis tenebrionis* has been observed in roots of non-irrigated trees. On branches and twigs of weakened trees the coleopterans *Acrantus vestitus, Estonoborus perrisii [Carphoborus perrisi]* and *Sinoxylon sexdentatum* might be found. On leaves, the leaf folders *Archips rosanus* and *Teleiodes decorella* are endemic in some regions. *Thaumetopoea solitaria* has been reported only once feeding on leaves. Leaf-feeding Coleoptera, mainly Chrysomelidae, are widespread but are of minor importance. *Pseudocoeliodes rubricus* attacks the inflorescences of male trees only. The psyllid *Agonoscena* sp. may cause premature defoliation. *Idiocerus stali [Sulamicerus stali]*, when in large populations, causes withering of leaves and blight of young panicles. The most serious pests of pistachios are the microlepidopteran *Palumbina guerinii* and the seed chalcid *Eurytoma plotnikovi*. Both attack fruits every year, causing up to 90% infestation. The scale insects *Anapulvinaria pistaciae, Saissetia oleae, Ceroplastes rusci, Melanaspis inopinata* and *Lepidosaphes pistaciae* have been observed in small populations. *Apomyelois ceratoniae [Ectomyelois ceratoniae]* has been found on split fruits remaining on the trees after harvest. This species and *Ephestia* sp. may infest stored nuts. For most of these pests, sanitation measures are the primary means of control. Annual spray applications are necessary against *P. guerinii* and *E. plotnikovi*. Sprays against other pests are applied only in cases of heavy infestations.

**Ni, D.W.** 1998. [Main pests and diseases of *Castanea mollissima* in Zhejiang and their control techniques.]. (In Chinese with summary in English.) *Journal of Zhejiang Forestry Science and Technology* 18: 6, 68-71.
Notes: The damage symptoms and ecological characteristics of the main diseases and pests endangering *Castanea mollissima* in Zhejiang, China, are described. These are caused by: *Cryphonectria parasitica* (a fungal pathogen), *Pseudomonas castanae* (a bacterial pathogen), and *Kermes nawae, Lachnus tropicalis, Dryocosmus kuriphilus, Cyllorhynchites sursulus, Characoma*

*ruficirra* and *Dicrocis punctiferalis [Conogethes punctiferalis]* (all insect pests). Some [environmental] prevention techniques are also outlined.

**Nicholas, A.H., Thwaite, W.G. & Spooner-Hart, R.N.** 1999. Arthropod abundance in an Australian apple orchard under mating disruption and supplementary insecticide treatments for codling moth, *Cydia pomonella* (L.) (Lepidoptera: Tortricidae). *Australian Journal of Entomology* 38: 1, 23-29.
Notes: The impact of three codling moth management strategies: (1) mating disruption alone; (2) mating disruption + azinphos-methyl, and (3) mating disruption + fenoxycarb, on some secondary pests and their natural enemies in an apple (cv. Jonathan, Granny Smith and Red Delicious) orchard were compared during 1993-94 and 1994-95 in Australia. In the absence of azinphos-methyl (strategies 1 and 3), two-spotted mite (*Tetranychus urticae*) was controlled by *Typhlodromus occidentalis* and populations of generalist predators (e.g. ladybirds [Coccinellidae], lacewings [Chrysopidae] and earwigs [Forficulidae]) increased. Populations of a parasitoid of woolly aphid (*Eriosoma lanigerum*), *Aphelinus mali*, also increased but not enough to provide adequate control of the aphid. Combined damage caused by lightbrown apple moth (*Epiphyas postvittana*), budworms (*Helicoverpa* spp.) and San Jose scale (*Quadraspidiotus perniciosus*) was significantly higher in the absence of azinphos-methyl in 1994-95. Beneficial insect populations were not suppressed by fenoxycarb. In 1994-95, mating disruption + fenoxycarb produced better control of *E. postvittana* than mating disruption alone. During transition to an apple integrated pest management program based on codling moth mating disruption, fenoxycarb was shown to be less disruptive to any natural control of secondary pests than azinphos-methyl.

**Nowierski, R.M., Huffaker, C.B., Dahlsten, D.L., Letourneau, D.K., Janzen, D.H. & Kennedy, G.G.** 1999. The influence of insects on plant populations and communities. Pages 585-642. *in* Huffaker, C.B. & Gutierrez, A.P., Ecological Entomology. 2nd ed. New York: John Wiley & Sons. 756 pp.
Notes: *Parlatoria oleae* and *Icerya purchasi* mentioned as examples of insect populations used to evaluate the impact of biological control. *Carulaspis visci* and *Lepidosaphes newsteadi* were given as examples of herbivores that have closely coevolved with a particu lar host species but are more detrimental to a relative of the host than to the original host itself. *Dactylopius opuntiae* discussed in relation to their ability to regulate populations of *Opuntia* spp.

**Obrycki, J.J. & Kring, T.J.** 1998. Predaceous Coccinellidae in biological control. *Annual Review of Entomology* 43: 295-321.
Notes: Coccinellidae are important natural enemies of pest species, including mealybugs and scales; example given on successful biological control of cottony-cushion scale (*Icerya purchasi)* by *Rodolia cardinalis;* three *Chilocorus* spp. mentioned against *Aonidiella aurantii*.

**Oka, H., Ito, Y., Yamada, S., Kagami, T., Hayakawa, J., Harada, K., Atsumi, E., Suzuki, M., Suzuki, M. & Odani, H.** 1998. Separation of lac dye components by high-speed counter-current chromatography. *Journal of Chromatography A* 813: 71-77.
Notes: Lac dye is a natural food additive extracted from a stick lac which is a secretion of the insect

*Coccus laccae (Laccifer lacca* Kerr) and is widely used for coloring food. It is known that its red color is derived from a water-soluble pigment including laccaic acids A, B, C, and E. The quantities of these components vary according to the locality and season. For food sanitation and safe manufacturing practice, therefore, the development of a simple and precise method for identification of each component is required. High-speed counter-current chromatography (HSCCC), an advanced liquid-liquid partition method that does not require a solid support, has been used as a technique for the purification of lac dye components in these experiments.

**On a scale of 1 to . .** 1999. *Arborist News* 8: 1, 35-36.
Notes: The establishment and spread of horse chestnut scale, *Pulvinaria regalis*, throughout Great Britain, is discussed. The life cycle and ecology of *P. regalis* are reviewed. The symptoms of scale infestations and their effects on horse chestnuts [*Aesculus hippocastanum*] are discussed. Recommendations for management of scale infestations in urban trees are given.

**Onorato, M., Casu, A.P. & Gerardi, M.** 1998. [The effect of temperature and development on citrus fruits.] Temperatura e sviluppo del cotonello degli agrumi. (In Italian.) *Informatore Agrario* 54: 32, 75-77.
Notes: The relationship between temperature and infestations of *Planococcus citri* (determined by trap catches) on citrus fruits was determined from field studies conducted in Italy. A model to describe this relationship is given.

**Ozaki, K., Kitamura, S. & Subiandoro, E.** 1999. Life history of *Aulacaspis marina* Takagi and Williams (Hom., Coccoidea), a new pest of mangrove plantations in Indonesia, and its damage to mangrove seedlings. *Journal of Applied Entomology* 123(5): 281-284.
Notes: Scale insects of a newly described species, *Aulacaspis marina* Takagi and Williams, have killed a large number of mangrove (*Rhizophora mucronata* Lamk.) saplings planted in abandoned shrimp ponds on Ball island, Indonesia. The mean fecundity of *A. marina* was 141 eggs. The generation time of this species was between 34 and 42 days, based on four generations, suggesting that the species has nine to 10 generations a year on Ball island where the temperatures are seasonally constant. When crawlers of *A. marina* were transferred to potted seedlings of *R. mucronata*, they settled on all leaves of the seedlings. Newly expanded leaves were not infested by the first generation crawlers but were attacked by the following generations. The insect attack induced browning of the leaves and finally caused leaf fall; the leaves fell 25-159 days after the crawler transfer. Consequently, the seedlings died on average 128 (range 82-159) days after infestation. This suggests that once a large number of crawlers attack *R. mucronata* seedlings, *A. marina* can kill them within several months. When crawlers were transferred to potted seedlings of three mangrove species (*R. mucronata, Rhizophora apiculata*, and *Bruguiera gymnorrhiza*), which were the main species planted at the study site, the numbers that developed into adult females did not differ significantly among these species. This suggests that these mangrove species are almost equally susceptible to *A. marina*.

**Pankhurst, C.E., Magarey, R.C., Stirling, G.R., Holt, J.A., Brown, J.D. & Hogarth, D.M.** 1999. Rotation-induced changes in soil biological properties and their effect on yield decline in sugarcane.

*Proceedings of the 1999 Conference of the Australian Society of Sugar Cane Technologists* 79-86.
Notes: [Conference held at Townsville, Queensland, Australia, 27-30 April 1999.] The impact of three different rotation breaks (legume/grass pasture, alternate crops and bare fallow) on components of the soil biota was evaluated at three sites (Tully, Ingham and Mackay) in Queensland, Australia. The breaks had different effects on the soil biota, but each produced a large increase (rotation response) in the growth and yield of the subsequent sugarcane crop. All three breaks reduced the population density of the lesion nematode, *Pratylenchus zeae*, the number of spores of *Pachymetra* and the numbers of ground pearls (Margarodidae). Microbial biomass levels under the crop and continuous cane treatments were similar at all three sites. *Pseudomonas* spp. increased significantly under the pasture break at all sites but rotation-induced shifts in populations of other culturable groups of microorganism were variable. There was, however, a general decline in all microbial groups measured under the bare fallow break at Ingham and Mackay. Fatty acid analysis of the soils indicated that gram negative bacteria, fungi and mycorrhizal fungi were present in significantly higher amounts under the pasture break at each site. Plant growth experiments in the glasshouse showed that the bare fallow break was as effective as fumigation in removing yield decline symptoms from the soil. In contrast, the pasture and cropped soils gave a fumigation response, suggesting that yield decline pathogens were still present in these soils. However, this fumigation response was additive to the rotation response achieved by these treatments, indicating the possibility of further increases in sugarcane growth following these breaks.

**Park, I.G., Mah, Y.I., Yoon, H.J. & Yang, S.Y.** 1998. [Studies on the regional distribution and some ecological characteristics of Chinese white-wax scale in Korea.]. (In Korean with summary in English.) *Korean Journal of Applied Entomology* 37: 2, 137-142.
Notes: The regional distribution and some ecological characteristics of *Ericerus pela* were investigated in 1996/97 in the Republic of Korea. 10.8% of the stems of privet (*Ligustrum obtusifolium*) were infested with the scale in Chungpyong compared 1.1% in Yongwol and Pyongtaek. The average survival rate of the female adult on privet was 85.3%. A female laid 7783.5 eggs on average, and 36.7% of females laid between 7000 and 10 000 eggs. Average egg size was 0.40 mm in length and 0.21 mm in width. The hatchability was highest at 27°C. Eggs could be preserved at 15°C for 50 days in maximum.

**Pellizzari-Scaltriti, G. & Fontana, P.** 1999. *Rhizopulvinaria nevesi* (Gomez-Menor Ortega, 1946) n. comb. for *Leconopsis nevesi* and comments on the genus *Rhizopulvinaria* Borchsenius, 1952 (Hemiptera Coccoidea Coccidae). (In English with summary in Italian.) *Bollettino di Zoologia Agraria e Bachicoltura. Milano* Ser. II, 31(1): 17-23.
Notes: This species is transferred to *Rhizopulvinaria*. The adult female is redescribed and illustrated and lectotype is designated.

**Petschen, I., Parrilla, A., Bosch, M.P., Amela, C. & Botar, A.A.** 1999. First total synthesis of the sex pheromone of the oleander scale *Aspidiotus nerii*: An unusual sesquiterpenic functionalized cyclobutane. *Chemistry - A European Journal* 5(11): 3299-3309.
Notes: The first total synthesis of the sex pheromone of the oleander scale *Aspidiotus nerii* (5), an economically important polyphagous pest, is described. The synthesis is based on a stereocontrolled

and completely regioselective intramolecular exo-cyclization of cis-epoxynitrile 9 to afford cyclobutane alcohol t-10 stereoselectively. Introduction of the unusual 4-methylpent-4-enyl group onto the cyclobutane skeleton was effected through Wittig reaction of aldehyde 17b with the bulky ylide 3,3(ethylenedioxy)butylidenetriphenyl-phosphorane. This process requires protection of the primary hydroxy group of 10 with a nonbulky protecting agent, like methoxymethyl (MQM) but not tetrahydropyranyl (THP), as confirmed by molecular modelling studies. After selective transformations to manipulate the three acid-sensitive protecting functionalities present, that is, the tert-butyl-dimethylsilyl (TBDMS), ethylene acetal, and MOM groups, compound 5 was obtained in 26.4% overall yield from t-10b. In a different approach, complete cleavage of these protecting groups in 19b furnished keto diol 31, which after regioselective acetylation of the primary alcohol and Wittig reaction afforded acetate 5 in 21.4% overall yield from t-10b. The synthetic material exhibited spectroscopic features identical to those of the natural material and showed remarkable biological activity in field tests.

**Phillips, S., Briddon, R.W., Brunt, A.A. & Hull, R.** 1999. The partial characterization of a badnavirus infecting the greater asiatic or water yam (*Dioscorea alata*). (In English with summary in German.) *Journal of Phytopathology* 147: 5, 265-269.
Notes: A bacilliform virus from *Dioscorea alata* , designated *Dioscorea alata* bacilliform virus (DaBV), from Barbados and West Africa and from other *Dioscorea* spp. from West African, Caribbean, Asian and South American countries, was characterized. The virus was transmitted by the mealybug, *Planococcus citri* and by mechanical transmission of partially purified preparations to several *Dioscorea* spp.

**Pijls, J.W.A.M., Driessen, G.J.J, Butot, R.P.T., Conijn, C.G.M., Van Alphen, J.J.M. & Francke, P.J.** 1998. Development of an environmentally friendly method to control the mealybug *Phenacoccus emansor* in iris bulb stores in the Netherlands. *Proceedings of the Section Experimental and Applied Entomology of the Netherlands Entomological Society* 9: 111-116.
Notes: [Proceedings of the 9th Meeting of Experimental and Applied Entomologists, Leiden, Netherlands, 19 December 1997.] Mealybugs are a recurrent problem in storage rooms of flower bulbs in the Netherlands, despite preventative chemical treatment. The causes of this problem, and the biology, ecology and dispersal opportunities of *P. emansor* in Iris bulbs were investigated. Alternative control methods (both curative and preventative) were tested. Combined physical and biological control methods offer good prospects to solve the mealybug problem in an environmentally friendly manner.

**Pink Mealybug *Maconellicoccus hirsutus* (Green)** 1998. Subtitle: The emergence reproduction and spread of the pink mealybug in the Americas. San Jose, Costa Rica: IICA (Inter-American Institute for Cooperation on Agriculture). 31 pp.
Notes: *M. hirsutus* was detected in the Caribbean Lesser Antilles Islands in 1994 and by 1998 has been found in 21 Caribbean countries and/or islands and one country in South America (Guyana). The pest has been reported on over 200 host plants and is responsible for significant economic losses in agriculture, forestry, tourism, parks and natural preserves. This report provides background on the current problem and describes alternative courses of action, advocating a regional response to

include all countries either infested or at risk.

**Portillo, L. & Vigueras, A.L.** 1998. Natural enemies of cochineal (*Dactylopius coccus* Costa): Importance in Mexico. *Journal of the Professional Association for Cactus Development* 3: 43-49.
Notes: At the present time, the culture of carmine cochineal (*Dactylopius coccus* is redeveloping in Mexico and the world. However, several natural enemies reduce very significantly the populations of this insect on its *Opuntia* hosts, especially in Mexico where there is a higher impact. Therefore, it is necessary to develop some controls over the enemies of cochineal. This paper presents information about the natural enemies of cochineals, with emphasis on Mexico, as a first step to support further controls.

**Potter, D.A.** 1998. Destructive turfgrass insects: biology, diagnosis and control. Chelsea, MI: Ann Arbor Press (a Division of Sleeping Bear Press). 344 pp.
Notes: A practical reference for turfgrass professionals, lawn care specialists, grounds and golf course managers, landscapers and others. Insects covered include *Margarodes meridionalis, Odonaspis ruthae, Tridiscus sporoboli* and *Trionymus* spp. Importance and nature of injury, host species, distribution, brief field descriptions, life history and habits, and control are topics discussed.

**Prasad Kumar, Divakar, B.N., Hegde, N.K. & Ganigara, B.S.** 1998. Nature of damage and efficacy of insecticides against mealybug, *Ferrisia virgata* (Ckll.) on black pepper cuttings. *Pest Management in Horticultural Ecosystems* 4: 52-53.
Notes: Among 6 insecticides tested against *Ferrisia virgata* in black pepper (*Piper nigrum*) cuttings under glass in Karnataka, India, dimethoate, parathion-methyl and quinalphos were the most effective.

**Puertas, M.J., González-Sanchez, M., Manzanero, S., Romera, F. & Mar Jiménez, M.** 1998. Genetic control of the rate of transmission of rye B chromosomes. IV. Localization of the genes controlling B transmission rate. *Heredity* 80: 209-213.
Notes: *Pseudococcus affinis* is mentioned as another species besides rye where variation in B transmission rate has been reported.

**Qin, T.K. & Gullan, P.J.** 1998. Systematics as a tool for pest management: case studies using scale insects and mites. *Sixth Australasian Applied Entomological Research Conference* 1: 479-488.
Notes: [Conference held in Brisbane, 29 Sept. - 2 Oct. 1998.] The geographic origins or original sources of many introduced pests are often unknown, which can hamper their long-term management using effective natural enemies. Although many studies have shown that accurate identification of pests is vital to their successful biological control, the application of phylogenetic methods to solving applied taxonomic problems is uncommon. This paper demonstrates how systematics can be used as a tool: (1) to predict the geographic origin of a pest; and (2) to pinpoint the area from the range of a widespread pest which served as the source for a particular introduction. We use the Chinese wax scale *Ceroplastes sinensis* (not found in China as implied by its name), a pest of citrus, to exemplify the first point, and the redlegged earth mite *Halotydeus destructor*, a pasture pest, as an example of both points. A cladistic study of the wax scale group showed that the sister species of

the Chinese wax scale was South American in origin; a subsequent visit to Argentina was successful in finding this pest scale and its parasitoid wasps.

**Reardon, R.C., Edwards, W.G. & Meyerdirk, D.** 1998. Pink Hibiscus mealybug. (In English with summary in Spanish.) *United States Department of Agriculture, Forest Service, State and Private Forestry* HT-1: 1-14.
Notes: Revision of Program Aid No. 1606; pamphlet by D.E. Meyerdirk. Life history and identification, damage, conventional control measures and color photographs.

**Redak, R.A. & Bethke, J.A.** 1998. Control of brown soft scale on ficus under greenhouse conditions, winter 1997. Page 344. *in* Saxena, K.N., Ed., Arthropod Management Tests, Vol. 23. Lanham, MD: Entomological Society of America.
Notes: Chemical control substances evaluated against *Coccus hesperidum*.

**Rehman, S.U., Browning, H.W., Nigg, H.N. & Harrison, J.M.** 1999. Residual effects of carbaryl and dicofol on *Aphytis holoxanthus* Debach (Hymenoptera : Aphelinidae). *Biological Control* 16(3): 252-257.
Notes: *Aphytis holoxanthus* Debach is an important biological control agent of Florida red scale, *Chrysomphalus aonidum* (L.). Laboratory tests quantified the mortality of this hymenopteran parasite caused by held residues of carbaryl and dicofol. Behavior and mortality of adult *A. holoxanthus* on carbaryl-treated "Hamlin" orange leaves were related to quantities of dislodgeable pesticide residues over time as held residues weathered. After 24 h, mortality of *A. holoxanthus* by dicofol was not observed through day 31 when the experiment was terminated. Our data showed that held-weathered carbaryl residues killed *A. holoxanthus* for a period of up to 22 days posttreatment under spring conditions in Florida.

**Reis, P.R., Souza, J.C. de & Goncalves, N.P.** 1998. [Pests of tropical grapes.] Pragas da videira tropical. (In Portuguese.) *Informe Agropecuario Belo Horizonte* 19: 194, 92-95.
Notes: The principal arthropod pests of grapes in tropical regions of Brazil are listed. These include: *Eurhizococcus brasiliensis, Phylloxera vitifoliae [Viteus vitifoliae]*, diaspidids, *Paramadarus complexus, Polyphagotarsonemus latus, Colomerus vitis, Calepitrimerus vitis, Tetranychus urticae, Costalimaita* sp., *Bemisia argentifolii*, noctuids and *Ceratitis capitata*. Brief notes on control are given for each pest group.

**Ripka, G.** 1998. New data to the knowledge on the phytoseiid fauna in Hungary (Acari: Mesostigmata). *Acta Phytopathologica et Entomologica Hungarica* 33: 3-4, 395-405.
Notes: The results are given of a survey of phytoseiid mites made between 1990 and 1997 on street trees, in parks, green spaces of housing estates, arboreta and home gardens in Hungary and Croatia. Species of Phytoseiidae were found on 84 woody plant species out of the 301 studied. A total of 29 phytoseiid mite species were found. The following six species are new for the Hungarian fauna: *Amblydromella intercalaris, A. rhenana, Amblyseius versutus, Neoseiulus huron, Typhlodromus ernesti* and *T. repens. Euseius finlandicus [Seiulus finlandicus]* and *Kampimodromus aberrans* were the two most frequent phytoseiid species. Several species overwintered under colonies of scale

insects (Coccidae).

**Ripka, G. & Kazmierski, A.** 1998. New data to the knowledge on the stigmaeid fauna in Hungary (Acari: Prostigmata). *Acta Phytopathologica et Entomologica Hungarica* 33: 3-4, 419-424.
Notes: The results are given of regular collections of stigmaeid mites made between 1990 on 1997 on street trees, in parks, green spaces of housing estates, arboreta and home gardens in Budapest (Hungary) and Croatia. Species of Stigmaeidae were found on 44 woody plant species out of 301 studied. Four stigmaeid mite species were found: *Mediolata* sp., *M. mariaefrancae, Zetzellia mali* and *Z. crassirostris. M. mariaefrancae* was recorded for the first time in Hungary. *Z. mali* was the most frequently recorded species and was often found on the pubescent vein angles and midribs of leaves of species that included *Corylus colurna, Acer campestre* and *Fraxinus angustifolia. M. mariaefrancae* was collected on bark in association with the scale insects *Pseudaulacaspis pentagona, Quadraspidiotus ostreaeformis* and *Unaspis euonymi.*

**Rodriguez, I., Martinez, M. de los A., Sanchez, L. & Rodriguez, M.G.** 1998. [Field comparison of the effectiveness of *Heterorhabditis bacteriophora* strain HC1 for the control of mealybugs (Homoptera: Pseudococcidae) on coffee.]. (In Spanish with summary in English.) *Revista de Protección Vegetal* 13: 3, 195-198.
Notes: [Original title: Comprobacion en campo de la efectividad de *Heterorhabditis bacteriophora* cepa HC1 en el control de chinches harinosas (Homoptera: Pseudococcidae) del cafeto.] The effectiveness of *Heterorhabditis bacteriophora* strain HC1 was evaluated against a pseudococcid complex on coffee in Santiago de Cuba during February-June 1995. Twenty-five Canephora coffee plants (Robust variety) and an equal number of Arabica coffee (Typical variety) with three degrees of infestation by mealybugs were used. One litre of nematode suspension containing 8X104 infective juveniles. Evaluation was carried out after four months. Infestation was reduced by 88% on Robust plants and by 84% on Typical.

**Russell, J.F.A.** 1999. The role of governments in crop protection research and development. *International Crop Protection: Achievements & Ambitions* 73: 123-150.
Notes: [(BRITISH CROP PROTECTION COUNCIL SYMPOSIUM PROCEEDINGS) Farnham : British Crop Protection Council.] The paper opens by reviewing the rationale for government involvement in the plant protection sector, discussing the externalities from "market failure" in the form of health and environmental risks, destruction of predator populations and pest resurgence. It stresses the need for governments to introduce policies that embrace an IPM approach, but in this context deplores the growing polarisation between the environmental lobby and the pesticide industry. After briefly reviewing the distributional effects of government interventions, it reviews the methods of such interventions through both non-pesticide and pesticide policies. The paper then discusses the role of governments at the international level through agreements, guidelines and the policies of aid agencies, with examples of the successful regional programmes of the cassava mealy bug and screw-worm control. Brief case studies then follow of the nature and effects of government policies in both developed (Sweden, UK and USA) and developing countries (Costa Rica, Indonesia and Ethiopia). The closing summary of the issues involved ends with a special plea for developed country governments to take a stronger lead in advocating and supporting the use of IPM in

developing countries.

**Sagarra, L.A. & Vincent, C.** 1999. Influence of host stage on oviposition, development, sex ratio, and survival of *Anagyrus kamali* Moursi (Hymenoptera : Encyrtidae), a parasitoid of the Hibiscus Mealybug, *Maconellicoccus hirsutus* Green(Homoptera : Pseudococcidae). *Biological Control* 15(1): 51-56.
Notes: Host stage selection, host suitability, and sex allocation by the solitary encyrtid parasitoid, *Anagyrus kamali* Moursi (Hym., Encyrtidae), were studied in laboratory experiments in order to improve mass production of this parasitoid. All nymphal stages and adult females of the Hibiscus Mealybug (HMB), *Maconellicoccus hirsutus* Green (Hom., Pseudococcidae), were parasitized in no-choice experiments. In two-choice experiments third larval instar and preoviposition adult females were the most preferred, in terms of number of hosts selected for oviposition. The number of eggs per host was consistently greater in adult females than in nymphal stages. However, in adult female mealybugs, more than 60% of the parasitoid's eggs were encapsulated. More parasitoid progeny emerged from younger host stages than from older ones; nevertheless, the *A. kamali* sex ratio from hosts which were parasitized as early instars was close to one. Parasitized third instars and adult female mealybugs produced a population of *A. kamali* with a sex ratio of 0.4. Our findings have implications for mass rearing of the parasitoids, since the parasitoid choice of the host stage in which it oviposits strongly influences the production of female progeny.

**Saha, S.K., Jaiswal, A.K. & Singh, B.H.** 1998. Pre-harvest forecasting of sticklac yield from culture of lac insect, *Kerria lacca* (Kerr), on *Butea monosperma* (Lam.) Taub. *Journal of Entomological Research. New Delhi* 22: 3, 273-282.
Notes: To identify the most important yield affecting attributes in lac for the summer season crop of rangeeni lac on *Butea monosperma*, 14 factors were studied. Significant and positive correlation was found with yield and quantity of broodlac used for raising lac insect (*Kerria lacca*) culture, number of host shoots with lac culture, height of host crown, length of lac insect settlement per shoot, volume occupied by 100 female lac insects, diameter of host canopy and number of stumps per tree in decreasing order of magnitude. The forecast model, retaining quantity of broodlac used, number of host shoots with lac culture per tree, length of lac insect settlement per shoot and number of living lac insect per cm2, explained 51% variation in yield. The model developed showed that forecasts of sticklac yield per tree is possible once lac insect culture is established on shoots (3-4 weeks after raising the culture). This corresponds to 20-22 weeks before crop harvesting.

**Samson, P.R. & Harris, W.J.** 1998. Seasonal phenology and distribution in soil in sugarcane fields of the pink ground pearl, *Eumargarodes laingi* Jakubski, with notes on *Promargarodes* spp. (Hemiptera: Margarodidae). *Australian Journal of Entomology* 37: 130-136.
Notes: The distribution of cysts of *Eumargarodes laingi* in soil and the seasonal phenology of the different life stages were examined in sugarcane fields near Bundaberg, Queensland, Australia. Cysts were widely distributed in soil, occurring in equal numbers in both the planting rows of sugarcane and most or all of the inter-row space. Cysts were smaller at increasing distance from the sugarcane plants. Most cysts were found in the top 20 cm of soil but some occurred to a depth of at least 50 cm. Cysts of *Promargarodes* spp. were also found in one field. These had a similar lateral distribution

to *E. laingi* but a greater proportion occurred more than 20 cm deep. Adults of *E. laingi* were found from October to February in the four fields examined in 1993 and 1994. Adults were found in the greatest numbers in November, but they comprised less than 10% of the total *E. laingi* population at any time. A large number of cysts of all sizes was present throughout the year, and the results indicate that most individuals had a life cycle of at least 2 years. The large reservoir of cysts during the adult emergence period explains why *E. laingi* has proved difficult to control with insecticides and with cultural methods during this supposedly vulnerable time.

**Samson, P.R. & Harris, W.J.** 1999. Efficacy of Vapam (metam-sodium) against pink ground pearl, *Eumargarodes laingi* Jakubski (Hemiptera: Margarodidae), in sugarcane. *Plant Protection Quarterly* 14: 1, 35-37.
Notes: Studies were conducted to determine the efficacy of the liquid soil fumigant Vapam (metam) for control of pink ground pearl, *Eumargarodes laingi*, in sugarcane. Vapam drenched into pots at the equivalent of 125 litres ha-1 killed almost all cysts of pink ground pearl. In field trials near Bundaberg, Queensland, vapam injected into the soil at 250-500 litres ha-1 before planting consistently reduced pearl numbers in the first year after application on two soil types. Control of up to 85% was achieved in a sandy soil. In red volcanic clay (the more usual habitat), population reductions of 50-70% were achieved. Treated populations of pink ground pearl recovered within two years post-treatment in ratoon crops, so Vapam alone will not provide long-term control using current application methods. However, it may be useful in combination with resistant sugarcane varieties that maintain populations at low levels.

**Santa Cecilia, L.V.C. & Chalfoun, S.M.** 1998. [Pests and diseases which affect pineapple.] Pragas e doencas que afetam o abacaxizeiro. (In Portuguese.) *Informe Agropecuario Belo Horizonte* 19: 195, 40-57.
Notes: The main pest and diseases which affect pineapple (*Ananas comosus*) in Sao Paulo and Minas Gerais, Brazil, are listed. The main pests are *Dysmicoccus brevipes* and *Thecla basilides*, while *Fusarium subglutinans [Gibberella fujikuroi* var. *subglutinans]* and *Thielaviopsis paradoxa [Ceratocystis paradoxa]* are the most important diseases. Notes are given on biology, symptoms and damage, and favourable conditions for each pest and disease. Integrated control of the main pests and diseases is described, with reference to: legislation; use of healthy seedlings; cultural control; chemical control; and biological control.

**Saunders, J.L., Coto, D.T. & King, A.B.S.** 1998. [Invertebrate pests of annual crops in Central America.] Plagas invertebradas de cultivos anuales alimenticios en America central. Turrialba, Costa Rica: CATIE: Programa de Investigación. 305 pp.
Notes: Species discussed include *Dysmicoccus brevipes* and *Maconellicoccus hirsutus*; distribution; hosts; control techniques; references.

**Schoen, L. & Martin, C.** 1999. [A "new" type of scale on tomatoes. *Pseudococcus viburni*, a potential greenhouse pest.] Une "nouvelle" cochenille sur tomate. *Pseudococcus viburni*, ravageur potentiel en serre. (In French with summary in English.) *Phytoma* No. 514, 39-40.
Notes: *P. viburni*, a floury scale first introduced into the Netherlands in 1990, has caused a great

deal of damage since 1995. It was first reported in France in 1997, in Brittany and Roussillon. *P. viburni* can survive outside in tropical and Mediterranean areas, and also in greenhouses. *P. viburni* is spread via plant matter, but is also carried by humans and animals. It has a waxy protective shield and is able to survive for long periods in greenhouse structural material and heating elements. *P. viburni* is difficult to control chemically. Rigorous preventive treatment is therefore required. If such treatment fails, repeated chemical treatments should be applied. Two potential biological control agents, the predator *Cryptolaemus montrouzieri* and the parasitoid *Leptomastix epona*, are currently being studied.

**Sengonca, E. & Arnold, C.** 1999. Survey on the distribution of the Horse Chestnut Scale *Pulvinaria regalis* Canard (Hom., Coccidae) in Germany in the years 1996 to 1998. *Anzeiger für Schädlingskunde* 72(6): 153-157.
Notes: In the present study, the distribution of the Horse Chestnut Scale insect *Pulvinaria regalis* Canard in Germany in the years 1996 to 1998 and tendencies in the variation of infestation levels during the past three years were investigated by a survey. The investigations about tendencies in the variation of infestation levels revealed a decrease in scale numbers only in the cities where Horse Chestnut Scales have been observed first in Germany. On the other hand, almost every place located further away from these infestation sites showed a population increase of *P. regalis*. Constant infestation levels over the past three years could be found in only two cities. In most cases lime, maple and horse chestnut trees were the host plants of this scale insect.

**Sengonca, C., Uygun, N., Karaca, I. & Schade, M.** 1998. Primary studies on the parasitoid fauna of Coccoidea in cultivated and non-cultivated areas in the east Mediterranean region of Turkey. *Anzeiger Schädlingskunde, Pflanzen(schutz) und Umweltschutz* 71: 7, 128-131.
Notes: The parasitoid fauna of Coccoidea in cultivated and non-cultivated areas was studied in the eastern Mediterranean region of Turkey in 1994-97. In total, 25 parasitoid species belonging to Aphelinidae, Encyrtidae and Eulophidae (Hymenoptera) were reared from 21 different scale hosts. On crop plants, mainly citrus and peach, 13 parasitoids from eleven Coccoidea hosts were determined while 14 parasitoid species were obtained from twelve scale insects on non-cultivated plants. Seven parasitoid species are new records for the Turkish insect fauna. Only one of them was found on citrus, while the other six species were sampled in non-cultivated areas. The most common parasitoids encountered were *Aphytis melinus, Encarsia berlesei, Comperiella bifasciata* and *Metaphycus flavus* (Eulophidae) in cultivated areas and *Coccophagus lycimnia* (Aphelinidae) in non-cultivated areas. All other parasitoid species were obtained only from a few scale insects hosts.

**Senn, R., Hofer, D., Hoppe, T., Angst, M., Wyss, P., Brandl, F., Maienfisch, P., Zang, L. & White, S.** 1998. CGA 293'343: a novel broad-spectrum insecticide supporting sustainable agriculture worldwide. *Brighton Crop Protection Conference: Pests & Diseases - 1998: Volume 1* 27-36.
Notes: A new neonicotinoid insecticide, CGA 293'343 (ISO draft common name: thiamethoxam) is described. CGA 293'343 belongs to the thianicotinyl compounds and is the first example of the second generation neonicotinoid insecticide. Ecological toxicology studies revealed that CGA 293'343 had favourable toxicology, being practically non-toxic for birds (when ingested), fish, Daphnia and molluscs. Algae and earthworms were insensitive to CGA 293'343, but it was

moderately toxic to mysid shrimp. Laboratory studies and field trials indicated that dose rates of between 10 and 200g a.i./ha applied by foliar/soil or seed treatment, were sufficient for control of all target insect pests such as aphids, whiteflies, thrips, ricehoppers, rice bugs, mealybugs, white grubs, Colorado potato beetle, flea beetles, wireworms, ground beetles, leaf miners and some lepidopterous species. It is suggested that CGA 293'343 could be used in a number of situations from staple food to highly industrialized crop production. Market introduction of CGA 293'343 is scheduled for 1998-2000 under trademarks ACTARATM for foliar and soil treatments, and CRUISER R for seed treatment.

**Sether, D.M., Ullman, D.E. & Hu, J.S.** 1998. Transmission of pineapple mealybug wilt-associated virus by two species of mealybug (*Dysmicoccus* spp.). *Phytopathology* 88(11), 1224-1230.
Notes: Closterovirus-like particles associated with mealybug wilt of pineapple were acquired and transmitted by the pink pineapple mealybug, *Dysmicoccus brevipes*, and the gray pineapple mealybug, *D. neobrevipes*. Mealy-bugs acquired pineapple mealybug wilt-associated virus (PMWaV) from infected pineapple plants or detached leaves. The virus was detected in plants by tissue blot immunoassay and confirmed by immunosorbent electron microscopy. Plants exposed to mealybugs reared on PMWaV-free pineapple tissue remained uninfected. The presence of ants was correlated with an increased rate of virus spread when caged with *D. brevipes*. All stages of *D. neobrevipes* acquired PMWaV, although vector efficiency decreased significantly in older adult females. The probability of a single third-instar immature transmitting the virus was 0.04. Both species of mealybug acquired and transmitted PMWaV from infected pineapple material that had been clonally propagated for decades, and both species acquired PMWaV from sources previously infected with the virus by the other mealybug species.

**Sharma, K.K., Bhattacharya, A. & Sushil, S.N.** 1999. Indian lac insect, *Kerria lacca*, as an important source of honeydew. *Bee World* 80(3): 115-118.
Notes: Scale insects are notorious pests but humans have successfully exploited some of them to their advantage. The Indian lac insect, *Kerria lacca* (Homoptera) is one such insect which is purposely cultured in some Asian countries such as India, Thailand, China and Vietnam for its various products of commercial importance (resin, wax and dye).

**Shen, Q.** 1998. [Studies on natural enemies of *Kermes castaneae*.]. (In Chinese with summary in English.) *Journal of Zhejiang Forestry Science and Technology* 18: 5, 14-16.
Notes: Eighteen species of natural enemies of *Kermes castaneae* are reported, comprising 7 predators and 11 parasitoids. The prey rate of predators exceeded 25%, and the highest parasitism rate was 62.7%. There were 7 dominant species of natural enemies in the forest.

**Shevale, B.S., Kaulgud, S.N. & Verghese, A.** 1998. Population dynamics of pests of pomegranate *Punica granatum* Linnaeus. *Advances in IPM for horticultural crops: Environmental implications and thrusts.* 47-51.
Notes: [Proceedings of the First National Symposium on Pest Management in Horticultural Crops, Bangalore, India, 15-17 October 1997.] Field studies in 1990-95 in Maharashtra examined the seasonal abundance of pests of pomegranates. The incidence of pomegranate butterfly (Deudorix

isocrates) was most severe during July-October, showing a significant positive correlation with relative humidity. The mealybugs (*Ferrisia* spp.), soft scale (*Parasaissetia nigra*) and whitefly (*Siphoninus phillyreae*) were more abundant during March-June, showing a significant positive correlation with temperature and a negative correlation with relative humidity. Thrips and aphids were most prominent during July-October and November-February, respectively.

**Smith, R.G.** 1999. Wax glands, wax production and the functional significance of wax use in three aphid species (Homoptera : Aphididae). *Journal of Natural History* 33(4): 513-530.
Notes: The structural details of wax glands and the physical form of the secreted wax is described for the apterae of three aphid species-beech woolly aphid, spruce root aphid and woolly apple aphid. The glands are composed of greatly enlarged epidermal cells underlying a modified cuticle that forms distinctive wax gland plates. Secreted wax in the form of threads passes out of the cuticle as filaments, the arrangement of these filaments in the cuticle above each epidermal cell gives rise to the distinctive wax skein found in each species-hollow, solid or honeycombed. It is suggested that the primary role of the secreted wax is to prevent the aphids becoming contaminated by their own secreted honeydew and that of other members of the colony (which includes scale insects). Other secondary roles considered include: individual microclimate isolation; protection from fungi, parasites and predators; waterproofing and frost protection.

**Sobrinho, R.B., Bandeira, C.T. & Mesquita, A.L.M.** 1999. Occurrence and damage of soursop pests in northeast Brazil. *Crop Protection* 18(8): 539-541.
Notes: Field studies from 1995 to 1997 in the Paraipaba county state of Ceara, Brazil evaluated the occurrence and potential damage of soursop *Annona muricata* L. pests. Different species of Membracidae, Coccidae, Diaspididae and Aphididae were among those evaluated with plant damage that varied from 16 to 20%.

**Soria, S. de J. & de Mello, R.P.** 1998. [Occurrence of *Prolepsis lucifer* (Diptera, Asilidae) in southern Brazil, with notes on the morphology of larvae and pupae.] Ocorrência de *Prolepsis lucifer* (Diptera, Asilidae) no sul do Brasil, com anotaçoes morfologicas sobre larvas e pupas. (In Portuguese with summary in English.) *Entomologia y Vectores* 5: 6, 279-294.
Notes: *Prolepsis lucifer* was observed preying on larvae and adults of the vine pest *Eurhizococcus brasiliensis* (Margarodidae) in Rio Grande do Sul, Brazil. Morphological characters of the larvae, pupae and adults of *P. lucifer* are described.

**Soria, S., Estal, P. del & Vinuela, E.** 1998. [*Physokermes hemicryphus* (Dalman) and *Xylococcus filiferus* Low, two species of forest coccids new for the Spanish fauna.] *Physokermes hemicryphus* (Dalman) y *Xylococcus filiferus* Low, dos coccidos forestales nuevos para la fauna espanola. (In Spanish with summary in English.) *Boletín de Sanidad Vegetal, Plagas* 24: 2, 219-224.
Notes: *Physokermes hemicryphus* is a pest of *Picea abies*. The species is already known in Europe and North America, but has been found for the first time in Spain (Madrid, Segovia and Valencia). The European species *Xylococcus filiferus* develops on *Tilia* sp. It is well known in some countries of central Europe, but has been found for the first time in Spain (Segovia). Data on biological characteristics and host damage are provided for both species.

**Soria, S., Estal, P. del & Vinuela, E.** 1998a. [First detection of Odonaspis greeni (Cockerell) and *Bambusaspis bambusae* Boisduval on ornamental bamboos in Spain.] Presencia en Espana de *Odonaspis greeni* (Cockerell) y *Bambusaspis bambusae* Boisduval sobre plantas ornamentales de bambu. (In Spanish with summary in English.) *Boletín de Sanidad Vegetal, Plagas* 24: 2, 337-342.
Notes: *Odonaspis greeni* and *Bambusaspis bambusae* are two specific pests of some species of bamboo, and they have spread from the Asiatic region throughout many other world regions where bamboo is used for ornamental plantings. Both scales have been found for the first time in Spain. *O. greeni* in a glasshouse in Madrid on *Bambusa ventricosa* and *B. bambusae* on *Bambusa* sp. in the Canary Islands (Tenerife, La Palma and Las Palmas).

**Soria, F.J., Villagran, M., Martin, P. & Ocete, M.E.** 1998. [On the distribution of *Asterodiaspis ilicicola* (Targioni-Tozzetti, 1888) (Homoptera, Asterolecaniidae) in holm oak.] Sobre la distribución de *Asterodiaspis ilicicola* (Targioni-Tozzetti, 1888) (Homoptera, Asterolecaniidae) en encina. (In Spanish with summary in English.) *Boletín de Sanidad Vegetal, Plagas* 24: 2, 307-312.
Notes: *Asterodiaspis ilicicola* is a scale insect which feeds and grows on holm oak [*Quercus ilex*] leaves. Some aspects of the biology of this species were studied, including data about its distribution in the top of the tree. Infestation and intensity of attack of *A. ilicicola* according to position in the tree are quantified.

**Souissi, R.** 1999. The influence of the host plant of the cassava mealybug *Phenacoccus manihoti* on the plant and host preferences of its parasitoid *Apoanagyrus lopezi*. *Biological Control* 15(1): 64-70.
Notes: Olfactory responses of the parasitoid *Apoanagyrus lopezi* De Santis to odors emitted by four plant; species or cultivars, characterized by different levels of antixenotic and antibiotic resistance to the cassava mealybug, *Phenacoccus manihoti* Matile-Ferrero, were studied in a Y-tube olfactometer. Three of the host plants used belong to the Euphorbiaceae: two cassava varieties (Incoza and Zanaga, *Manihot esculenta* Crantz) and the Faux-caoutchouc (FG) (a hybrid of ICI, *esculenta* and *M. glaziovii* Muel. Arg.). The fourth plant was Talinum (*Talinum triangularae* Jack., Portulacaceae). In dual-choice tests, females of *A. lopezi* preferred the mealybug-infested plants to the uninfested plants or mealybugs alone. Female parasitoids discriminated between the different uninfested or infested-mealybug plant species and varieties. They preferred uninfested cassava *M. esculenta* to uninfested Talinum. Within the species *M. esculenta*, the parasitoid did not discriminate between uninfested plants of the varieties Incoza and Zanaga, but Zanaga was more attractive than the hybrid FC. When infested, Incoza and Zanaga were more attractive than Talinum or FC, The response of *A. lopezi* females to odors emanating from mealybugs reared on the four different host plants was also investigated. Females did not discriminate among mealybugs reared on plants of the *Manihot* genus. However, they showed a marked preference for the odor of mealybugs reared on Incoza and Zanaga rather than those reared on Talinum, The response of *A. lopezi* to chemicals emanating from different host plants is discussed in a tritrophic context and related to their antixenotic resistance.

**Souissi, R. & Le Ru, B.** 1999. Behavioural responses of the endoparasitoid *Apoanagyrus lopezi* to

odours of the host and host's cassava plants. *Entomologia Experimentalis et Applicata* 90(2): 215-220.
Notes: The host of this endoparasitoid is *Phenacoccus manihoti*, a pest of *Manihot esculenta*.

**Souissi, R., Nenon, J.P. & Le Ru, B.** 1998. Tritrophic interactions between host plants, the cassava mealybug *Phenacoccus manihoti* Matile-Ferrero (Hom., Pseudococcidae) and its parasitoid *Apoanagyrus lopezi* De Santis (Hym., Encyrtidae). *Journal of Applied Entomology* 122(9-10): 561-564.
Notes: The influence of the host plant on the parasitism of third instar *Phenacoccus manihoti* Matile-Ferrero by *Apoanagyrus (Epidinocarsis) lopezi* De Santis, was investigated under laboratory conditions. Four different host plants were used: two cassava varieties (Incoza and Zanaga, *Manihot esculenta* Crantz, Euphorbiaceae), the Faux caoutchouc (FC) (a hybrid of *M. esculenta* and *Manihot glaziovii*, Euphorbiaceae) and Talinum ( *Talinum triangularae* Jack., Portulacaceae). The percentage of parasitism of *P. manihoti* by *A. lopezi* varied significantly between host plants and was 1.5 to 1.8 higher on Talinum than on the plants of the Manihot genus. The parasitism on Incoza did not differ from the one on Zanaga but was significantly higher than that on FC. The percentage of mummified hosts also differed among the four plants and was lower on FC (80.5%) than on the others. A significantly lower percentage of emerged parasitoids (69.5%) was recorded with the Incoza variety, which was the most resistant cassava plant. The total mealybug mortality due to parasitoid activity was significantly higher on Talinum than on the others. The results for the Manihot plants suggest that the probability of achieving successful augmentative biological control will be greater on the plants of the *M. esculenta* species despite lower *A. lopezi* survival on Incoza due to its high level of antibiosis resistance. Talinum would be a better host plant for a mass rearing of the host and the parasitoid in the laboratory.

**Srivastava, S.C., Kumar, P., Mishra, Y.D. & Jaiswal, A.K.** 1998. Estimation of kusmi winter crop sticklac yield from *Flemingia macrophylla* (Willd.) O'Ktze based on plant and insect characters of *Kerria lacca* (Kerr.). *Indian Journal of Forestry* 21: 1, 9-12.
Notes: Plant and insect characters affecting the yield of the kusmi sticklac crop on *Flemingia macrophylla* in the winter season were investigated in 3-yr-old plants at the Indian Lac Research Institute, Bihar. The plants were pruned to 6 inches above ground level in January-February, and tillers and new shoots allowed to develop until July; they were then inoculated with broodlac at 100 g/plant. Three plant characters (height, total number of shoots and inoculable shoots) and 3 insect characters (length of coverage by crawlers on twigs, settlement density and mortality) were recorded at the time of inoculation and after 4 wk. The yield of sticklac was significantly related to the number of inoculable shoots and length of crawler coverage per plant, and the density of settlement on shoots, but not to any of the other characters investigated.

**Stimmel, J.F.** 1998. Wax scales, *Ceroplastes* spp. (Homoptera: Coccidae). *Regulatory Horticulture (Pa. Dept. of Agric.)* 24(2): 17-19.
Notes: Reviews hosts and distribution, identification, life history, damage and control.

**Stimmel, J.F.** 1999. Maskell scale, *Lepidosaphes pallida* (Maskell) Homoptera: Diaspididae.

*Regulatory Horticulture (Pa. Dept. of Agric.)* No. 25(1): 23-24.
Notes: Notes on hosts, distribution, field description, life history, damage and control.

**Stimmel, J.F.** 1999a. Is winter mortality wishful thinking?. *Regulatory Horticulture (Pa. Dept. of Agric.)* 25(1): 7-9.
Notes: Discussion includes mention of the ability of *Ceroplastes* spp., originally found in tropical or subtropical regions, to withstand Pennsylvania winters.

**Subbarayudu, B. & Maheswar, L.B.** 1998. Incidence of certain major parasites of lac insect, *Kerria lacca* (Kerr) on *Schleichera oleosa*. *Indian Forester* 124: 8, 669-670.
Notes: Field studies were carried out in 1994-95 at the Indian Lac Research Institute, Bihar (India) on the parasites infecting *Kerria lacca* inoculated onto 21 *Schleichera oleosa* trees in week 29 of 1994. After inoculation random samples of the lac insect were collected from week 33 at weekly intervals until the crop matured. The samples were immediately caged and kept under laboratory conditions until there was no further parasite emergence (week 43 of 1995). Three parasitic species were found, as reported in previous studies. These were: *Tetrastichus purpureus [Aprostocetus purpureus], Tachardiaephagus tachardiae* and *Coccophagus tschirchii*. The parasites showed different patterns of peak emergence, which are described.

**Sugonyaev, E.S.** 1998. [Chalcid wasps (Hymenoptera, Chalcidoidea) parasites on soft scales (Homoptera, Coccidae) in Vietnam. 5. A new species of the genus *Coccophagus* Westwood (Hymenoptera, Aphelinidae).]. (In Russian with summary in English.) *Entomologicheskoe Obozrenye* 77: 480-482, 526.
Notes: Host is *Saissetia neglecta*.

**Sullivan, D.J., Volkl, W.** 1999. Hyperparasitism: Multitrophic ecology and behavior. *Annual Review of Entomology* 44: 291-315.
Notes: Hyperparasitoids are secondary insect parasitoids that develop at the expense of a primary parasitoid, thereby representing a highly evolved fourth trophic level. This review evaluates multitrophic relationships and hyperparasitoid ecology. First, hyperparasitoid communities of various taxa of phytophagous and predacious insects are described. Second, specific patterns of hyperparasitoid community organization and hyperparasitoid ecology are described in detail, using the aphid-parasitoid-hyperparasitoid food web as a model system. Aphid hyperparasitoid communities consist of ecto- and endohyperparasitoids, with ectohyperparasitoids being less host specific than endohyperparasitoids. Lifetime fecundity and intrinsic rate of increase of hyperparasitoids are generally lower than those of their primary hosts. Interactions with adult primary parasitoids do not influence hyperparasitoid searches, but aphid-attending ants typically prevent successful hyperparasitoid foraging. Impact of hyperparasitism on biological control is reviewed. *Epidinocarsis lopezi* and *Phenacoccus manihoti* are discussed.

**Takagi, S.** 1999. For a better understanding of *Aulacaspis*: the *Calcarata* species group (Homoptera: Coccoidea: Diaspididae). *Insecta Matsumurana* 55: 133-180.
Notes: The *calcarata* species group of *Aulacaspis* comprises seven species occurring in Southeast

Asia, *A. calcarata (=A. vitis*: Williams and Watson, 1988), *A. marginata, A. mesuae, A. calophylli, A. baukiana, A. mesuarum*, and *A. pinangiana*, spp. nov., which are commonly characterized by having spurlike processes on the pygidium. In the body shape of the full-grown adult female they represent two remarkably different types: five species belong to the *rosae* type, and the other two to the *vitis* type. Supposing the *rosae* type originated from the *vitis* type, the change can be understood in terms of growth phenomena including acceleration and truncation. The view is adopted that species of the *rosae* type appeared in parallel among different species groups of *Aulacaspis*, and that the division of *Aulacaspis* species into the *rosae* type and the *vitis* type, is tranferred to *Aulacaspis* , and *Superturmaspis* and *Semichionaspis*, both based on that species nomenclaturally, are synonymized with *Aulacaspis. Myrtaspis*, gen. nov., with *M. marginalis*, sp. nov., for the type-species, closely related to *Aulacaspis*, and also similar to *Chionaspis* and *Narayanaspis* for other reasons. *Chionaspis syzygii, Semichionaspis jombosicola* and *S. putianensis* are transferred to *Myrtaspis. Fraseraspis litseae*, gen. et sp. nov., is described to afford an example of the emergence of a body shape similar to the *rosae* type in another lineage.

**Takagi, S.** 1999a. Notes on the scale insect subtribe Kuwanaspidina (Homoptera: Coccoidea: Diaspididae). *Insecta Matsumurana* 56: 95-150.
Notes: The kuwanaspidine pattern of marginal appendages is defined. Five genera are recognized and referred to the subtribe Kuwanaspidina, tribe Diaspidini. Seven new species are described from Malaysia, Japan, the Philippines, and India: *Kuwanaspis pectinata, Nikkoaspis berincangensis, N. sikokiana, Xiphuraspis ctenopyga, medangaspis payunga* (gen. et sp. nov.), *Coronaspis malesiana*, and *C. malabarica*. Some species referred to the subtribe do not exactly conform to the kuwanaspidine pattern; a few of them are interpreted to have undergone atavistic modifications, and the others to have changed towards the advanced state of the Diaspidini. They are kept in the subtribe according to the view that an atavistic organism does not mean the revival of an ancestral taxon and that an incompletely derivative state alone is not sufficient for taxonomic change, *Kuwanaspis* and *Nikkoaspis* are closely related to each other, but the other genera appear to be isolated especially owing to a fairly wide variety of characters observed in the first instar larvae and also in the second instar males. It follows that the known forms are fragments from a once diversified large group, unless unrelated forms are included. Preliminary considerations are given to the question why marginal appendages change from taxon to taxon. A list of the Kuwanaspidina is prepared. *Chuaspis* Tao and Wong is synonymized with *Kuwanaspis*, and *C. shuichuensis* Tao and Wong with *K. bambusicola*.

**Tan, Y.G. & Zhao, J.Z.** 1998. [A new species of encyrtid (Hymenoptera: Encyrtidae) parasitizing *Unaspis yanonensis* (Homoptera: Diaspididae) in China.]. (In Chinese with summary in English.) *Entomotaxonomia* 20(4): 300-302.
Notes: A new species of the genus *Coccidencyrtus* is reported, *C. longicaudatus* sp. nov. *C. longicaudatus* was collected from Jianshui county, China, and was reared on the citrus pest *Unaspis yanonensis*. A brief description is presented with illustrations of some anatomical features.

**Tang, X.F., Jia, J.G. & Wang, H.** 1998. [Experiment to control persimmon wooly scale by spraying Sujiek emulsion.]. (In Chinese.) *China Fruits* No. 4, 31-32.

Notes: An experiment was carried out in a persimmon plantation in China, seriously damaged by the persimmon wooly scale, *Eriococcus kaki*. Different concentrations of Sujiek emulsion [of unstated composition] and cypermethrin were applied. Results showed that applying the 1000 or 1500 times solution of 40% Sujiek emulsion to second instars resulted in 100% mortality after spraying. The effectiveness of Sujiek was greater than spraying the 1000 times solution of cypermethrin.

**Tao, C.C.C.** 1999. List of Coccoidea (Homoptera) of China. *Special Publication (Taiwan Agric. Res. Inst.)* No. 78: 176.
Notes: Species from 15 families listed -- Monophlebidae, Margarodidae, Ortheziidae, Pseudococcidae, Eriococcidae, Kermesidae, Asterolecaniidae, Phoenicoccidae, Kerridae, Aclerdidae, Coccidae, Conchaspidae, Beesoniidae and Diaspididae. Distribution within China and hosts given.

**Tatara, A.** 1999. Determination of optimum spraying time for chemical control of mulberry scale, *Pseudaulacaspis pentagona* (Targioni) (Hemiptera : Diaspididae) in tea fields. *Jarq-Japan Agricultural Research Quarterly* 33(3): 155-161.
Notes: Monitoring methods of mulberry scale larvae, *Pseudaulacaspis pentagona*, were evaluated for determining the spraying time for effective chemical control. Among them, the calculation of the ratio of "more than half hatched egg batches" which was found to be suitable due to its accuracy, is, however, time-consuming. Optimum spraying time is defined as the duration of the period required to achieve a ratio of more than half hatched eggs in egg batches (60 to 90%), which is referred to as "more than half hatched egg batches." The use of sticky traps set inside a tea bush to capture crawlers of the mulberry scale is a simple and accurate monitoring method. The optimum spraying time occurs 2 to 5 days after the peak capture of the crawlers by the traps. The traps should be set up from the beginning of the egg hatching period, and should be examined daily or every other day to determine the peak capture of the crawlers. The use of sticky traps for monitoring is suitable for only the first generation of mulberry scale. Thus observations of "more than half hatched egg batches" are needed to determine the optimum spraying time for the second and third generations of the mulberry scale.

**Toki, M., Ooi, T. & Kusumi, T.** 1999. Sesterterpenoids and diterpenoids of the wax e xcreted by a scale insect, *Ceroplastes pseudoceriferus*. *Journal of Natural Products* 62(11): 1504-1509.
Notes: A new sesterterpene, (2Z,6Z, 10E)-cericerene-15,24-diol (1), and its 30-hydroxytriacontanoate (2) were isolated from the wax exuded by the scale insect *Ceroplastes pseudoceriferus*, together with the acetates and 30-hydroxytriacontanoates of 3,15-dihydroxy- and 15,20-dihydroxylabda-7,13-diene (3-6). The absolute configurations of the labdadiene alcohols were antipodal to the ordinary labdanes isolated from terrestrial plants.

**Trjapitzin, S.V. & Trjapitzin, V.A.** 1999. [Parasites of the mealybugs on cultivat ed grapes in Argentina, with description of a new species of the genus *Aenasius* Walker (Hymenoptera, Encyrtidae).]. (In Russian.) *Entomologicheskoe Obozrenye* 76: 174-179.
Notes: Scale species discussed include *Planococcus ficus* and *Ferrisia virgata*.

**Tsacas, L. & Chassagnard, M.** 1999. [Afrotropical species of the of the subgenus *Gitonides* Kalb of the genus *Cacoxenus* Loew with larvae predatory on mealybugs (Diptera: Drosophilidae).]. (In French with summary in English) *Annales de la Société Entomologique de France* 35(1): 91-121.
Notes: [Original title: Les espèces afrotropicales du sous-genre *Gitonides* Knab du genre *Cacoxenus* Loew à larves prédatrices de cochenilles (Diptera: Drosophilidae).] The four subgenera and the 23 species of the genus *Cacoxenus* Loew were reexamined. The study of the Afrotropical species of the subgenus *Gitonides* Knab has been undertaken. Four species were previously known as belonging to this subgenus and two others were considered as synonyms of *perspicax*. *Cacoxenus asiaticus*, an oriental species, is transferred from the subgenus *Paracacoxenus* Hardy to the subgenus *Gitonides*. A study of material from this genus revealed eight new species which are placed in two new species groups: the *apidoxenus* group (*coccidoctonus*, sp. n., *pictipennis*, sp. n.) and the *perspicax* group (*multidentatus*, sp., n., *notius*, sp. n., *odontophorus*, sp. n., *oligodous*, sp. n., *polyodous*, sp. n., *rhopalophorus*, sp. n.). The origin and the synonymies of the cosmopolitan species *perspicax* (Knab) are briefly discussed, as well as the distribution of the Afrotropical species and the significance of the morphological characters of the terminalia for subgeneric systematics. The larval life history of *C. (G.) perspicax* is briefly discussed. The importance of the discovery of new predator-prey relations involving new species is pointed out.

**Turtle, A. & Turtle, S.** 1999. Pests and problems of bamboo in the U.S.A. *Temperate Bamboo Quarterly* 4(2): 61-71.
Notes: Scale pests discussed include *Antonina pretiosa, Kuwanaspis hikosani, K. pseudoleucaspis, Odonaspis secreta, Asterolecanium bambusicola*, *Unachionaspis tenuis* and the scale predator, *Cryptolaemus montrouzieri.* Brief descriptions, damage, illustrations.

**Umeh, V.C., Ahonsi, S., Kolade, J.A., Umeh, V.C., Ahonsi, S. & Kolade, J.A.** 1998. Insect pests encountered in a citrus orchard in Nigeria. (In English with summaries in French & Spanish.) *Fruits* 53: 6, 397-408.
Notes: The lack of good horticultural practices which minimises pest and disease attack and ensures vigorous plant growth is believed to contribute to citrus decline in many parts of Nigeria. A study was therefore undertaken to investigate the contribution of insect pests to this citrus tree loss. Three citrus plots with die-back problems, located in an orchard in Nigeria, were studied: a progeny garden with diverse citrus types, a sweet orange variety trial and two rootstock trials. Leaves, twigs and fruits were sampled for insect pest infestation from randomly selected citrus trees. Termite infestation level was rated based on the extent of live termite galleries and the number of fruits dropped beneath a tree was noted. Important insect pests were identified as termites (Isoptera), leaf miners (*Phyllocnistis citrella* ), scale insects (Diaspididae), and fruit flies (*Ceratitis capitata*). Termites and scale insects significantly contributed to the die-back of citrus plants. The sweet orange variety Washington navel was most susceptible to insect pest attack. The incidence of fruit fly was widespread and caused damage to marketable citrus fruits. In the rootstock trials, Rough lemon rootstocks were greatly attacked by termites, especially those budded with Lake tangelo. Termites and scale insects are likely to contribute to faster decline in some citrus varieties than in others as shown by the high susceptibility of Washington navel to pest attacks. Such cases may be aggravated by the use of a rootstock unsuitable for areas which are constantly under high disease and pest

pressure.

**Uygun, N. & Elekcioglu, N.Z.** 1998. Effect of three Diaspididae prey species on development and fecundity of the ladybeetle *Chilocorus bipustulatus* in the laboratory. *Biocontrol* 43(2): 153-16 2.
Notes: The purpose of this investigation was to determine the most suitable prey for the development and fecundity of the predatory coccinellid, *Chilocorus bipustulatus* (L.) on three different diaspidid species: *Aspidiotus nerii* Bouche, *Aonidiella aurantii* (Maskell), and *Pseudaulacaspis pentagona* (Targioni-Tozzetti), Life tables were constructed at constant 25 degrees C and the developmental time, longevity, fecundity, and the sex ratio were determined. Individuals fed with *A. nerii* displayed the shortest larval and pupal developmental time (26.0 days), lowest immature mortality rate (16.6%), highest net reproduction rate (264.7 females/female), shortest generation time (72.9 days), and the highest intrinsic rate of increase (0.077 females/female/day). The results showed that under laboratory conditions *C. bipustulatus* developed best on *A. nerii*.

**Uygun, N., Sengonca, C., Erkilic, L. & Schade, M.** 1998. The Coccoidea fauna and their host plants in cultivated and non-cultivated areas in the East Mediterranean region of Turkey. *Acta Phytopathologica Academiae Scientiarum Hungaricae* 33: 1-2, 183-191.
Notes: The Coccoidea fauna of agricultural crops, ornamental and urban plants, forests and macchia was studied in the east Mediterranean region of Turkey in 1994-97. A total of 51 Coccoidea species including 30 from Diaspididae and 22 species from Coccidae, Pseudococcidae, Eriococcidae, Asterolecaniidae, Kermesidae, Ortheziidae, Cerococcidae, and Margarodidae were identified and are tabulated. Six diaspidid species (*Diaspidiotus distinctus, Duplachionaspis stanotophri, Rhizaspidiotus donacis, Lepidosaphes malicola, Leucaspis knemion and Parlatoria crotonis*), one species from Pseudococcidae and Coccidae, and the genus *Acanthococcus* from Eriococcidae were determined as new records for the Turkish fauna. Most species encountered were from the family Diaspididae (30) followed by Coccidae (9). Scale insects were more frequently determined on wild plants, especially on those bordering agricultural fields, than on crop plants. Scale insects on wild plants were often associated with different parasitoids and predators, indicating that these habitats play an important role in the natural control of scale insects in agricultural crops.

**Varshney, R.K.** 1999. Tachardiidae versus Kerriidae as family name of the lac insects (Hemiptera: Coccoidea). *Bionotes* 1(3): 61-62.
Notes: Review of arguments attempting to establish the correct name for the lac insects. This author supports Tachardiidae.

**Verghese, A. & Ramachander, P.R.** 1998. Developing a sampling plan for estimating the settler population of the guava green scale *Chloropulvinaria psidii* (Maskell), (Pseudococcidae: Homoptera). *Advances in IPM for horticultural crops: Environmental implications and thrusts.* 40-42.
Notes: [Proceedings of the First National Symposium on Pest Management in Horticultural Crops, Bangalore, India, 15-17 October 1997.] Studies to develop a sampling plan for *Chloropulvinaria psidii* were carried out for 17 fortnights from mid-April to December in 1990-91 in a guava orchard in Karnataka. Settlers followed a clumped distribution with a fractional 'k' of the negative binomial