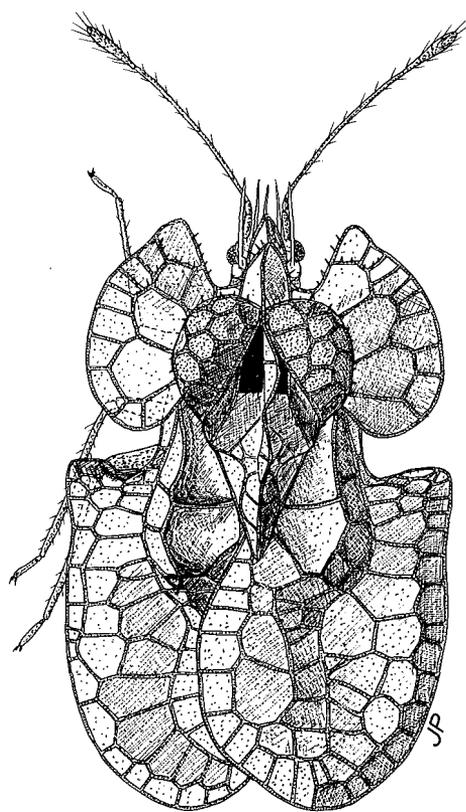


ISRAEL JOURNAL OF ENTOMOLOGY

VOLUME XXVII 1993



THE ENTOMOLOGICAL SOCIETY OF ISRAEL

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COVER: Habitus of *Hyalochiton multiseriatus* (Reuter) (Hemiptera: Tingidae), one of the 54 species of lace-bugs recorded in this issue from Israel (drawn by J. Péricart; reprinted from Péricart, 1983).

Publication date: 30 July 1993

ISSN 0075-1243

Typeset by Phylis Naiman and F. Grosser, Jerusalem, Israel
Printed by Achva Press, Jerusalem, Israel

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The papers published in this journal are abstracted and indexed in the REVIEW OF APPLIED ENTOMOLOGY and in ENTOMOLOGY ABSTRACTS.

PUBLICATION OF THE ISRAEL JOURNAL OF ENTOMOLOGY

is supported by

THE H. BYTINSKI-SALZ ENDOWMENT FUND

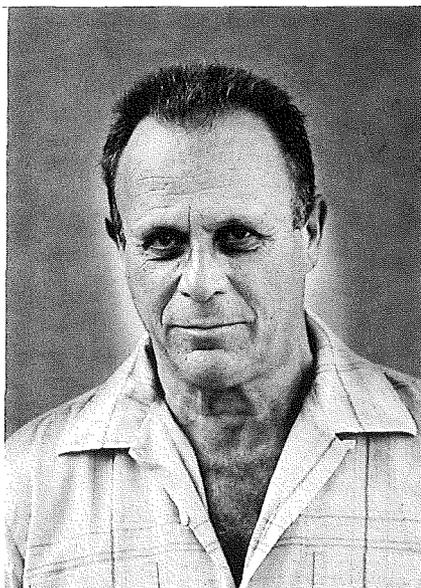
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THE SHOSHANA YATHOM ENDOWMENT FUND

A personal donation by Joseph Halperin is gratefully acknowledged.

OBITUARY

Michael Costa
(1922–1992)



IN MEMORIAM

Dr. Michael Costa, writer, educator and outstanding acarologist and entomologist, was born on 25 March 1922 at Hamburg, Germany, and died on 17 March 1992, one week before his 70th birthday. His father, a physician, was very active in the Zionist movement, co-founder of several Zionist periodicals and author of a history of Zionism. The parents often hosted at Hamburg Zionist envoys from Palestine. This background explains Michael Costa's subsequent fervor for Zionist and kibbutz ideals. Until the age of 11, young Michael studied at the "Talmud Torah" school in Hamburg. In 1933 he emigrated to Palestine. Upon his arrival in this country he first went to school at Ramat HaSharon. Following a short stay at the Ben Shemen youth village, Michael asked to be sent to high school at the Pedagogic Institute

(now "Shomria" high school) of the HaShomer HaZa'ir Movement at Kibbutz Mishmar HaEmeq. He was among the first graduates of this institute. He then joined the Hakhshara nucleus which later founded Kibbutz Lahavot HaBashan and which received its training at Kibbutz Ma'abarot and Kibbutz Tel Amal (now Nir Dawid) and in a Hakhshara camp at Karkur near 'En Shemer.

At this time Costa fell under the spell of the meteorologist S. Duvdevani, Israel's well-known dew researcher, and became his devoted pupil and assistant. During a stretch as instructor for the youth organization of the Hashomer HaZa'ir Movement in Tel Aviv, he frequently visited the Biological Institute of Y. Margolin, an early and outstanding Palestinian Jewish zoologist and biologist, in Tel Aviv, and his connections with biology were strengthened. The Pedagogic Institute at Mishmar HaEmeq then requested the Hakhshara to release Costa to serve as a teacher at the institute and he returned to Mishmar HaEmeq. Subsequently, his work with Duvdevani and the time he spent at the Biological Institute led him to be one of the first academically trained persons of the Kibbutz Movement. Since his love for both nature and teaching was well known, he was released from kibbutz duties during 1942 to 1944 for studies at the Hebrew University of Jerusalem. The Kibbutz Movement was loath at that time to let kibbutz members complete academic studies and Costa did not collect his B.Sc. degree. From 1944 until the War of Liberation (1947–49), Costa was thus a member of Kibbutz Mishmar HaEmeq and a teacher at the Pedagogic Institute. He participated in the defense of the kibbutz against the army of Kaukji and was wounded severely by shrapnel and also suffered the loss of a big toe, but with great courage overcame his disability.

After the war, Costa was invited to teach at the Kibbutz Seminary "Oranim." Some years later, with a changed atmosphere in the Kibbutz Movement as regards academic studies, and with characteristic firmness of decision and singlemindedness of purpose, he returned to the Hebrew University and, after receiving confirmation that he had completed the requirements for the B.Sc. degree, was admitted to the M.Sc. studies. In 1955 Costa received the M.Sc. degree (major subject: zoology; minor subjects: parasitology and biochemistry) and in 1959 the Ph.D., *summa cum laude*, with a thesis on "The Ectoparasites of Birds and Mammals in Israel," which laid out his further career as an animal parasitologist.

The Scientist. In 1960–61 Costa spent a postdoctoral sabbatical in London, working at the British Museum (Natural History) in the Department of Zoology, Arachnida Section, with O.E. Evans, J.G. Sheals and D. McFarlane; in 1977 he enjoyed another sabbatical at the British Museum. During 1969–70 he was at the Department of Zoology of the University of Georgia at Athens, GA, USA, where he cooperated with P.E. Hunter, on a Senior Foreign Scientist's NSF (National Science Foundation) Fellowship.

Scientific Work. Costa's first two papers dealt with ectoparasites of rodents — fleas and ticks, respectively — the latter paper published with his tutor for the Ph.D., O. Theodor. He then directed his interest to mites associated with rodents, such as the Levant vole, *Microtus guentheri*, and the mole rat, *Spalax ehrenbergi*. Apart from his Ph.D. thesis, he issued in 1967, with O. Theodor as senior author, a survey of the ectoparasites of wild mammals and birds in Israel, published by the Israel Academy of Sciences and Humanities. The mesostigmatic mites which he had collected on rodents in this country were studied by him during his 15-months postdoc at the British Museum, in close cooperation with the eminent acarologists there. These Acari stemmed either from trapped rodents or were collected from the nests of

rodents. Later work at the end of the 1960s (with E. Nevo) continued on the topic of *S. ehrenbergi*-associated mites — nidicolous arthropods associated with different chromosomal types of the rodent. However, already in 1963, he turned to the leitmotiv of his research subject, mesostigmatic mites associated with coprid beetles, especially scarabaeid beetles, but also with other insect species, cerambycid and carabid beetles, bumble bees, bugs and cockroaches or other arthropods, such as the hermit crab, *Coneobita scaevola*.

The main emphasis in his studies is on taxonomy, but his papers abound with biological and evolutionary findings, descriptions of rearing methods, etc. Quite early (1967) he published the first detailed list of these mites (170 species) in Israel. He also described mesostigmatic mites from litter and wreckage found on the Mediterranean shore of Israel. With time, Costa became the foremost expert on mites on beetles and determined species from all over the world. He described, alone or with associates, nine new genera, 81 new species and three subspecies.

Scientific Connections. During the late 1950s and early 1960s, acarology became firmly entrenched as a separate discipline and Costa was quite active in this process. He was a charter member of the American Society of Acarology. He participated in the 1st, 2nd and 3rd International Congresses of Acarology and was a member of the Executive Committee and chairman of the Subcommittee for Symposia of the 4th congress. He attended International Congresses of Entomology, of Zoology, and of Systematics and Evolutionary Biology. He was a member of the Society of Systematic Zoology (USA). He was chosen to deliver the International Relations Address, which he dedicated to "Entomology in Israel," at the 1969 Annual Meeting of the Entomological Society of America. The esteem in which he was held in the UK can be judged by his election as a fellow of the Linnean Society, London (1964) and a fellow of the Royal Entomological Society of London (1973). His special and close professional and personal relations with the British Museum, and especially with the Zoological Department, persisted and deepened with the years. His vitality, sincerity, enthusiasm and talents singled him out for a special status at this institution. In 1977 he was awarded an honorary membership by the directors and trustees of the Museum for his "unique contribution to the Museum." This is an honor bestowed on only a few. Costa was fully justified in saying that London was his second home, with the highlight being the British Museum (Natural History).

In Israel, Costa was a member of the Israel Society of Zoology, serving several times on its board and as a member of its Editorial Board; in 1989 he was elected one of the two first honorary members of this society. He was a very active member of the Israel Society of Entomology and of the Fauna (now Fauna and Flora) Palestina Committee of the Israel Academy of Sciences and Humanities.

The Teacher. From 1951, Costa was a member of the staff, and periodically head of the Department of Biology at Oranim, the Teachers' College (Kibbutz Seminary) of the Kibbutz Movement. He and his colleagues A. Shkolnik, E. Nevo and A. Abouafia established the Biology Section at Oranim, which ultimately became the Department of Biology of Haifa University. Whereas his founding colleagues ultimately transferred to other institutions, Costa maintained Biology at Oranim with some help from A. Shkolnik and a devoted team of teachers who had joined him. In 1972, Costa was appointed associate professor and Head of the Department of Biology, and in 1976 full professor at Haifa University.

Costa's last years were overshadowed by illness. Late in 1986 he suffered a first stroke,

which curtailed a visit to the UK, and a second, more severe stroke, 3 months later. However, he recovered sufficiently to return, albeit disabled, to work. During his last years his mobility was severely reduced and his eyesight failed progressively, but this in no way affected his fertile, versatile mind. Even during this last stage of his illness his home was visited continuously by one and all because he was an outstanding personality and a brilliant conversationalist.

Costa remained a man of Oranim until his last day and his connections with Oranim remained firm over his last years, during which the staff persisted in visiting him, discussing all happenings in both the academic section and the seminary, and asking for advice and guidance on personal, academic and practical matters.

The Writer. In 1978 Costa published a 280-page book "Insects Anti Man" (HaKibbutz HaMe'uchad Publishers), in which he elucidated the competition and fight between mankind and insects of medical, hygienic and veterinary importance and went into detail on insect-transmitted diseases and the different control options. This textbook (in Hebrew) is used by universities, centers for public health instruction, and schools. In addition, he prepared for Everyman's University an updated entomology text in Hebrew in three volumes (1981–83), a standard text to this day. A further important book (1985) by Costa was "A Bridge across the Two Cultures" (Afik Publishers), the latter in the sense of C.P. Snow, in which he presented his concept of biology and problems of biology to students of the humanities. The book starts with a description of geometry as a possible link between the two cultures. Costa was, characteristically, a great admirer of M.C. Escher's drawings.

His last book, written during his final illness, shows us Costa as the Renaissance personality he obviously was. In "The Golden Section, Solomon's Seal (pentagram) and David's Shield (hexagram; Magen David) — An Interdisciplinary Study" (Sifriat HaPo'alim Publishers), which went to press during his last year of illness (1991) with the devoted help of his wife, Yardena Costa, he again extended a bridge between the two cultures. Costa demonstrated how the geometric rule of the golden (divine) section plays a role in mathematics — such as algebra, and of course art, architecture, music, botany and zoology, and discussed the occurrence of the pentagram and hexagram forms in flowers, living organisms and nature at large vs its significance in mysticism. In addition, he left behind the unpublished manuscript of an again interdisciplinary book, on perception, viewed from the angles of physiology (eye and brain), art and psychology.

Costa was no narrow specialist; he was both a brilliant instructor of laymen and an excellent lecturer to scientists and professionals. Apart from his published scientific work, he wrote encyclopedia chapters: for the Hebrew Encyclopedia, on fleas, on mites, and on ticks; and for the Encyclopedia Britannica for the Young, on fleas, on lice, on rhinoceros beetles, and on ticks. Furthermore, he contributed to semi-popular periodicals, e.g. *Teva va'Aretz* (Nature and Land) on such varied subjects as the domestication of animals; the richness of life in the tropics; small soil arthropods; mites that feed on fly eggs; the carpenter bee and its "guests"; the biology of the rhinoceros beetle; and the mites associated with the rhinoceros beetle.

The Kibbutznik. Costa came to Kibbutz Mishmar HaEmeq at the age of 12 and his destiny was firmly bound up with that of the kibbutz. He was a teacher at the school where he had studied and at the Teachers' Seminary, professor at Haifa University, but, above all, a dedicated and proud kibbutz member. He refused tempting offers to join the staff of the

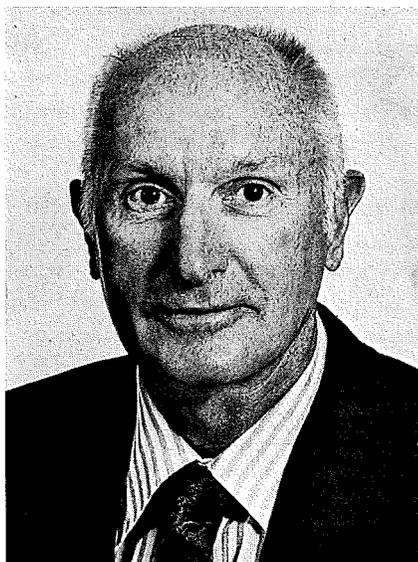
Hebrew University of Jerusalem or Tel Aviv University, because he considered kibbutz life as the right and ideal form of life.

Dr. Costa will be sorely missed. This country can boast of only few such versatile and cultured scientists with such astounding multifaceted interests. He is survived by his loving wife Yardena who, with indefatigable patience and bravery, encouraged him and cared for him during his last 5 years of illness, his sister Miriam, his children Amos, Ruthi, Yoram and Gideon, and four grandchildren.

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OBITUARY

Paul DeBach
(1914-1992)



IN MEMORIAM

Paul DeBach, Emeritus Professor of Biological Control and Emeritus Entomologist, University of California, Riverside, died of a heart attack in February, 1992. With his untimely departure at age 77, the science and practice of biological control have lost their foremost proponent and undisputed world leader.

Paul was born on December 28, 1914 in Miles City, Montana, but his family moved to California when he was six years old. He attended public schools in Hollywood, then spent two years at the University of California at Los Angeles. His way to biological control is described in his own words: "... when I was a 19-year-old sophomore student at the University of California at Los Angeles taking a course in Economic Entomology from Professor A.M. Boyce, Professor Harry S. Smith, the late world authority on biological control, was invited over from the then University of California's Citrus Experiment Station at Riverside to give a series of lectures on biological control. This was the turning point in my professional career. Biological control was so intellectually satisfying, so biologically intriguing and so ecologically rational a means of pest control that I immediately opted to become a specialist

in this field and to do my Ph.D. research when the time came under Professor Smith at Riverside. This I did and I have always been happy with my choice.”

Paul received his Bachelor's degree in Entomology from the University of California at Berkeley in 1937, then went on to do research at the Citrus Experiment Station in Riverside during 1938–40, and received his Ph.D. in Entomology from the University of California at Berkeley in 1940. In 1941 he also received the State Junior College Teaching Credential from the University of California at Los Angeles. Following work at the U.S. Public Health Service during 1941–42 and the U.S. Department of Agriculture, Bureau of Entomology and Plant Quarantine during 1942–45, he was appointed Assistant Entomologist at the Citrus Experiment Station of the University of California, and continued at Riverside throughout his career. He was promoted to Associate Entomologist in 1951 and to Entomologist in 1957. In 1961 he was appointed Professor of Biological Control, retiring to Emeritus status in 1982.

Paul DeBach has made fundamental contributions that have shaped the science and practice of biological control more than any other person. Spanning more than four decades, his scientific endeavors have demonstrated an exceptional integration of applied, mission-oriented research with basic, pioneering studies into the ecology, biology and biosystematics of insect natural enemies.

His applied research programs, aimed at the control of citrus pests in California, have included such landmark projects as the biological control of the California red scale, *Aonidiella aurantii* (Maskell), the purple scale, *Lepidosaphes beckii* (Newman), the woolly whitefly, *Aleurothrixus floccosus* (Maskell), and the bayberry whitefly, *Parabemisia myricae* (Kuwana). These and other projects have not only resulted in remarkable savings to agriculture, but have also helped establish, elucidate or illustrate some of the most important basic concepts, principles and practices of biological control. Many of the natural enemies he discovered and imported for these projects have later been successfully introduced into many other countries. *Aphytis melinus* DeBach for the California red scale, *Cales noacki* Howard for the woolly whitefly, and *Eretmocerus debachi* Rose and Rosen for the bayberry whitefly are but three outstanding examples. In addition he inspired, initiated and personally directed numerous biological control projects against major pests in many parts of the world, including the Florida red scale, *Chrysomphalus aonidum* (L.), by *Aphytis holoxanthus* DeBach in Israel and elsewhere, the rufous scale, *Selenaspidus articulatus* (Morgan), by *Aphytis roseni* DeBach and Gordh in South America, the arrowhead scale, *Unaspis yanonensis* (Kuwana), by *Aphytis yanonensis* DeBach and Rosen in Japan, the Mediterranean black scale, *Saissetia oleae* (Olivier), by *Metaphycus helvolus* (Compere) in Greece and Turkey, and countless others. Many of these projects have been crowned with outstanding success. His foreign exploration in search of new natural enemies included numerous trips practically all over the world.

The breadth of DeBach's scientific activities is amazing. There is no major aspect of biological control on which he has not left an indelible mark. He was the first to develop experimental methods for evaluating the efficacy of natural enemies, and carried out some of the seminal, groundbreaking studies in their augmentation, conservation and genetic improvement, thus laying the foundations for the modern methodology of biological control. In his basic ecological research he contributed to our understanding of the role of climatic factors and natural enemies in the population dynamics of pest insects, and was among the first to demonstrate the adverse environmental effects of toxic chemical pesticides and their role in inducing pest outbreaks. His detailed, long-term field studies of interspecific competi-

tion and competitive displacement among species of *Aphytis* parasitic upon the California red scale have provided the theoretical basis for the policy of multiple importation of natural enemies in biological control. In his biosystematic studies of parasitic Hymenoptera he elucidated the intricate relationships between sibling species, semispecies and biological strains, and their relevance to biological control. Indeed, it is hard to imagine modern biological control without Paul DeBach's trailblazing contributions.

Paul DeBach's list of more than 200 publications includes three major books. *Biological Control of Insect Pests and Weeds* under his editorship (1964), for many years the "Bible" of biological control and still unsurpassed by any other general textbook, has appeared also in Russian and Spanish editions. His *Biological Control by Natural Enemies* (1974) was also translated into Spanish, and was published again in a revised edition in 1991. *Species of Aphytis of the World* (1979) won him the first Filippo Silvestri Gold Medal in Portici, Italy in 1980. An excellent, very clear writer and editor, his numerous research papers, thoughtful articles and book chapters have had a profound influence on students, biological control researchers and integrated pest management (IPM) practitioners all over the world. Far beyond his enormous contributions to biological control and IPM, he was ahead of his time in promoting an ecological awareness among professionals, agriculturists and the general public.

Paul DeBach has won international acclaim for his outstanding achievements and leadership. Among his many honors, he was invited to serve on numerous national and international panels and committees, and to present invitational lectures at national and international meetings. He served as Chairman of the Biological Control Section of the Entomological Society of America (ESA), as Associate Director (with Carl B. Huffaker) of the International Center for Biological Control of the University of California (1970–76), as the first President of the International Organization for Biological Control (IOBC) (1971–72) and as Member of its Executive Committee (1971–76). He was a Fellow of the American Association for the Advancement of Science, was elected Honorary Fellow of the Entomological Society of the Soviet Union (1973), was nominated for the National Medal of Science (1974), and received the C.W. Woodworth Award from the Pacific Branch of the ESA (1976). In 1989, the Senate of the Hebrew University of Jerusalem awarded him an Honorary Doctorate for his contributions to biological control, integrated pest management and environmental quality.

A great naturalist and an avid fisherman and skin diver, in the last several years of his life Paul divided his time almost equally between his home in South Laguna, California and his "rancho" at Las Barracas, Baja California Sur, Mexico. Spending some eight weeks with him down there to do some collaborative writing has been perhaps the greatest experience of my life. His biological interests reached far beyond entomology, and were manifest also during his so-called retirement. One of his last projects was a biosystematic study of cacti of the genus *Mammillaria* in Baja California.

Above all, Paul's numerous colleagues, students, disciples and friends will always cherish his memory not only as an outstanding, keen scientist and great leader, but also as a modest, generous human being and a warm, wonderful friend.

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NOTES FOR AUTHORS

Israel Journal of Entomology, a peer-reviewed journal, publishes original contributions in all areas of entomology. Authors are entirely responsible for statements, whether of fact or opinion.

MANUSCRIPTS

Manuscripts, in English only, are considered on the understanding that their contents would not be published elsewhere. If a preliminary announcement relating to the contents of the paper has already been published, this must be stated.

Papers should be concisely written. Consulting the latest issue of the Journal and the "Style Manual for Biological Journals" is highly recommended. Manuscripts should be submitted in triplicate, typed double space on one side of a page only, together with a 3.5" or 5.25" IBM-compatible diskette. The name and version of the wordprocessor used should be indicated. For programs other than WordPerfect, WordStar, MS Word, Wordmill or Einstein, an ASCII version of the file should be included. The title of the paper should be informative, but preferably not exceed twenty words. An abstract provided at the beginning of the paper will indicate the main aspects of the subject, to be followed by 5–7 key words. Words which are to be italicized in print, such as scientific names, should be underlined with a single solid line. No more than three categories of subheadings are allowed; footnotes to text should be kept to a minimum.

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Spelling and terminology should be consistent throughout. Scientific names, on first mention, should be followed by the name of the first describer, written in full. When referring to paired organs in morphological descriptions, the singular form should be used. Names of localities in Israel will be given as they are transliterated in the latest issue of "List of settlements, localities and antiquity sites, Survey of Israel, Ministry of Labour." Regions in Israel and nearby areas should follow the "Fauna Palaestina" map (as in Theodor, O. 1975. Fauna Palaestina, Insecta I: Diptera Pupipara. The Israel Academy of Sciences and Humanities, Jerusalem).

TABLES

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1. In the text, reference to the literature should conform to the "name-and-date" system, e.g., Williams (1929); (Bodenheimer, 1938); Jones and Smith (1950). Unpublished references are to be cited as author followed by either (personal communication), (unpublished) or (in press). Only the latter category will appear in the list of references, together with the title of the periodical to which the paper was submitted for publication.

2. When reference is made to taxonomic descriptions, or to quoted passages, the relevant page number(s) should follow the year, e.g., Brown (1939:25).

3. Where three or more authors are concerned, reference is made only to the first, followed by "et al." and the year, e.g., Thomson et al. (1945).

4. The list of references will be given at the end of the article, according to the following examples, *with the titles of all periodicals unabbreviated and italicized.*

Bergman, E.D. 1976. The future of insecticides — a problem of human environment. *Israel Journal of Entomology* 11:5–14.

Taylor, L.R. and Palmer, J.M.P. 1970. Aerial sampling. In: Aphid Technology. Edit. H.F. van Emden. Academic Press, London. pp. 125–138.

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TAXONOMY

1. Comprehensive treatments of taxa (genera, families, etc.) will receive higher priority over partial treatments. Partial lists of species or faunistic lists, not accompanied by proper keys or references to such keys, will receive lower priority.
2. Authors must comply with the requirements of the International Code of Zoological Nomenclature and with the published Opinions of the International Commission.
3. The following abbreviations should be adopted: *n. gen.* – new genus; *n. sp.* – new species; *n. comb.* – new combination of names; *n. syn.* – denotes synonymy established for the first time; *n. stat.* – will be used to indicate a new change in rank of a name; *nomen nudum*, *nomen dubium* are not abbreviated.
4. In treating the taxonomy of a described taxon, the following form is essential for the beginning of a chapter.

Filippia olea (Costa, 1832)

(Fig. 1)

Coccus oleae Costa, 1832:21; Green, 1868:42 (biology)

Lecanium oleae. Smith, 1892:15 (list); Brown, 1899:20 (description)

Filippia oleae. Fernald, 1903:13 (catalog); Hall, 1943:50 (hosts list)

The full references to the above citations should be given in the REFERENCES section.

5. New taxa must be distinguished from related taxa.
6. In describing new species, the complete data of the type-series, together with the collection(s) in which it is deposited, will be recorded in the original description as follows:

MATERIAL EXAMINED. Holotype ♀, ISRAEL: Jerusalem, 14.v.1956, on *Ficus carica*, G. Levi (BMNH). Paratypes, 20 ♀, same data as holotype (USNM); Tel Aviv, 3.v.1962, on *Acacia* sp., G. Brown (1♂, 8♀; TAU).
7. Authors are required to deposit all type-material in nationally or internationally recognized institutions (not private collections).
8. Records of described species will be listed at the end of each relevant chapter as follows:

MATERIAL EXAMINED. EGYPT: Sinai, Dahab, 13.v.1958, ex. *Phoenix* sp., D. Cohen (1♂, 1♀; BMNH); ISRAEL: Akko, 20.ii.1967, on *Pistacia vera*, M. Levi (1♀; ZTV).

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