

An Annotated Bibliography of *Melittobia* (Hymenoptera: Eulophidae).

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ABSTRACT - A comprehensive list of over 400 publications mentioning the cosmopolitan wasp genus *Melittobia* (Hymenoptera: Eulophidae), is offered herein. The list spans from 1839 to early 2005 and it covers papers on taxonomy, life history, ecology, and behavior. A "Notes" field helps to identify specific topics covered and the particular *Melittobia* species mentioned. This bibliography provides easy access to the widely scattered literature on the genus.

KEYWORDS: Eulophidae, *Melittobia*, annotated bibliography, WOWBugs.

INTRODUCTION

Wasps of the genus *Melittobia* (Hymenoptera: Eulophidae) are ectoparasitoids, mainly of solitary wasps and bees or their nestinquilines, as well as flies and insects of different orders (Balfour-Browne 1922; Parker & Thompson 1928; Dahms 1984b; Krombein 1968). Currently one species, *M. digitata*, is reared commercially on flesh flies (*Neobellieria bullata*) (Matthews 1997b; Matthews et al. 1996) for use in science education curricula (e.g., Matthews & Matthews 2003; National Science Resources Center 2003).

Fourteen species of *Melittobia* have been described (Dahms 1984a); some have a nearly cosmopolitan distribution, probably facilitated by human commerce. Those species that appear to be uncommon or rare could simply reflect the way collecting has been done over the years.

The only taxonomic revision of the genus and key to species is provided by Dahms (1984a). The most recent checklist of the U.S. species appears in La Salle (1993). Australian and New Zealand species are mentioned in various papers (Dahms 1973, 1983, 1984a, 1984b, 1984c; Donovan & MacFarlane 1984; MacFarlane & Donovan 1989; MacFarlane & Pengelly 1977) that deal either with their systematics and biology or with their importance as parasitoids of leaf-cutter bees and their control. Afro-Indian species are described, mentioned or studied by Assem et al. (1982a, 1987), Dahms (1984a), Masi (1917) and Risbec (1951, 1952, 1956). Japanese and Asian species are mentioned by Assem & Maeta (1978, 1980), Dahms (1984a), González et al. (2004a), Iwata & Tachikawa (1966), Maeta (1978, 1985), Maeta & Yamane (1974) and Masi (1936). Other checklists (Bouček & Graham 1978a, 1978b; Dalla-Torre 1898;

Domenichini 1966; Graham 1987) include Old World *Melittobia*. Santis (1949, 1957, 1967, 1979, 1981, 1983, 1989) lists the *Melittobia* present in America south of Mexico. The species collected in Venezuela are listed by González & Terán (1996). González et al. (2004b) list species present in some Central American and Caribbean countries. In many cases some species identifications need to be updated.

There has been an interest in the biology of the different species of *Melittobia*, in part due to their polyphagous habit which make some of economical importance (Balfour-Browne 1922; Dahms 1984b; Schmieder 1938). The courtship behavior of some species have been widely studied (Assem 1975, 1976a, 1976b, 1981, 1985, 1987, 1996; Assem & Jachmann 1982; Assem & Maeta 1978, 1980; Assem et al. 1980, 1982a, 1982b, 1987; Dahms 1973; Evans & Matthews 1976; González 1985, 1994a, 1994b; González & Matthews 2005b; González & Terán 1995b; González et al. 1996; Matthews 1975, 1982). More recently, *Melittobia digitata* and *M. australica* have been increasingly used as model organisms to teach biology, ecology, and behavior concepts from elementary school to the college level (Beck et al. 2004; Flage 1995; Flage & Matthews 1996; Guinan & Matthews 2001; Guinan et al. 2000; Matthews 1982, 1997a, 1997b, 1998a, 1998b, 2000; Matthews & Matthews 1999, 2003; Matthews et al. 1996, 1997; National Science Resources Center 2003; Pyle et al. 1997, 1998). The importance of *Melittobia* as parasitoids or hyperparasitoids of bees used in pollination also has been the subject of many papers (Doroshina 1989, 1990; Erickson & Medenwald 1979; Eves et al. 1980; Farkas & Szalay 1985; Hobbs 1968; Holm 1960; Holm & Skou 1972; Iwata & Tachikawa

1966; MacFarlane & Donovan 1989; Packard 1864; Wael et al. 1993; Zerova et al. 1986). Dahms (1984b) provides the most extensive overview of *Melittobia* biology. Clarifications on the biology of some species are presented by González and Matthews (2002) and González et al. (2004a, 2004c).

The bibliography presented herein includes nearly all of the primary taxonomic references, most primary citations on biology, ecology and behavior of the different species and their hosts, and other significant literature. Many papers published in obscure or poorly known journals are included; these are often overlooked. Some relevant books or chapters of books are included when *Melittobia* is mentioned, normally as a secondary reference. Following each bibliographic entry is a "Notes" field that includes short comments, excerpts from the abstract, or the species name used by the author with the actual name (if it is a synonym) enclosed in parenthesis, or some other comment or textual quotes which we considered relevant. This enables the reader to gain an idea of what the paper is about. Most papers are in English but for those that are not, the original language is noted and whether it has an English abstract. Copies of all references mentioned herein are deposited at the *Melittobia* laboratory of the Department of Entomology of the University of Georgia in Athens, GA, 30606 USA.

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ANNOTATED BIBLIOGRAPHY

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- Notes:* A female of *Melittobia australica* does not produce males in a single burst, but continues to produce male eggs at a constant low rate in order to avoid the high mortality of her own sons by lethal male-male combat.
- Abe, J., Y. Kamimura, N. Kondo, and M. Shimada. 2003a. Extremely female-biased sex ratio and lethal male-male combat in a parasitoid wasp, *Melittobia australica* (Eulophidae). *Behavioral Ecology* 14(1):34-39.
- Notes:* *Wolbachia*-infected individuals of *Melittobia australica* showed the same sex ratio patterns as non-infected individuals. Experiments suggest that lethal male-male combat is an additional factor distorting the sex ratio toward greater female bias.
- Abe, J., Y. Kamimura, H. Ito, H. Matsuda, and M. Shimada. 2003b. Local mate competition with lethal male combat: Effects of competitive asymmetry and information availability on a sex ratio game. *Journal of Evolutionary Biology* 16(4):607-613.
- Notes:* This paper presents a sex allocation model for local mate competition in *Melittobia* spp. considering the asymmetry of competitive abilities among sons.
- Adams, R. F. 2002. Dynamics of daily progeny production in *Melittobia digitata* Dahms: Baseline studies. *The Undergraduate Science Bulletin* 3:17-21.
- Notes:* Females of *M. digitata* produce relatively more sons when new hosts are provided on a daily basis than with only one host for the whole laying period. In both cases the overall sex ratio was 97.6% female biased, with daily sex ratios ranging from 91.5 to 100% female. Unfertilized eggs are laid regularly throughout the period of oviposition, not just at the beginning.
- Alayo, P., and L. R. Hernández. 1978. *Introducción al estudio de los himenópteros de Cuba. Superfamilia Chalcidoidea*. La Habana: Ed. Academia de Ciencias de Cuba. 105 pp.
- Notes:* Spanish. *Melittobia* sp. as a parasitoid of *Sceliphron assimile* (Hymenoptera: Sphecidae) in Cuba.
- Alford, D.V. 1975. *Bumblebees*. London: Davis-Poynter. 352 pp.
- Notes:* *Melittobia* is known to attack *Bombus* and *Psithyrus* larvae (Hymenoptera: Apidae). *Melittobia acasta* occurs in the British Isles. Alford does not know whether *Melittobia* could parasitize bumblebees in the wild, but mentions that they are successful in attacking *Bombus terrestris* brood in managed conditions.
- Altson, A. M. 1920. The life history and habits of two parasites of blowflies. *Proceedings of the Zoological Society of London* (15):195-243.
- Notes:* *Melittobia acasta* as hyperparasite of *Alysia manducator* (Hymenoptera: Braconidae). Comments on morphology of *M. acasta* and its mandibles, and comparison with those of *Nasonia vitripennis* (Hymenoptera: Pteromalidae).
- Alves Dos Santos, I. 2003. Trap-nesting bees and wasps on the University campus in Sao Paulo, southeastern Brazil (Hymenoptera: Aculeata). *Journal of the Kansas Entomological Society* 76(2):328-334.
- Notes:* *Melittobia* wasps were among the

- natural parasitoids of the trap nest occupants.
- Antolin, M. F. 1999. A genetic perspective on mating systems and sex ratios of parasitoid wasps. *Population Ecology* 41:29-37.
Notes: *Melittobia* is mentioned as a haplodiploid species that inbreeds. However, Antolin notes that haplodiploidy does not necessarily lead to inbreeding.
- Ashmead, W. H. 1892. Notes on the genus *Melittobia*. *Proceedings of the Entomological Society of Washington* 2:228-232.
Notes: Notes on biology of *Melittobia* mention *Melittobia audouinii* (= *M. acasta*), *Anthophorabia megachilis* (= *M. megachilis*), *Melittobia pelopoi* (nomen nudum). Description of *Melittobia chalybii*.
- Ashmead, W. H. 1894. The habits of the aculeate Hymenoptera. *Psyche* 7:19-26.
Notes: *Melittobia megachilis* parasitizing *Megachile centuncularis*. *Pteratomus putnamii* (= *Anagrus putnamii*) (Hymenoptera: Mymaridae) mentioned as hyperparasitoid of *Melittobia megachilis*.
- Ashmead, W. H. 1904. The classification of the chalcid flies of the superfamily Chalcidoidea with descriptions of new species in the Carnegie Museum collected in South America by Herbert H. Smith. *Memoirs of the Carnegie Museum* 1:225-555.
Notes: Brief comments on *Melittobia acasta*.
- Askew, R. R. 1968. Sib-mating in *Nasonia vitripennis* (Walker) (Hymenoptera, Pteromalidae) and other Chalcidoidea and its possible evolutionary significance. *Proceedings of the XIIIth International Congress of Entomology* 1968:325.
Notes: *Melittobia* is mentioned as one of the many Chalcidoidea in which sib-mating occurs immediately after emergence.
- Assem, J. van den. 1975. Temporal patterning of courtship behaviour in some parasitic Hymenoptera, with special reference to *Melittobia acasta*. *Journal of Entomology* 50:137-146.
Notes: Males of most species of *Melittobia* seem to produce an essential combination of key stimuli only once per courtship display; female receptivity occurs at only one point, which is termed the "finale".
- Assem, J. van den. 1976a. Queue here for mating: Waarnemingen over het gedrag van ongeparde *Melittobia* wijfjes ten opzichte van een mannelijke soortgenoot. *Entomologisch Bericht* 36:74-79.
Notes: Dutch with English abstract. Reactions of unmated *Melittobia* females with respect to a male are described. They crowd around a male, especially when he is courting. Egg production starts after an insemination has occurred. *Melittobia acasta* is the model for this study.
- Assem, J. van den. 1976b. Male courtship behaviour, female receptivity signal, and size differences between the sexes in Pteromalinae (Hymenoptera, Chalcidoidea Pteromalidae), and comparative notes on other chalcidoids. *Netherlands Journal of Zoology* 26:535-548.
Notes: Courtship behavior in *Melittobia* species is compared with selected taxa of Pteromalinae.
- Assem, J. van den. 1981. Voortplantingsgegrag van sluipwespen. *Vakblad Voor Biologen* 61(6):114-121.
Notes: Dutch. Comments on courtship behavior of chalcidoid wasps including *Melittobia*.
- Assem, J. van den. 1985. Mating behaviour in parasitic wasps. In *Insect Parasitoids*, ed. J. K. Waage, and D.J. Greathead, 137-167. London: 13th Symposium Royal Entomological Society.
Notes: A general review of the role of courtship and mating behavior in parasitic wasps, especially in the Chalcidoidea. Comments on courtship behavior of *Melittobia*, including *M. acasta*, *M. assemi* and *M. hawaiiensis* groups.
- Assem, J. van den. 1996. Mating behaviour. In *Insect Natural Enemies. Practical Approaches to Their Study and Evaluation*, ed. M. Jervis, and N. Kidd, 163-221. London: Chapman and Hall.
Notes: Surveys mating behavior of various Chalcidoidea including *Melittobia*.
- Assem, J. van den, and F. Jachmann. 1982. The coevolution of receptivity signaling and body size in the Chalcidoidea. *Behaviour* 80:96-105.
Notes: *Melittobia* sp. courtship behavior mentioned for comparison with *Nasonia vitripennis* (Hymenoptera: Pteromalidae).
- Assem, J. van den, and F. Jachmann. 1999. Changes in male perseverance in courtship and female readiness to mate in a

- strain of the parasitic wasp *Nasonia vitripennis* over a period of 20+ years. *Netherlands Journal of Zoology* 49(3):125-137.
- Notes:* Long-term cultures of *Nasonia vitripennis* are compared with long-term cultures of *Melittobia*. Similarities and differences are noted.
- Assem, J. van den, and Y. Maeta. 1978. Some observations on *Melittobia* species (Hymenoptera, Chalcidoidea-Eulophidae) collected in Japan. *Kontyû* 46:264-272.
- Notes:* Observations on courtship on three species of *Melittobia* from Japan. Designated "1", "2", and "3", they are *M. acasta*, *M. australica* and *M. clavicornis* respectively.
- Assem, J. van den, and Y. Maeta. 1980. On a 4th species of *Melittobia* from Japan. *Kontyû* 48:477-481.
- Notes:* Courtship behavior of a 4th species of Japanese *Melittobia* (= *Melittobia sosui*) is described as well as two male morphs in this species.
- Assem, J. van den, H. A. J. in den Bosch, and E. Prooy. 1982a. *Melittobia* courtship behavior: A comparative study of the evolution of a display. *Netherlands Journal of Zoology* 32:427-471.
- Notes:* Courtship displays of nine *Melittobia* species are described and compared. Based on specific differences they are arranged in clusters and relative positions are discussed. Species are designated by numbers. Species 1 and 2 are identified as *M. clavicornis* and *M. acasta*, respectively. The other species were later described or identified by Dahms (1984a) as *M. evansi* (3), *M. digitata* (4), *M. assemi* (5), *M. sosui* (6), *M. hawaiiensis* (7), *M. "Kauai"* (7/8), and *M. australica* (8).
- Assem, J. van den, M. J. Gijswijt, and B. K. Nubel. 1980. Observations on the courtship and mating strategies in a few species of parasitic wasps (Chalcidoidea). *Netherlands Journal of Zoology* 30:208-227.
- Notes:* Comments on courtship behavior of some Chalcidoidea, including the genus *Melittobia*.
- Assem, J. van den, M. J. Gijswijt, and B. K. Nubel. 1982b. Characteristics of courtship and mating behaviour used as classificatory criteria in Eulophidae-Tetrastichinae (Hymenoptera), with special reference to the genus *Tetrastichus* s.l. *Tijdschrift voor Entomologie* 125:205-220.
- Notes:* The usefulness of behavioral characters for taxonomic work is tested in a study of courtship and mating behavior of some Tetrastichinae, including *Melittobia* spp. Information on hosts, collecting site and sex ratio is given for *M. acasta*, one of the species used in this study.
- Assem, J. van den, T. C. Narendran, and V. V. Sudheendrakumar. 1987. An analysis of the courtship behaviour of *Melittobia assemi* (Hymenoptera: Eulophidae). *Colemania* 4:23-28.
- Notes:* Study of the courtship of *M. assemi* from Kerala (India), Seychelles and Okinawa (Japan). The population in Okinawa was reproductively isolated from the Kerala and Seychelles populations. These last two were found to be conspecific. We believe the Okinawa population is what is actually known as *M. sosui*, not *M. assemi*.
- Augusto, S. C., and C. A. Garófalo. 2004. Nesting biology and social structure of *Euglossa (Euglossa) townsendi* Cockerell (Hymenoptera, Apidae, Euglossini). *Insectes Sociaux* 51:400-409.
- Notes:* *Melittobia* sp. mentioned attacking immatures of *Euglossa townsendi*.
- Austin, A.D, and M. Downton. 2000. The Hymenoptera: An introduction. In *Hymenoptera: Evolution, Biodiversity and Biological Control*, ed. A. D. Austin, and M. Downton, 37. Australia: CSIRO Publishing.
- Notes:* *Melittobia* mentioned as one of the Hymenoptera used in education.
- Balfour-Browne, F. 1922. On the life-history of *Melittobia acasta* Walker, a chalcid parasite of bees and wasps. *Parasitology* 14:349-370.
- Notes:* A comprehensive paper dealing with many biological aspects of *Melittobia acasta*, including hosts and habits.
- Beck, C. W., J. A. Guinan, L. S. Blumer, and R. W. Matthews. 2004. Exploring the Lotka-Volterra competition model using two species of parasitoid wasps. *Teaching Issues and Experiments in Ecology*, Vol. 2: Experiment #1.
- Notes:* Experiment that examines intraspecific and interspecific competition. Data are

- used to estimate the parameters of the Lotka-Volterra competition model. The insects used are *Melittobia digitata* and *Nasonia vitripennis* (Hymenoptera: Pteromalidae). On-line at: <http://tiee.ecoed.net/vol/v2/experiments/wasps/abstract.html>
- Berland, L. 1958. *Atlas des hyménoptères de France, Belgique, Suisse. I. Tenthredes, Parasites, Porte-Aiguillon (Béthylides)*. Paris: Boubée & Co. 155 pp.
- Notes: French. A brief description of the polymorphism found in *Melittobia acasta* females and drawings of the male and the female are given. Notes that they parasitize wasps, especially solitary ones, and that *M. acasta* can also be a hyperparasite.
- Blauch, B. M. 1948a. Do diploid males occur in the Chalcidoid wasp *Melittobia*? *Anatomical Record* 101(4):725-726.
- Notes: Meeting abstract which comments on experiments attempting to produce diploid males in *Melittobia*.
- Blauch, B. M. 1948b. Selection induced free oviposition by unmated females of the Chalcidoid wasp *Melittobia*. *Anatomical Record* 101(4):725.
- Notes: Meeting abstract which comments on experiments on oviposition in *Melittobia*.
- Blauch, B. M. 1954. Dzierzon law and free oviposition in *Melittobia*. *Genetics* 39(6):960-961.
- Notes: Meeting abstract which comments on experiments on oviposition in *Melittobia*.
- Bohart, G. E. 1972. Management of wild bees for the pollination of crops. *Annual Review of Entomology* 17:287-312.
- Notes: *Melittobia chalybii* is mentioned as one of the most important parasitoids of *Megachile rotundata* (Hymenoptera: Megachilidae) in California. This probably is a misidentification, as the only species we have found parasitizing *M. rotundata* from that area is *M. acasta*.
- Borgia, G. 1980. Evolution of haplodiploidy: Models for inbred outbred systems. *Theoretical Population Biology* 17:103-128.
- Notes: Unmated females of *Melittobia acasia* (*sic*, misspelling for *Melittobia acasta*) are noted to produce fewer eggs than mated ones. Mother/son mating occurs.
- Bosch, H. A. J. in den, and J. van den Assem. 1986. The taxonomic position of *Aceratoneuromyia granularis* Domenichini (Hymenoptera: Eulophidae) as judged by characteristics of its courtship behaviour. *Systematic Entomology* 11(1):19-23.
- Notes: *Aceratoneuromyia* has been considered a close relative of *Melittobia* and allies by several authors. Evidence from courtship behavior suggests that such a relationship is unlikely. Comments on *Melittobia* are mainly based on *M. acasta*.
- Boucek, Z. 1959. A study of central European Eulophidae, II: *Dialinopsis* and *Cirrospilus* (Hymenoptera). *Acta Faunistica Entomologica Musei Nationalis Pragae* 33:171-187.
- Notes: *Coroebus undatus* (Coleoptera: Buprestidae) mentioned as host of *Cirrospilus acasta* (= *Melittobia acasta*).
- Boucek, Z. 1977. Descriptions of *Tachinobia* gen.n. and three new species of Tetrastichinae (Hymenoptera: Eulophidae) with a tentative key to genera. *Bulletin of Entomological Research* 67:17-30.
- Notes: Key to the genera of Tetrastichinae. "There seems to be only one species in Europe, *M. acasta*", and "...*M. hawaiiensis* has become almost cosmopolitan, being now widespread in many tropical or subtropical countries". Since *M. australica* and *M. hawaiiensis* are very similar but reproductively isolated (see Assem et al. 1982a), Boucek's statement probably applies to both species. However, *M. australica* actually has a wider distribution than *M. hawaiiensis*.
- Boucek, Z., and M. W. R. de V. Graham. 1978a. British check-list of Chalcidoidea (Hymenoptera): Taxonomic notes and additions. *Entomologist's Gazette* 29:225-235.
- Notes: *Tetrastichus melittobius* Thompson and *Melittobia osmia* Thompson synonymized under *Melittobia acasta* (misspelling). "Syntypes of *T. melittobius* in Lund on three pins, the Lectotype (here designated), the upper-most female on one of these pins, labeled by Graham".
- Boucek, Z., and M. W. R. de V. Graham. 1978b. Chalcidoidea. *Handbooks for the Identification of British Insects* 11(4):67-110.
- Notes: Lists synonyms of the genus *Melittobia* and the species *Melittobia acasta*.
- Box, H. 1952. *Investigaciones sobre los taladra-*

- dores de la caña de azúcar (*Diatraea* spp.) en Venezuela. Informe del Progreso durante 1949 – 1951. Boletín Técnico 5. Venezuela: M.A.C.
- Notes: Spanish. *Melittobia* sp. as hyperparasite on *Paratheresia claripalpis* (Diptera: Tachinidae).
- Brian, M. V. 1957. Caste determination in social insects. *Annual Review of Entomology* 2:107-120.
- Notes: Life cycle of *Melittobia chalybii* on a single host is said to be like that of the ant *Myrmica* in a season in which the first larvae feeding on the host fluids develop as brachypterous adults and the later ones feeding on the solid tissues result in winged adults that first pass about two months of the larval stage in diapause. Brian's information is based on Schmieder (1953) (actually 1933). However, the only *Melittobia* species known to enter a larval diapause under laboratory conditions is *M. femorata*. This confusion in Schmieder's work is clarified by Matthews and González (2002).
- Brindley, W. A. 1976. Carbaryl control of chalcidoid parasites from alfalfa leaf-cutting bees. *Journal of Economic Entomology* 69(2):225-228.
- Notes: General comments on control under laboratory conditions of parasitoids of *Megachile* bees (Hymenoptera: Megachilidae) including *Melittobia*.
- Brèthes, J. 1911. Himenópteros Argentinos. *Anales del Museo nacional de Historia Natural de Buenos Aires* (3)20:205-316.
- Notes: Spanish. Description in Latin for *Sphécophagus sceliphronidis* (= *Melittobia hawaiiensis*) from Argentina.
- Brockmann, H. J. 2004. Variable life-history and emergence patterns of the pipe-organ mud-daubing wasp, *Trypoxylon politum* (Hymenoptera: Sphecidae). *Journal of the Kansas Entomological Society* 77(4):503-527.
- Notes: *Melittobia* is mentioned as one of the top three "types of parasitism" in Northern (New Jersey) and Southern (Florida) populations of *T. politum*. *Melittobia digitata* is mentioned as the most important parasitoid in the Florida population affecting about 86 % of the material studied. (We have seen the *Melittobia* material from Brockmann's *T. politum* samples and can confirm that *M. digitata* is indeed the most abundant *Melittobia* in the Florida samples; however some were also attacked by *M. australica*. In the New Jersey samples the most common species was *M. femorata*, but *M. digitata* was found there also.)
- Brues, C. T. 1909. Notes and descriptions of North American parasitic Hymenoptera. VII. *Bulletin of the Wisconsin Natural History Society (new series)* 6:154-163.
- Notes: Description of *Chrysocharis aeneus* (= *Melittobia megachilis*) from females. *Crabro* sp. (Hymenoptera: Sphecidae) as host.
- Brues, C. T., and A. L. Melander. 1932. *Classification of Insects*. Cambridge, Mass., U.S.A.: Harvard College. 672.
- Notes: *Melittobia* is mentioned as one of the various genera in the family Eulophidae.
- Brues, C.T., A.L. Melander, and F.M. Carpenter. 1954. Classification of Insects. *Bulletin of the Museum of Comparative Zoology at Harvard College*. 108:1-917.
- Notes: *Melittobia* is mentioned as one of the various genera in the family Eulophidae.
- Buckell, E. R. 1928. Notes on the life history and habits of *Melittobia chalybii* Ashmead (Chalcidoidea: Elachertidae). *Pan-Pacific Entomologist* 5:14-22.
- Notes: Comments on the biology and other aspects of the life history of *Melittobia chalybii*, based on specimens collected in Vernon, New Jersey. The vouchers examined by Dahms (1984a) at the Smithsonian Institution are actually *M. digitata*, but the drawing of the male provided in this paper has a close resemblance to *M. acasta*. It is possible that Buckell studied both species.
- Burks, B. D. 1958. Chalcidoidea. In *Hymenoptera North of Mexico. Synoptic Catalog. (Agriculture Monograph No. 2) First supplement*, ed. K. V. Krombein, and B. D. Burks, 62-84. Washington D.C: Department of Agriculture.
- Notes: *Melittobia acasta* and *M. megachilis* are mentioned from North America.
- Burks, B. D. 1967. Family Eulophidae. In *Hymenoptera North of Mexico. Synoptic Catalog (Agriculture Monograph No. 2) Second Supplement*, ed. K. V. Krombein, and B. D.

- Burks, 213-282. Washington D.C.: Department of Agriculture.
- Notes: The genus *Aceratoneuromyia* is removed as synonym of *Melittobia*.
- Burks, B. D. 1979. Family Eulophidae. In *Catalog of Hymenoptera of America North of Mexico. Vol. 1*, ed. K. V. Krombein, P.D. Hurd Jr., D.R. Smith, and B.D. Burks, 967-1022. Washington D.C.: Smithsonian Institution Press.
- Notes: *Melittobia chalybii* and *M. megachilis* and their synonyms are included.
- Callan, E. Mac See Mac Callan, E.
- Cameron, P. 1908. Descriptions of two new genera and species of reared Chalcididae from Borneo. *Deutsches Entomologisches Zeitschrift, Berlin* 1908(5):559-561.
- Notes: Description of *Philopison clavicornis* (= *Melittobia clavicornis*).
- Camillo, E. 1999a. A solitary Brazilian mud-dauber wasp, *Brachymenes dyscherus* (Hymenoptera: Vespidae) with evidence of a life-cycle polyphenism. *Revista de Biología Tropical* 47(4):949-958.
- Notes: *Melittobia* is mentioned as a parasitoid of *B. dyscherus*.
- Camillo, E. 1999b. Bionomics of *Trypoxylon* (*Trypargilum*) *antropovi* and *Trypoxylon* (*Trypargilum*) *aestivale* (Hymenoptera, Sphecidae). *Iheringia, Série Zoológica, Porto Alegre* (87):29-36.
- Notes: From 98 cells of *T. antropovi* 2 were parasitized by *Melittobia* sp.; from 144 cells of *T. aestivale*, 2 were parasitized also by *Melittobia* sp.
- Camillo, E. 2001. Inquilines of *Brachymenes dyscherus* nests with special reference to *Monobia schrottkyi* (Hymenoptera, Vespidae, Sphecidae). *Revista de Biología Tropical* 49(3-4):1005-1012.
- Notes: Of 52 cells of *B. dyscherus* reared by *M. schrottkyi* *Melittobia* sp. parasitized 44.
- Camillo, E. 2002. The natural history of the mud-dauber wasp *Sceliphron fistularium* (Hymenoptera: Sphecidae) in southeastern Brazil. *Revista de Biología Tropical* 50(1):127-134.
- Notes: The most common mortality factors of *Sceliphron fistularium* were either unknown or due to the parasitoid *Melittobia* sp.
- Camillo, E., C.A. Garofalo, J.M.F. de Asis, and J.C. Serrano. 1996. Biología de *Podium denticulatum* Smith em ninhos armadilhas (Hymenoptera: Sphecidae: Sphecinae). *Anais da Sociedade Entomológica do Brasil* 25(3):439-450.
- Notes: Portuguese with English abstract. *Melittobia* sp. was one of the parasitoids attacking *P. denticulatum*.
- Campbell, T. R. 1973. *Competition between two parasitoids, Melittobia chalybii* Ashmead and *Melittobia species A* (Hymenoptera: Eulophidae). M.Sc. thesis. Athens, Georgia: University of Georgia. 54 pp.
- Notes: Studies on competition for hosts using *Melittobia chalybii* (= *M. australica*) and *Melittobia species A* (= *M. digitata*). Intraspecific male fighting reduces sex ratio in both species. Fecundity is reduced in *M. chalybii* (= *M. australica*) compared to *M. species A* (= *M. digitata*) when in competition for hosts.
- Campbell, B. C., J. Heraty, J. Y. Rasplus, K. Chan, J. Steffen-Campbell, and C. Babcock. 2000. *Molecular systematics of the Chalcidoidea using 28S-D2 rDNA*. In *Hymenoptera: Evolution, Biodiversity and Biological Control*, ed. A. D. Austin, and M. Dowton, 59-73. Australia: CSIRO Publishing.
- Notes: Classification of the major groups of Chalcidoidea using molecular characters. *Melittobia* is one of the genera included in this study.
- Campbell, B. C., J. D. Steffen-Campbell, and J. H. Werren. 1993. Phylogeny of the *Nasonia* species complex (Hymenoptera: Pteromalidae) inferred from an internal transcribed spacer (ITS2) and 28S rDNA sequences. *Insect Molecular Biology* 2(4):225-237.
- Notes: The D2 region (of 28S rDNA) had a base substitution rate 2 times slower than the ITS2 region and was used to resolve the phylogenetic affiliation of *Melittobia digitata* to the pteromalids.
- Campobasso, G., E. Colonnelli, L. Knutson, G. Terragitti, and M. Cristofaro. 1999. Wild plants and their associated insects in the Palearctic Region, Primarily European and the Middle East. U.S.A.: U.S. Department of Agriculture, Agricultural Research Service, ARS-147. 249 pp.
- Notes: *Melittobia acasta* mentioned in association with *Centaurea melitensis* (Asteraceae)

- Caudell, A. N. 1892. A rearing of *Melittobia*. *The Canadian Entomologist* 24(9):238.
Notes: *Melittobia pelopoei* (nomen nudum) collected from "Tachina flies" (Diptera: Tachinidae) collected in mud dauber nests. The species was identified at the Department of Agriculture, probably by W. Ashmead, who mentions the species in Ashmead (1892).
- Chávez, A. H. 1985. *Morfología, ciclo de vida y comportamiento de Zeta argillaceum (L.) (Hymenoptera: Eumenidae)*. Trabajo de ascenso. Barquisimeto, Lara, Venezuela: Universidad Centro Occidental Lisandro Alvarado. 74 pp.
Notes: Spanish. *Melittobia* sp. (= *M. australica*) is mentioned as parasitoid of *Zeta argillaceum* (Hymenoptera: Vespidae).
- Chevalier, L. 1930. Etude sur un Hyménoptère mangeur de chenilles *Cratotrechus larvarum* L. *Bulletin de la Société des Sciences Naturelles et Médicales de Seine-et-Oise* 11:21-26.
Notes: French. *Melittobia* sp. (very probably *M. acasta*) parasitizing *Cratotrechus larvarum* (= *Eulophus ramicornis*) (Hymenoptera: Eulophidae).
- Comstock, J. H. 1947. *An Introduction to Entomology. Ninth Edition, Revised*. Ithaca, New York: Comstock Publishing Company. 1064 pp.
Notes: "*Melittobia* is common in the nests of solitary bees and wasps. The female gains access to the larval cell, stings the enclosed larva or pupa to paralyze it and then deposits her eggs on it. The parasite larvae develop externally. Several generations develop on the same host before it is completely consumed. The males are short-winged and have the antenna modified into a pincher-like structure for holding the female's antenna during courtship. They are very pugnacious and often kill each other in battle. The females are either short- or long-winged."
- Cônsoli, F. L., and S. B. Vinson. 2002a. Clutch size, development and wing morph differentiation of *Melittobia digitata* Dahms (Hymenoptera: Eulophidae). *Entomologia Experimentalis et Applicata* 102:135-143.
Notes: Effects of the clutch size on the development, egg load, and wing morph differentiation of *Melittobia digitata*.
- Cônsoli, F. L., and S. B. Vinson. 2002b. Larval development and feeding behavior of the wing dimorphics of *Melittobia digitata* Dahms (Hymenoptera: Eulophidae). *Journal of Hymenoptera Research* 11(2):188-196.
Notes: The two female morphs of *Melittobia digitata* have similar larval morphology; however, development of the short wing female (brachypterous morph) is faster. Mouth apparatus of larvae is described.
- Cônsoli, F. L., and S. B. Vinson. 2004. Wing morph development and reproduction of the ectoparasitoid *Melittobia digitata*: Nutritional and hormonal effects. *Entomologia Experimentalis et Applicata* 112:47-55.
Notes: Specific nutrients from the host hemolymph or changes in the host internal composition at a critical stage (120 - 123 h) appears to induce changes in pathways that control parasitoid metabolism and nutrient allocation decision during cell growth and development of imaginal discs.
- Cônsoli, F. L., H. S. Tian, S. B. Vinson, and C. J. Coates. 2004. Differential gene expression during wing morph differentiation of the ectoparasitoid *Melittobia digitata* (Hym. Eulophidae). *Comparative Biochemistry and Physiology, Part A: Molecular & Integrative Physiology* 138(2):229-239.
Notes: Differential gene expression between short- and long-winged larvae is described for *Melittobia digitata*. The complete cDNA of a putative metalloprotease found was fully sequenced and is described. The role of the putative differentially expressed genes during wing morph differentiation of *M. digitata* is discussed.
- Cônsoli, F. L., W. J. Williams, S. B. Vinson, R. W. Matthews, and M. F. Cooperband. 2002. Trans-bergamotenes - male pheromone of the ectoparasitoid *Melittobia digitata*. *Journal of Chemical Ecology* 28:1675-1689.
Notes: Alpha- and beta-trans-bergamotenes were found to be the active compounds of the male *Melittobia digitata* sex attractant.
- Cooperband, M.F. 1998. *Understanding host-acceptance behavior and larval feeding of the parasitic wasp Melittobia digitata (Hymenoptera: Eulophidae) to facilitate rearing on an*

- artificial host*. M.Sc. Thesis. College Station: Texas A & M University. 122 pp.
- Notes*: Introduces *Melittobia*, explores optimal conditions for oviposition, investigates host-acceptance requirements, and discusses larval feeding.
- Cooperband, M. F., and S. V. Vinson. 2000. Host-acceptance requirements of *Melittobia digitata* (Hymenoptera: Eulophidae), a parasitoid of mud dauber wasps. *Biological Control* 17:23-28.
- Notes*: Females of *Melittobia digitata* respond to both shape and nutritional content of the host.
- Cooperband, M. F., P. Fanti, S. B. Vinson, and R. W. Matthews. 1996. Factors involved in *in vitro* rearing of *Melittobia digitata*. *Proceedings of the 20th International Congress of Entomology, Firenze, Italy*. 1996:638.
- Notes*: Meeting abstract comments on preliminary attempts at artificially rearing *Melittobia digitata*.
- Cooperband, M. F., R. W. Matthews, and S. B. Vinson. 2003. Factors affecting the reproductive biology of *Melittobia digitata* and failure to meet the sex ratio predictions of Hamilton's local mate competition theory. *Entomologia Experimentalis et Applicata* 109(1):1-12.
- Notes*: *Melittobia digitata* appear to satisfy all of Hamilton's local mate competition requisites but do not exhibit the predicted change in sex ratio with increased foundress number.
- Cousin, G. 1938. La néoténie chez *Gryllus campestris* et ses hybrides. *Bulletin Biologique de la France et de la Belgique* 72:79-118.
- Notes*: French. The time for complete development and morphs in *Melittobia chalybii* is mentioned based on Schmieder (1933). (See González and Matthews 2002, for information on the work done by Schmieder and collaborators)
- Cowan, D. P. 1991. The solitary and presocial Vespidae. In *The Social Biology of Wasps*, ed. K. G. Ross, and R.W. Matthews, 33-73. Ithaca, Cornell University Press.
- Notes*: Review of literature indicating that infestations of *Melittobia* on *Zeta abdominale* (Hymenoptera: Vespidae) are severe in rock shelters where numerous females nest in close proximity. Females of *Melittobia* enter nests while they are open and being provisioned, squeeze through tiny cracks, or chew through the mud wall to gain entrance to a cell.
- Cowley, D. R. 1961. The associates of *Pison spinolae* Shuckard (Hymenoptera: Sphecidae). *New Zealand Entomologist* 2: 45-46.
- Notes*: *Melittobia clavicornis* (= *M. hawaiiensis*) is mentioned as a parasitoid of *P. spinolae* in New Zealand.
- Cresson, E. T. 1887. *Melittobia megachilis*. In Synopsis of the families and genera of the Hymenoptera of America North of Mexico, together with a catalogue of the described species and bibliography. *Transactions of the American Entomological Society*, suppl. 1887:244.
- Notes*: *Melittobia megachilis* is presented as a new combination of *Anthophorabia megachilis*.
- Cross, E. A., M. G. Stith, and T. R. Bauman. 1975. Bionomics of the organ-pipe mud-dauber, *Trypoxylon politum* (Hymenoptera: Sphecoidea). *Annals of the Entomological Society of America* 68:901-916.
- Notes*: Life history and habits of *Trypoxylon politum* (Hymenoptera: Sphecidae). *Melittobia chalybii* (probably a misidentification) mentioned as a common parasitoid of *T. politum*
- Crozier, R. H. 1977. Evolutionary genetics of the Hymenoptera. *Annual Review of Entomology* 22:263-288.
- Notes*: "Intermale combat for possession of the emergence site and the virgin females also indicates outbreeding and competition between sibships". Comment based on Matthews (1975) on *Melittobia* and two other references on other parasitoids.
- Cumber, R. A. 1953. *Melittobia clavicornis* (Cameron) (Hym. Eulophidae) parasite of the mason wasp *Pison spinolae* Shuckard (Hym. Trypoxylonidae). *New Zealand Entomologist* 1:16-17.
- Notes*: Here, *Melittobia clavicornis* = *M. hawaiiensis*.
- Dahms, E. C. 1973. The courtship behaviour of *Melittobia australica* Girault, 1912 (Hymenoptera: Eulophidae). *Memoirs of the Queensland Museum* 16:411-414.
- Notes*: The courtship of *M. australica* is dis-

- cussed and compared with that of *M. acasta* and *M. chalybii*.
- Dahms, E. C. 1978. A checklist of the types of Australian Hymenoptera described by Alexandre Arsen Girault, I: Introduction, acknowledgements, biography, bibliography and localities. *Memoirs of the Queensland Museum* 19(2):127-190.
Notes: Mentions Girault's paper where *Melittobia australica* was described.
- Dahms, E. C. 1983. A checklist of the types of Australian Hymenoptera described by Alexandre Arsen Girault, 2. Preamble and Chalcidoidea species A - E with advisory notes. *Memoirs of the Queensland Museum* 21(1):1-255.
Notes: *Melittobia australica* is mentioned as one of the many chalcidoids described by Girault.
- Dahms, E. C. 1984a. Revision of the genus *Melittobia* (Chalcidoidea: Eulophidae) with the description of seven new species. *Memoirs of the Queensland Museum* 21(2):271-336.
Notes: New combinations [*Tachinobia diopsisephila* and *Cirrospilus cosmopterygi* (Hymenoptera: Eulophidae)], redescription of seven species (*M. clavicornis*, *M. acasta*, *M. chalybii*, *M. megachilis*, *M. hawaiiensis*, *M. australica* and *M. bekiliensis*), description of 5 new species (*M. evansi*, *M. scapata*, *M. femorata*, *M. assemi*, *M. s-sui*) and another one not named (from Argentina and Kauai), synonymies [*M. strandi* and *Anthophorabia fasciata* (= *M. acasta*); *M. japonica* (= *M. clavicornis*); *M. sceliphronidis* (= *M. hawaiiensis*); *Tachinobia gradwelli* (= *Tachinobia diopsisephila*); and still unidentifiable species (*M. osmiae* and *M. hawaiiensis peles*) are presented.
- Dahms, E. C. 1984b. A review of the biology of species in the genus *Melittobia* (Hymenoptera: Eulophidae) with interpretations and additions using observations on *Melittobia australica*. *Memoirs of the Queensland Museum* 21(2):337-360.
Notes: A review of published accounts of all aspects of *Melittobia* biology, including new observations on the behavior and biology of *M. australica*.
- Dahms, E. C. 1984c. An interpretation of the structure and function of the antennal sense organs of *Melittobia australica* (Hymenoptera: Eulophidae) with the discovery of a large dermal gland in the male scape. *Memoirs of the Queensland Museum* 21(2):361-385.
Notes: Histology of *Melittobia australica* male antennae is presented and together with behavioral observations, and the role of the male scape as a putative pheromone source is suggested.
- Dalla-Torre, K. W. 1898. *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. V. Chalcididae et Proctotrupidae*. Lipsiae: Engelmann. 598 pp.
Notes: Catalog and checklist. Includes *Melittobia acasta*.
- Delaplane, K. S., and D. F. Mayer. 2000. *Crop Pollination by Bees*. CABI Publishing, New York. 344 pp.
Notes: *Melittobia* spp. mentioned as parasitoids of alfalfa leafcutting bees [*Megachile* spp. (Hymenoptera: Megachilidae)].
- de Santis, L. See Santis, L. de
- de Wael, L. See Wael, L. de
- Deyrup, L. D., and R. W. Matthews. 2003a. A simple technique for milking the venom of a small parasitic wasp, *Melittobia digitata* (Hymenoptera: Eulophidae). *Toxicon* 42:217-218.
Notes: Describes a method for obtaining a good quantity of pure venom from *M. digitata*.
- Deyrup, L. D., and R. W. Matthews. 2003b. Host preference and utilization by *Melittobia digitata* (Hymenoptera: Eulophidae) in relation to mating status. *Journal of Entomological Science* 38(4):512-517.
Notes: When simultaneously offered two flesh fly hosts [*Neobellieria bullata* (Diptera: Sarcophagidae)], *Melittobia digitata* virgin females used just one of the hosts more often than mated ones did. Females can discriminate one flesh fly from the other, and choose to avoid ovipositing on both.
- Deyrup, L. D., M. Deyrup, and R. W. Matthews. 2003c. Paralyzation and developmental delay of a factitious host by *Melittobia digitata* (Hymenoptera: Eulophidae). *Journal of Entomological Science* 38(4):533-535.
Notes: Pupae of mealworms [*Tenebrio molitor* (Coleoptera: Tenebrionidae)] are paralyzed and their development is arrested

- after they are stung by *Melittobia digitata* females prior to oviposition.
- Deyrup, L. D., R. W. Matthews, and J. M. González. 2005. Cooperative chewing in *Melittobia digitata* Dahms, a parasitoid wasp, is stimulated by structural cues and a venom pheromone in crude venom extract. *Journal of Insect Behavior* (In Press).
- Notes: A putative pheromone released during stinging is the trigger that stimulates *Melittobia* females to cooperatively chew through the cocoon or nest. Experiments were done with *M. digitata* but other *Melittobia* species were also observed.
- Domenichini, G. 1966. *Index of Entomophagous Insects. I. Palearctic Tetrastichinae (Hym. Eulophidae)*. Paris: Le Francois. 101 pp.
- Notes: *M. acasta* and *M. japonica* (= *M. clavicornis*) are mentioned, with references to original descriptions, synonymy, taxonomy, hosts and geographic distribution.
- Donovan, B. J. 1976. Co-operative material penetration by *Melittobia hawaiiensis* (Hymenoptera: Eulophidae) and its adaptive significance. *New Zealand Entomologist* 6(2):192-193.
- Notes: Cooperative boring by females of *Melittobia hawaiiensis* attempting to escape their rearing container is described and its possible adaptive significance discussed. Vouchers of Cumber (1953) and Cowley (1961) are noted to be not *M. clavicornis* but *M. hawaiiensis*.
- Donovan, B. J. 1989. Potential enemies of the introduced wasp parasitoid *Sphécophaga vesparum* (Hymenoptera: Ichneumonidae) in New Zealand. *New Zealand Journal of Zoology* 16(3):365-367.
- Notes: *Melittobia acasta* is mentioned as one of the known destroyers of *Sphécophaga vesparum*.
- Donovan, B. J., R. P. Mac Farlane. 1984. Bees and Pollination. In *New Zealand Pest and Beneficial Insects*, ed. Scott R.R., 247-269. Australia: Lincoln University, College of Agriculture.
- Notes: *Melittobia* spp. are discussed as parasitoids of bumblebees and leaf-cutter bees.
- Doroshina, L. P. 1989. Adaptive features of *Melittobia acasta* (Chalcidoidea, Eulophidae), a parasite of solitary bees. *Zoologicheskij Zhurnal* 68:60-69.
- Notes: Russian with English abstract. Data are reported on the adaptive behaviors of *Melittobia acasta*, including comments on phototropism, migration, locomotion, development, and reproduction.
- Doroshina, L. P. 1990. Protection from chalcids and optimization of nesting conditions for bees (Hymenoptera: Apoidea, Megachilidae). *Zoologicheskij Zhurnal* 69(3):55-59.
- Notes: Russian with English abstract. *Melittobia acasta* as parasitoid of *Megachile* sp. and *Anthidium florentium* (Hymenoptera: Megachilidae). Plants in the genus *Artemisia* (Asteraceae) are repellent to *M. acasta*. To reduce infestation, *Megachile* and *Anthidium* colonies should be placed close to materials needed for nest building and *Artemisia* plants.
- Doutt, R.L. 1959. The biology of parasitic Hymenoptera. *Annual Review of Entomology* 4:161-182.
- Notes: Outcrosses of *Melittobia* are mentioned to be less fecund than closely inbred crosses.
- Doutt, R. L. 1973. Maternal care of immature progeny by parasitoids. *Annals of the Entomological Society of America* 66(2):486-487.
- Notes: Females of *Melittobia* remain with their brood while it develops. This behavior is rare in gregarious external parasitoids.
- Edwards, C. J., and D. H. Pengelly. 1966. *Melittobia chalybii* Ashmead (Hymenoptera: Eulophidae) parasitizing *Bombus fervidus* Fabricius (Hymenoptera: Apidae). *Proceedings of the Entomological Society of Ontario* 96:98-99.
- Notes: *Melittobia chalybii* shown to parasitize *Bombus fervidus* in Ontario, Canada. *Sphécophaga burra* (Hymenoptera: Ichneumonidae) is mentioned as host of the parasitoid but should not be considered as such. Eggs of *Saperda candida* (Coleoptera: Cerambycidae) are also mentioned as host but might be questionable since the main hosts of *Melittobia* are the prepupae and pupae stages.
- Eickwort, G. C. 1971. *Hoplitis anthocopoides*, an European mason bee established in New York State (Hymenoptera: Megachilidae). *Psyche* 77:190-201.
- Notes: First record of *H. anthocopoides* in the

- U.S., which is later mentioned as a host of *M. chalybii* (probably *M. acasta*) (see Eickwort 1973).
- Eickwort, G. C. 1973. Biology of the European mason bee, *Hoplitis anthocopoides* (Hymenoptera: Megachilidae) in New York State. *Search, Agriculture, Entomology (Ithaca)* 3(2):1-31.
- Notes:* *Melittobia chalybii* is recorded as a parasitoid of *H. anthocopoides*. Due to the fact that the bee was a recent immigrant from Europe (see Eickwort 1971) and that it was located in New York State, it is possible that the parasitoid was actually *M. acasta*.
- Erickson, E. H, and R. Medenwald. 1979. Parasitism of queen honeybee pupae by *Melittobia acasta*. *Journal of Agricultural Research* 18(1):73-76.
- Notes:* Parasitism by *Melittobia acasta* on developing queen honeybees in Wisconsin is reported.
- Evans, D. A, and R. W. Matthews. 1976. Comparative courtship behavior in 2 species of the chalcid wasp *Melittobia* (Hymenoptera: Eulophidae). *Animal Behaviour* 24:46-51.
- Notes:* Courtship behaviors of *Melittobia chalybii* (= *M. australica*) and *M. sp. A* (= *M. evansi*) are described and compared.
- Evans, H. E., and M. J. West-Eberhard. 1970. *The Wasps*. The University of Michigan Press, Ann Arbor. 265 pp.
- Notes:* Comments on *Melittobia chalybii* based on Schmieder (1933) [See González and Matthews (2002) for explanation on *M. chalybii* from Schmieder's work].
- Eves, J. D., and C. A. Johansen. 1974. Population dynamics of larvae of the alfalfa-cutting bee *Megachile rotundata* in eastern Washington, U.S.A. *Washington Agricultural Experimental Station Technical Bulletin* 78:1-12.
- Notes:* *Melittobia* sp. reported as a parasitoid of *Megachile rotundata* (Hymenoptera: Megachilidae).
- Eves, J.D., D.F. Mayer, and C.A. Johansen. 1980. Parasites, predators, and nest destroyers of the alfalfa leafcutting bee, *Megachile rotundata*. Western Regional Extension Publication 32.
- Notes:* *Melittobia* sp. mentioned as a parasitoid of *Megachile rotundata*.
- Farkas, J., and L. Szalay. 1985. Controlling of insect-parasites of alfalfa leaf cutting bee stock *Megachile rotundata* F., Hymenoptera, Megachilidae). *Apidologie* 16(2):171-180.
- Notes:* *Melittobia acasta* found infesting prepupae of *Megachile rotundata* imported from the U.S. and Canada to Hungary.
- Farkas, J., and L. Szalay. 1986. *Melittobia acasta* Walker (Hymenoptera: Eulophidae) the most dangerous indirect pest of Lucerne seed production. *Acta Agronomica Hungarica* 35(1-2):103-106.
- Notes:* *Melittobia acasta* could remain dangerous in spite of the control operations so far carried out. This wasp could compromise the future of success of Lucerne seed production in Hungary.
- Farlane, R. P. Mac See Mac Farlane, R. P. Fernández Triana, J. L., J. L. Triana, H. Satriol, M. A. Vega Castillo, S. Ricardo, M. González, and E. Portuondo Ferrer. 2002. Datos preliminares sobre la biodiversidad del Orden Hymenoptera en la provincia Granma, Cuba. *Boletín de la Sociedad Entomológica Aragonesa*. (31):42-48.
- Notes:* Spanish. *Melittobia* sp. was found in two localities in Granma Province, Cuba. No details are given on hosts. On-line at: <http://entomologia.rediris.es/aranet/e2/10/04hymenopteracuba/>
- Ferriere, C. 1933a. Chalcidoid and Proctotrupoid parasites of pests of the coconut palm (2nd part). *Stylops* 2(4):86-96.
- Notes:* *Melittobia hawaiiensis* collected in either Java or New Guinea and reared in the laboratory. No details on the host or precise locality are given.
- Ferriere, C. 1933b. Chalcidoid and Proctotrupoid parasites of pests of the coconut palm. *Stylops* 2(4):97 - 108.
- Notes:* Presence of *Melittobia hawaiiensis*. Mentions that *Philopison clavicornis* Cameron is really in the genus *Melittobia* "and perhaps only a variety of *M. acasta* Walker".
- Ferriere, C. 1960. Un nouveau Tetrastichinae parasite d' Anthomyides au Japon (Hymenopteres: Eulophidae). *Acta Hymenopterologica, Fukuoka* 1:105-108.
- Notes:* French. The genus *Melittobia* and species *M. japonica* (= *M. clavicornis*) are used for comparison in the description of

- Aceratoneuromyia atherigona*, a "closely related" parasitoid from Japan.
- Fidgen, L. L., J. D. Sweeney, and D. T. Quiring. 1999. Stage-specific survival of *Strobilomyia appalachensis* (Diptera: Anthomyiidae). *The Canadian Entomologist* 131:483-494.
- Notes: Although Sweeney et al. (2002) cite this paper as the source for *Melittobia acasta* as a parasitoid of North American *Strobilomyia neantracina* and/or *S. appalachensis* (Diptera: Anthomyiidae), *M. acasta* is not mentioned anywhere in it. According to J. D. Sweeney (personal communication) the mention was a mistake and the citation actually referred to an unpublished manuscript.
- Flage, L. R. 1995. *Attitudinal and cognitive dimensions of middle grade students participating in an open-ended inquiry laboratory, "mystery organism"*. Ph.D. dissertation. Athens, Georgia: University of Georgia. 198 pp.
- Notes: *Melittobia digitata* (the WOWBug) is the "mystery organism" and it is described as an ideal insect to develop inquiry-based life science curricular activities. These are the basis of a qualitative analysis evaluating attitudes, beliefs, and participation of students in one middle school science class.
- Flage, L. R., and R. W. Matthews. 1996. Affective and cognitive dimensions of 6th grade students involved in an open-ended inquiry laboratory, "mystery organism". *Invertebrates in Captivity Conference* 1996:92-99.
- Notes: Attitudes, beliefs, and participation of students in a middle school science class are evaluated in the context of inquiry activities using *Melittobia digitata* (the "mystery organism").
- Flanders, S. E. 1943. The role of mating in the reproduction of parasitic Hymenoptera. *Journal of Economic Entomology* 36(5):802-803.
- Notes: Comments on oviposition of *Melittobia acasta* and *M. chalybii*.
- Freeman, B. E. 1973. Preliminary studies on the population dynamics of *Sceliphron assimile* Dahlbom (Hymenoptera: Sphecidae) in Jamaica. *Journal of Animal Ecology* 42:173-182.
- Notes: *Melittobia chalybii* (= *M. australica*) is mentioned as one of the most important mortality factors of *S. assimile* in Jamaica.
- Freeman, B. E. 1974. The distribution in Jamaica of the mud wasp *Sceliphron assimile* Dahlbom (Sphecidae) and its associates. *Caribbean Journal of Science* 14(3-4):115-124.
- Notes: In Jamaica, *Melittobia chalybii* (= *Melittobia australica*) attacks various aculeates (Hymenoptera) [*Trypoxylon texense* and *Sceliphron assimile* (Sphecidae), *Megachile concinna* and *Chalicodoma lanata* (Megachilidae), *Pachodynerus nasidens* (Vespidae)]. The mortality caused by *Melittobia* is greater in western regions of the country.
- Freeman, B. E. 1977. Some aspects of the regulation of the Jamaican population of *Sceliphron assimile* (Dahlbom) (Sphecidae). *Journal of Animal Ecology* 46:231-248.
- Notes: *Melittobia* sp. is one of the parasitoids that help regulate the population of the solitary wasp *Sceliphron assimile*.
- Freeman, B. E., and K. Ittyeipe. 1976. Field studies on the cumulative response of *Melittobia* sp. (*hawaiiensis* complex) (Eulophidae) to varying host densities. *Journal of Animal Ecology* 45:415-423.
- Notes: The cumulative response of *Melittobia* sp. (*hawaiiensis* complex) (= *Melittobia australica*) to varying host densities shows a density-dependent relationship which levels off at high densities; a decline in the response at still higher densities is indicated.
- Freeman, B. E., and K. Ittyeipe. 1982. Morph determination in *Melittobia*, a eulophid wasp. *Ecological Entomology* 7:355-363.
- Notes: *Melittobia* sp. 1 (*hawaiiensis* complex) (= *M. australica*) can produce 3 female "behavioral" morphs (crawlers, jumpers and flyers). This trimorphism is related to levels of ecological space, and the general ecological conditions necessary for it to evolve are suggested.
- Freeman, B. E., and K. Ittyeipe. 1993. The natural dynamics of the eulophid parasitoid *Melittobia australica*. *Ecological Entomology* 18:129-140.
- Notes: Many aspects of the ecology of *Melittobia australica* are studied in the laboratory and the field in Jamaica.

- Freeman, B. E., and B. Johnston. 1978. The biology in Jamaica of the adults of the sphecid wasp *Sceliphron assimile* Dahlbom. *Ecological Entomology* 2:39-52.
 Notes: Male host cells tend to be basal and these are most affected by parasitism by *Melittobia* spp. thereby affecting the sex ratio of *S. assimile* (Hymenoptera: Sphecidae). This effect should be more pronounced at high densities since *Melittobia* is density-dependent.
- Freeman, B. E., and J. R. Parnell. 1973. Mortality of *Sceliphron assimile* Dahlbom caused by the eulophid *Melittobia chalybii* Ashmead. *Journal of Animal Ecology* 42:779-784.
 Notes: An ecological study of the mortality caused by *Melittobia chalybii* (= *M. australica*) on the population of *S. assimile* (Hymenoptera: Sphecidae) in Jamaica.
- Freeman, B. E., and C. A. Taffe. 1974. Population dynamics and nesting behaviour of *Eumenes colona* (Hymenoptera) in Jamaica. *Oikos* 25:388-394.
 Notes: *Melittobia chalybii* (= *Melittobia australica*) parasitizes *Monobia mochii*, *Pachodynerus nassidens*, *Eumenes colona* (= *Zeta abdominale*) (Hymenoptera: Vespidae), and *Sceliphron assimile* (Hymenoptera: Sphecidae). *Melittobia* acts as a density-dependent mortality factor on *Eumenes* (= *Zeta abdominale*), and may be capable of controlling numbers at high host densities but they cannot do so in regions having characteristically low densities of the host.
- Fye, R. E. 1965. Biology of Apoidea taken in trap nests in Northwestern Ontario (Hymenoptera). *The Canadian Entomologist* 97:863-877.
 Notes: *Melittobia chalybii* (possibly *M. acasta*) destroyed a few cells of *Hylaeus albifrons* (Hymenoptera: Colletidae) and *Megachile inermis* (Hymenoptera: Megachilidae).
- Gahan, A. B. 1938. Notes on some genera and species of Chalcidoidea (Hymenoptera). *Proceedings of the Entomological Society of Washington* 40:209-227.
 Notes: *Aceratoneuromyia australica* is placed as a synonym of *Melittobia indicum* (= *Aceratoneuromyia indica*).
- Garcia, M. V. B., and J. Adis. 1993. On the biology of *Penepodium goryanum* (Lepetier) in wooden trap-nests (Hymenoptera, Sphecidae). *Proceedings of the Entomological Society of Washington* 95(4):547-553.
 Notes: *Melittobia* sp. parasitized 15% of trap-nests of *P. goryanum*.
- Garofalo, C. A., E. Camillo, S. C. Augusto, B. M. Vieira de Jesus, and J. C. Serrano. 1998. Nest structure and communal nesting in *Euglossa (Glossura) annectans* Dressler (Hymenoptera, Apidae, Euglossini). *Revista Brasileira de Zoologia* 15(3):589-596.
 Notes: *Melittobia* is reported attacking nests of *Euglossa annectans* (Hymenoptera: Apidae). Infestation may have occurred in the laboratory, originating from nests of other wasps and bee species infested by the parasitoid.
- Gaul, A. T. 1952. The awakening and diurnal flight activities of vespine wasps. *Proceedings of the Royal Entomological Society of London* 27:33-35.
 Notes: *Melittobia* is mentioned as a parasitoid of social wasps.
- Gauld, I. A., B. Bolton. 1988. *The Hymenoptera*. Oxford University Press, Oxford. 332 pp.
 Notes: General comments on *Melittobia acasta*.
- Gauthier, N., J. La Salle, D. L. J. Quicke, and H. C. J. Godfray. 2000. Phylogeny of Eulophidae (Hymenoptera: Chalcidoidea), with a re-classification of Eulophinae and the recognition that Elasmidae are derived eulophids. *Systematic Entomology* 25:521-539.
 Notes: *Melittobia digitata* (from US) and *M. sp.* (from Costa Rica; likely *M. australica*) are placed in the Tetrastichinae after DNA analysis to build the phylogeny of Eulophidae.
- Genaro, J. A. 1994. Inquilinos de *Sceliphron assimile*, con énfasis en *Podium fulvipes* (Hymenoptera: Vespidae, Sphecidae, Megachilidae). *Caribbean Journal of Science* 30(3-4):268-270.
 Notes: Spanish. *Melittobia* sp. present in Cuba parasitizing *Sceliphron assimile* (Hymenoptera: Sphecidae) and its inquilines except *Chalicodoma lanata* (Hymenoptera: Megachilidae).
- Genaro, J. A. 1996. Nest parasites (Coleoptera, Diptera, Hymenoptera) of some wasps and bees (Vespidae, Sphecidae,

- Colletidae, Megachilidae, Anthophoridae) in Cuba. *Caribbean Journal of Science* 32(2):239-240.
- Notes: Spanish. *Melittobia* sp. parasitizing *Polistes major*, *Pachodynerus nasidens* and *Sceliphron assimile* at various locations in Cuba.
- Giffard, W. M. 1913. A newly introduced wasp (*Odynerus*). *Proceedings of the Hawaiian Entomological Society* 2(5):199-203.
- Notes: *Melittobia hawaiiensis* is mentioned as a parasitoid of *Odynerus nigripennis* (Hymenoptera: Vespidae). Larvae of *Sceliphron* (Hymenoptera: Sphecidae) are more susceptible than those of *Odynerus* to attack from *Melittobia hawaiiensis*.
- Giraud, J. 1869. Note biologique sur la *Melittobia audouinii*. *Annales de la Societe Entomologique de France* 1869:151-156.
- Notes: French. General comments on the biology of *M. audouinii* (= *M. acasta*).
- Girault, A. A. 1912. A new *Melittobia* from Queensland. *Psyche, Cambridge* 19:203-205.
- Notes: Description of *Melittobia australica*.
- Girault, A. A. 1917. New Australian chalcid-flies (Hymenoptera: Chalcididae). *Insecutor Inscitiae Menstruus* 5:133-155.
- Notes: Mentions *Aceratoneuromyia australica* (= *Aceratoneuromyia indica*).
- Godfray, H. C. J., and J. M. Cook. 1997. Mating systems of parasitoid wasps. In *The Mating Systems in Insects and Arachnids*, ed. J.C. Choe, and B. J. Crespi, 211-225. Cambridge, U.K.: Cambridge University Press.
- Notes: General comments about the hosts, sex ratio and male fights in *Melittobia acasta*.
- Godfray, H. C. J. and M. Shimada. 1999. Parasitoids: A model system to answer questions in behavioral, evolutionary and population ecology. *Research in Population Ecology* 41:3-10.
- Notes: Even though it does not mention *Melittobia* directly, references to papers written on the genus are presented.
- Gonçalves, D. O. 1992. *Compensação de dose em Scaptotrigona postica Latreille (Hymenoptera, Apidae) e Melittobia hawaiiensis (Hymenoptera, Eulophidae)*. Tesis M.Sc. Rio Claro, Sao Paulo: Universidade Estadual Paulista. 152 pp.
- Notes: Portuguese with English abstract.
- Numbers of copies of proteins in males and females of *Scaptotrigona postica* and *Melittobia hawaiiensis* were determined using classical methods of protein fractioning and high performance bidimensional chromatography.
- González, J. M. 1985. *Studies on courtship and sexual communication in Melittobia parasitic wasps (Hymenoptera: Eulophidae)*. M.Sc. thesis. Athens, Georgia: University of Georgia. 57 pp.
- Notes: Courtship of brachypterous and macropterous females of *Melittobia femorata* is compared with *Melittobia evansi*. Includes evidence for presence of a pheromone in males of *M. femorata* and *M. australica*, and for a group effect among females attracted to courting males in *M. australica*, *M. digitata* and *M. femorata*.
- González, J. M. 1987. *Melittobia australica* Girault y *M. acasta* (Walker) (Hymenoptera: Eulophidae). Dos adiciones a la fauna parasítica Venezolana. *Resúmenes del X Congreso Venezolano de Entomología, Maracay* (1987):12.
- Notes: Spanish. Meeting abstract. Brief comments on *M. australica* and *M. acasta*, how they differ, their morphology and behavior, and their hosts.
- González, J. M. 1994a. *Taxonomía, biología y comportamiento de avispa parasítica del género Melittobia Westwood (Hymenoptera: Eulophidae) en Venezuela*. Tesis Doctoral. Maracay, Aragua: Universidad Central de Venezuela. 118 pp.
- Notes: Spanish with English abstract. Taxonomy, distribution and hosts of *M. australica* and *M. acasta* in Venezuela. Both female morphs are described. Biology of *M. acasta*, including dispersion, access to hosts, and influence of population density on survival. Courtship of *M. acasta* and *M. australica* with brachypterous and macropterous females is compared to *M. femorata* and *M. evansi*.
- González, J. M. 1994b. *Taxonomía, biología y comportamiento de las avispa parasíticas del género Melittobia Westwood (Hymenoptera: Eulophidae) en Venezuela*. *Ectopicos* 7(1):41.
- Notes: Spanish. "Thesis Abstracts" section of the Journal. Same abstract that appears in González (1994a).

- González, J. M., J. Abe, and R. W. Matthews. 2004a. Offspring production and development in the parasitoid wasp *Melittobia clavicornis* (Cameron) (Hymenoptera: Eulophidae) from Japan. *Entomological Science* 7(1):15-19.
Notes: Life history development, sex ratio, and offspring production on natural, facultative, and factitious hosts of *Melittobia clavicornis* are presented. Published literature related to *M. clavicornis* is summarized and clarified.
- González, J. M., and M. A. Gaiani. 1990. Comentarios bionómicos sobre dos nidos de *Euglossa cordata* (L.) (Hymenoptera: Apidae: Euglossini). *Boletín de Entomología Venezolana (N.S.)* 5(18):141-143.
Notes: Spanish with English abstract. *Melittobia australica* parasitizing *Euglossa cordata* (Hymenoptera: Apidae: Euglossinae) and *Stelis* sp. (Hymenoptera: Megachilidae).
- González, J. M., J. A. Genaro, and R. W. Matthews. 2004b. Species of *Melittobia* (Hymenoptera: Eulophidae) established in Bahamas, Costa Rica, Cuba, Hispaniola, Puerto Rico and Trinidad. *Florida Entomologist* 87(4):619-620.
Notes: *Melittobia australica* and *M. acasta* are recorded from Cuba, while only *M. australica* is recorded from the other countries mentioned.
- González, J. M., and R. W. Matthews. 2002. Development and sex ratio of *Melittobia australica* and *M. digitata* (Hymenoptera: Eulophidae) on *M. rotundata* (Hymenoptera: Megachilidae) and *Trypoxylon politum* (Hymenoptera: Sphecidae). *The Great Lakes Entomologist* 35(1):85-91.
Notes: Development, sex ratio and other aspects of the biology of *Melittobia australica* and *M. digitata* on *Trypoxylon politum* (Hymenoptera: Sphecidae) and *Megachile rotundata* are presented and compared with other *Melittobia* spp. and other hosts. Clarification of the *Melittobia* species used by Schmieder (1933, 1938, 1939) and Whiting (1947) referred to as *M. chalybii*.
- González, J. M., and R. W. Matthews. 2005a. Comparative development and competitive ability of *Dibrachys pelos* Grissell (Hymenoptera: Pteromalidae) on various potential hosts. *Florida Entomologist* (In Press).
Notes: Development of *Dibrachys pelos* on different hosts is studied either alone or in competition with *Melittobia digitata*. Comparative data on host conversion efficiency indicate that *M. digitata* was more efficient than *D. pelos* on every host used except *Anthrax* sp. (Diptera: Bombyliidae).
- González, J. M., and R. W. Matthews. 2005b. Courtship of the two female morphs of *Melittobia digitata* (Hymenoptera: Eulophidae). *Florida Entomologist* (In Press).
Notes: Courtship of sib-mating *Melittobia digitata* is reviewed, described, and quantified for virgins of the non-dispersing brachypterous female morph and the dispersing macropterous female morph when paired with experienced males.
- González, J. M., R. W. Matthews, and J. R. Matthews. 1985. A sex pheromone in males of *Melittobia australica* and *M. femorata* (Hymenoptera: Eulophidae). *Florida Entomologist* 68:279-286.
Notes: Evidence for the production of an abdominally-based male pheromone that attracts females for courtship is presented for *M. australica* and *M. femorata*.
- González, J. M., R. W. Matthews, and J. B. Terán. 1996. Cortejo en las avisparas parasitoides *Melittobia acasta* y *Melittobia australica* (Hymenoptera: Eulophidae). *Revista de Biología Tropical* 44:687-692.
Notes: Courtship behavior of macropterous and brachypterous females of *M. acasta* and *M. australica* is described and compared to *M. femorata* and *M. evansi*.
- González, J. M., and J. B. Terán. 1995a. Distribución y hospederos de las avisparas parasíticas del género *Melittobia* (Hymenoptera: Eulophidae) en Venezuela. *Resúmenes del XIV Congreso Venezolano de Entomología. Barquisimeto, Lara.* (1995):48.
Notes: Spanish. Meeting abstract with comments on distribution and hosts of *Melittobia acasta* and *M. australica* in Venezuela.
- González, J. M., and J. B. Terán. 1995b. Cortejo en avisparas parasíticas del género *Melittobia* (Hymenoptera: Eulophidae). *Resúmenes del XIV Congreso Venezolano de Entomología. Barquisimeto, Lara.* (1995):58
Notes: Spanish. Meeting abstract with com-

- ments on courtship behavior of *Melittobia acasta* and *M. australica*.
- González, J. M., and J. B. Terán. 1996. Parasitoides del género *Melittobia* Westwood (Hymenoptera: Eulophidae) en Venezuela. Distribución y hospederos. *Boletín de Entomología Venezolana (N.S.)* 11:139-147.
Notes: Spanish with English abstract. Description of male, brachypterous and macropterous females of *Melittobia acasta* and *M. australica*, their hosts and distribution in Venezuela.
- González, J. M., and J. B. Terán. 2001. Dispersión, búsqueda y acceso al hospedador por *Melittobia acasta* (Hymenoptera: Eulophidae). *Boletín del Centro de Investigaciones Biológicas, (Maracaibo)* 35:52-64.
Notes: Spanish with English abstract. Assays on dispersion, searching and access to the host by *Melittobia acasta*.
- González, J. M., J. B. Terán., and M.T. Badaraco. 1999. Efecto de la densidad poblacional sobre la sobrevivencia en *Melittobia acasta* (Hymenoptera: Eulophidae). *Boletín del Centro de Investigaciones Biológicas, (Maracaibo)* 33:197-210.
Notes: Population density is directly related to mortality in hosts. Natural egg density of *M. acasta* on *Sceliphron fistularium* (Hymenoptera: Sphecidae) is about 400 eggs/host in Venezuela.
- González, J. M., J. B. Terán., and R. W. Matthews. 2004c. Review of the biology of *Melittobia acasta* (Walker) (Hymenoptera: Eulophidae) and additions on development and sex ratio of the species. *Caribbean Journal of Science* 40(1):52-61.
Notes: Published biological information on *Melittobia acasta* is summarized and clarified. New information on sex ratio, offspring production and temperature effects upon different stages is presented.
- Gordh, G. 1979. Chalcidoidea. In *Catalog of Hymenoptera in America North of Mexico*, ed. K.V. Krombein, P.D. Hurd Jr., D.R. Smith, and B. D. Burks, 743-1043. Smithsonian Institution Press: Washington.
Notes: Catalog, checklist; includes *Melittobia* present in North America.
- Gordh, G., A. S. Menke, E. C., Dahms, and J. C. Hall. 1979. The privately printed papers of A. A. Girault. *Memoirs of the American Entomological Institute* 28:1-400.
Notes: Girault mentions in a note that "*Chrysocharis aeneus* is *Melittobia megachilis*."
- Gould, S. J. 1977. *Ontogeny and Phylogeny*. Cambridge, Massachusetts: Harvard University Press. 501 pp.
Notes: Uses *Melittobia chalybii* as an example while discussing heterochrony and pedomorphosis.
- Goulet, H., and J. T. Huber. 1993. *Hymenoptera of the World: An Identification Guide to Families*. Ontario: Agriculture Canada. 668 pp.
Notes: "Members of *Melittobia* are parasitoids of aculeate Hymenoptera; their biology has been relatively well studied because of their strong sexual dimorphism, the development of two dimorphic generations on a single host, and the existence of fighting males."
- Gradwell, G. R. 1953. Notes on the taxonomy and biology of *Crataepus marbis* (Walker) (Hym., Eulophidae). *Entomologist's Monthly Magazine* 89:73-76.
Notes: The affinities of *Crataepus* would appear to lie with the Tetrastichines and in particular with the genus *Melittobia*.
- Gradwell, G. R. 1957. A new Tetrastichine (Hym., Eulophidae) genus with three included species. *Entomologist's Monthly Magazine* 93:1-5.
Notes: *Pronotalia* is described as a new genus close to *Melittobia*. A key to separate these and *Crataepus* is presented.
- Gradwell, G. R. 1958. The selection of a neotype for *Melittobia hawaiiensis* Perkins and re-erection of the genus *Aceratoneuromyia* Girault (Hym., Eulophidae). *Entomologist's Monthly Magazine* 94:277-278.
Notes: A female in a slide mounted by R.C.L. Perkins, probably from the original group used to describe *Melittobia hawaiiensis* (Perkins 1907), is designated as a neotype of the species. *Aceratoneuromyia* is re-erected as a valid genus and retired as a synonym of *Melittobia*. It contains the species *Aceratoneuromyia indicum*.
- Graham, M. W. R. de V. 1987. A reclassification of the European Tetrastichinae (Hymenoptera: Eulophidae), with a revision of certain genera. *Bulletin of the British Museum (Natural History) (Entomology)* 55(1):1-392.
Notes: Checklist, catalogue. Key to genera of

- Tetrastichini (males and females). A male head and antenna of *Melittobia acasta* are depicted.
- Graham, M. W. R. de V. 1991. A reclassification of the European Tetrastichinae (Hymenoptera: Eulophidae): Revision of the remaining genera. *Memoirs of the American Entomological Institute* (49):1-322.
- Notes: Synonyms for the genus *Melittobia* and for *M. acasta* are presented, with brief comments and references to the biology of the genus. *Melittobia acasta* is noted to be the only species found in Europe.
- Graham-Smith, G. S. 1916. Observations on the habits and parasites of common flies. *Parasitology* 8:440-544.
- Notes: *Melittobia acasta* parasitizes Caliphoridae and Tachinidae (Diptera).
- Graham-Smith, G. S. 1919. Further observations on the habits and parasites of common flies. *Parasitology* 11:347-384.
- Notes: *Melittobia acasta* parasitizes Caliphoridae and Tachinidae (Diptera).
- Grebennikov, V. S. 1972. An experiment in the domestication of bumble bees in the neighborhood of Isil'kul, Omak Province. *Mat Siberian Biologists Conference, Novosibirsk, USSR* 4:67-68.
- Notes: Russian. *Melittobā acasta* as an important parasitoid of bumblebee (Hymenoptera: Apidae) colonies.
- Griffin, A. S., and S. A. West. 2002. Kin selection: Fact and fiction. *Trends in Ecology and Evolution* 17:15-21.
- Notes: Male fighting in *Melittobia* is given as a case in which close relatives show extreme aggression, apparently contradicting kin selection theory.
- Guagliumi, P. 1959. Actual situation of entomology of sugar cane in Venezuela. *Proceedings of the 10th Congress of the International Society of Sugarcane Technology*. (1959):1000-1011.
- Notes: *Melittobia* sp. is a hyperparasitoid of *Metagonistylum minense* and *Paratheresia claripalpis* (Diptera: Tachinidae) in Venezuela.
- Guagliumi, P. 1962. Las Plagas de la Caña de Azúcar en Venezuela (Tomo II). Maracay, Venezuela: Ministerio de Agricultura y Cría, Centro de Investigaciones Agronómicas. 850 pp.
- Notes: Spanish. *Melittobia* sp. is mentioned as one of the frequent hyperparasites of *Metagonistylum minense* (Diptera: Tachinidae) It is also mentioned that it is frequently found in the puparia of *Paratheresia claripalpis* (Diptera: Tachinidae) taken from the field. A figure of a female *Melittobia* is provided, however it does not allow us to recognize any species. [We have collected *Melittobia australica* in Aragua state (see González 1994a, 1994b; González & Gaiani 1990; González & Terán 1995a, 1996), where most of Guagliumi research was done, and believe that was the species he found.]
- Guagliumi, P. 1966. *Insetti e aracnidi delle piante comuni de venezuela segnalati nel periodo 1938-1963. Relazioni e Monografie Agrarie Subtropicali e Tropicali Nuova Serie. N. 86*. Firenze: Istituto Agronomico per l'Oltremare. 391 pp.
- Notes: Italian. There is an Introduction in Spanish. It mentions *Melittobia* sp. in Venezuela based on Guagliumi (1959, 1962)
- Guinan, J. and R. W. Matthews. 2001. Dispersal cues used by parasitic wasps: Phototaxis, geotaxis and mated *Melittobia*. In *Tested studies for laboratory teaching, Volume 22*, ed. S.J. Karcher, 369-376. USA: Proceedings of the 22nd Workshop/Conference of the Association for Biology Laboratory Education (ABLE) (2000).
- Notes: A laboratory study of light and gravity effects on dispersal of mated *Melittobia*. Students develop and test hypotheses about factors that might affect dispersal.
- Guinan, J. A., R. W. Matthews, and J. R. Matthews. 2000. Courtship reaction chains and mate attraction: A 2-part laboratory activity using WOWBugs, a new model insect. In *Tested Studies For Laboratory Teaching. Vol. 21*, ed. S.J. Karcher, 380-404. USA: Proceedings of the 21st Workshop/Conference of the Association for Biology Laboratory Education (ABLE) (1999).
- Notes: A classroom activity to study courtship reaction chains in *Melittobia digitata* plus a simple bioassay to identify courtship cues.
- Hamilton, W. D. 1967. Extraordinary sex ratios. *Science* 156:477-156.

- Notes:* *Melittobia acasta* and *M. chalybii* are mentioned as examples of insects characterized by sibmating with arrhenotoky and spanandry.
- Hamilton, W. D. 1972. Altruism and related phenomena, mainly in social insects. *Annual Review of Ecology and Systematics* 3:193-232.
- Notes:* "... the emphasis on mortal combat in *Melittobia* varies from one account to another, while from illustrations there is an interesting hint that there may be in this case also some polymorphism, or race variation, in male head size."
- Hamilton, W. D. 1979. Wingless and fighting males in fig wasps and other insects. In *Sexual Selection and Reproductive Competition in Insects*, ed. M. S. Blum and N. A. Blum, 167-220. New York: Academic Press.
- Notes:* Fighting in *Melittobia* species could be related to the fact that a male may need to feed on rivals before he becomes equal to his task of mating many females. Hamilton suspected that this also influenced the sex ratio since males may destroy others as pupae.
- Hanson, P. E., and I. D. Gauld. 1995. *The Hymenoptera of Costa Rica*. London, Oxford: University Press. 920 pp.
- Notes:* The genus *Melittobia* is present in Costa Rica.
- Hansson, C. 1991. A catalogue of Chalcidoidea described by C.G. Thompson, with a checklist of Swedish species. *Entomologica Scandinavica. Supplement* 38:1-70.
- Notes:* Catalog and checklist. *Melittobia osmiae* is placed as junior synonym of *Melittobia acasta*.
- Hartley, C. S., and R. W. Matthews. 2003. The effect of body size on male-male combat in the parasitoid wasp *Melittobia digitata* (Hymenoptera: Eulophidae). *Journal of Hymenoptera Research* 12(2):272-277.
- Notes:* In male contests between artificially formed pairs, winning males were found to be larger than losing males, and fighting males (winners and losers combined) were found to be larger than non-fighting males.
- Hassel, M. P., and T. R. E. Southwood. 1978. Foraging strategies of insects. *Annual Review of Ecology and Systematics* 9:75-98.
- Notes:* Levels of ecological space (food item, patch and distribution of patches) are postulated, in a concept later used by Freeman & Ittyeipe (1982) to explain morph determination in *Melittobia australica*.
- Hermann, L. D. 1971. *The mating behavior of Melittobia chalybii* (Hymenoptera: Eulophidae). M.Sc. Thesis. Athens, Georgia: University of Georgia. 52 pp.
- Notes:* Description of all stages of *Melittobia chalybii* (= *M. australica*). Courtship behavior is described, with evidence for the presence of a male "calling" pheromone. Photographs show *Melittobia australica*, but Figure 6D shows a male that could easily be *M. femorata*. Vouchers of a species named "M. species 1" in the Entomology collection of the UGA Museum of Natural History are clearly *M. digitata*.
- Hermann, L. D., H. R. Hermann, and R. W. Matthews. 1974. A possible calling pheromone in *Melittobia chalybii* (Hymenoptera: Eulophidae). *Journal of the Georgia Entomological Society* 9:17.
- Notes:* Choice test experiments using Y-tubes and body extracts suggest the presence of a male pheromone in *Melittobia chalybii* (= *M. australica*).
- Herting, B. 1975. *Lepidoptera, Part 1 (Microlepidoptera)*. A Catalogue of Parasites and Predators of Terrestrial Arthropods. Section A. Host or Prey/Enemy. 6:1-618. Commonwealth Agricultural Bureaux. Commonwealth Institute of Biological Control.
- Notes:* *Melittobia* sp. as hyperparasitoid of a parasitoid that attacks *Diatraea saccharalis* (Lepidoptera: Pyralidae). *Melittobia cosmopterygis* (= *Cirrospilus cosmopterygis*) on *Cosmopteryx* sp. (= *Cosmopterix* sp.) (Lepidoptera: Cosmopterigidae); *Melittobia acasta* on *Carpocapsa pomonella* (= *Cydia pomonella*) (Lepidoptera: Tortricidae).
- Herting, B. 1976. *Lepidoptera, Part 2 (Microlepidoptera)*. A Catalogue of Parasites and Predators of Terrestrial Arthropods. Section A. Host or Prey/Enemy. 7:1-221. Commonwealth Agricultural Bureaux. Commonwealth Institute of Biological Control.
- Notes:* Catalogue and checklist. *Melittobia hawaiiensis* as hyperparasite found on *Ar-*

- tona catoxantha* (Lepidoptera: Zygaeni-
dae).
- Herting, B. 1977. *Hymenoptera. A Catalogue of Parasites and Predators of Terrestrial Arthropods. Section A. Host or Prey/Enemy.* 4:1-206. Commonwealth Agricultural Bureaux. Commonwealth Institute of Biological Control.
- Notes: *Melittobia* sp. on *Ancistrocerus nigicornis* and *Odynerus spinipes* (Hymenoptera: Vespidae), *Sceliphron caementarium* and *Trypoxylon mexicanum* (Hymenoptera: Sphecidae); *Melittobia acasta* on *Megachile bombycina* and *Megachile centuncularis* (Hymenoptera: Megachilidae), *Odynerus spinipes*, *Psenulus fuscipennis* (Hymenoptera: Sphecidae), *Sceliphron destillatorius*, *Trypoxylon* sp.; *Melittobia chalybii* on *Megachile inermis*; *Melittobia clavicornis* (= *M. australica*) on *Pison spinolae* (Hymenoptera: Sphecidae).
- Herting, B. 1978. *Neuroptera, Diptera, Siphonaptera. A Catalogue of Parasites and Predators of Terrestrial Arthropods. Section A. Host or Prey/Enemy.* 5:1-156. Commonwealth Agricultural Bureaux. Commonwealth Institute of Biological Control.
- Notes: *Melittobia* sp. on *Metagonistylum minense* and *Paratheresia claripalpis* (Diptera: Tachinidae); *Melittobia acasta* on *Pachyophthalmus signatus* (Diptera: Tachinidae); *Melittobia hawaiiensis* on *Argyrophylax leefmansii* (Diptera: Tachinidae).
- Hess, A. D. 1940. The biology and the control of the round-headed apple tree borer, *Saperda candida* Fabricius. *New York Agricultural Experiment Station (Geneva) Bulletin* (1940):688.
- Notes: *Melittobia chalybii* is mentioned as parasitoid of eggs of *Saperda candida* (Coleoptera: Cerambycidae), based on 1 wasp specimen that "emerged in a can in which eggs of ... the round-headed apple tree borer ... were being hatched". However, the author adds, "It seems doubtful that (the wasp) would parasitize the egg under natural conditions."
- Hickok, H. T. 1875. Experiments with the fly *Pteromalus gerardi*. *Proceedings of the Ploughkeepsie Society of Natural History* 1:131-141.
- Notes: Description of *Pteromalus gerardi* (= *Melittobia megachilis*) with numerous comments on its biology.
- Hobbs, G. A. 1968. Controlling insect enemies of the alfalfa leafcutter bee, *Megachile rotundata*. *Canadian Entomologist* 100:781-784.
- Notes: If *Melittobia chalybii* attacks *Megachile rotundata* (Hymenoptera: Megachilidae), it can be removed using light traps. As these experiments were done in Ottawa, Canada, besides *M. chalybii*, they could have found *M. acasta* and other *Melittobia* species also.
- Hobbs, G. A., and M. D. Kronic. 1971. Comparative behavior of 3 chalcidoid (Hymenoptera) parasites of the alfalfa leafcutter bee, *Megachile rotundata*, in the laboratory. *Canadian Entomologist* 103:674-685.
- Notes: Behavioral patterns of *Melittobia chalybii* and other parasitoids are compared in the laboratory. Because of the location (Alberta, Canada) we suspect that *Melittobia acasta* may have been the actual species involved.
- Holm, S. N. 1960. Experiments on the domestication of humble bees (*Bombus* Latr.), in particular *B. lapidarius* and *B. terrestris* L. *Royal Veterinary and Agricultural College of Copenhagen, Yearbook* 1960:1-19.
- Notes: *Melittobia* (*sic*, misspelling) *chalybii* was found parasitizing a larva from one of the *Bombus* colonies (Hymenoptera: Apidae) inside a greenhouse. Since these experiments were done in Denmark, it may have been not *M. chalybii*, but *M. acasta*, as later confirmed by Holm and Skou (1972).
- Holm, S. N., and J. P. Skou. 1972. Studies on trapping, nesting, and rearing some *Megachile* species (Hymenoptera, Megachilidae) and on their parasites in Denmark. *Entomologica Scandinavica* 3(3):169-180.
- Notes: *Melittobia acasta* was found as a parasitoid of *Megachile centuncularis*, *M. leachella*, and *M. willughbiella* (Hymenoptera: Megachilidae).
- Horn, S., and J. L. Hanula. 2004. A survey of cavity-nesting bees and wasps in loblolly pine stands of the Savannah River site, Aiken County, South Carolina. *Journal of Entomological Science* 39(3): 464-469.
- Notes: Cites *Melittobia* sp. in a table; does not

- give host.
- Howard, L. O. 1892. The habits of *Melittobia*. *Proceedings of the Entomological Society of Washington* 2:244-249.
- Notes: General biological and systematic comments on *Melittobia* are given. Hosts of *Melittobia acasta* (*sic*, misspelling) (= *M. acasta*), *Anthophorabia megachilis* (= *Melittobia megachilis*) and *Anthophorabia pelopoei* (nomen nudum) are mentioned.
- Howard, L. O., and W. F. Fiske. 1911. The importation into the United States of the parasites of the gypsy moth (*Porthetria dispar* L.) and the brown tail moth (*Euproctis chrysorrhoea* L.): A report on progress, with some considerations of previous and concurrent efforts of this kind. *Bulletin of the Bureau of Entomology of the United States Department of Agriculture* (91):1-312 pp.
- Notes: Unmated females of *Melittobia* can lay a few eggs on a host; only males will develop, and the mother will mate with one of them and then will lay fertilized eggs, producing a normal clutch of offspring. *Melittobia acasta* is mentioned as a hyperparasite of tachinids that parasitize the gypsy moth and the brown-tail moth.
- Howard, L. O., and C. V. Riley. 1891. Fall web-worm parasites in Indian Territory. *Insect Life* 4(1-2):133-134.
- Notes: *Melittobia pelopoei* (nomen nudum) found parasitizing flies (Diptera: Sarcophagidae) that parasitize mud-dauber wasps (*Sceliphron* sp.). "The great interest attaching to this rearing arises from the fact that the species of *Melittobia* have heretofore been reared only from hymenopterous insects".
- Hunt, J. H. 1993. Survivorship, fecundity, and recruitment in a mud dauber wasp, *Sceliphron assimile* (Hymenoptera: Sphecidae). *Ecology and Population Biology*. 86(1):51-59.
- Notes: *Melittobia australica* was found parasitizing *Sceliphron assimile* in Guanacaste, Costa Rica.
- Husain, T., and M. Y. Khan. 1986. Family Eulophidae. *Oriental Insects* 20:211-245.
- Notes: *Melittobia acasta* parasitizes *Eulimneria alkae* (= *Sinophorus turionus*) (Hymenoptera: Ichneumonidae) in India.
- Husband, R.W., and T. H. Brown. 1976. Insects associated with Michigan bumble bees (*Bombus* spp.). *Great Lakes Entomologist* 9:57-62.
- Notes: *Melittobia chalybii* is a parasitoid of *Bombus vagans* (Hymenoptera: Apidae). Mac Farlane & Griffin (1994) mention that, "according to Matthews", Husband & Brown (1976) found *M. acasta* instead of *M. chalybii*.
- Imms, A. D. 1931. *Recent Advances in Entomology*. Philadelphia: P. Blakiston's Son & Co. Inc. 374 pp.
- Notes: "The outstanding feature with respect to host-selection by ectoparasites is that they rarely affect hosts living openly and exposed. This peculiarity is very constant and it may possibly have originated as an adaptation whereby the exposed parasites are enabled to secure a measure of protection from the attacks of hyperparasites. Among parasites exhibiting this kind of host-preference the Chalcid *Melittobia acasta* affords an instructive example, since it selects a wide range of victims, which are distributed among the orders Diptera and Hymenoptera."
- Imms, A. D. 1964. *A General Textbook of Entomology*. Ninth Edition. London: Methuen and Co. Ltd. 886 pp.
- Notes: "*Melittobia* is a common ectoparasite of the pupae of *Bombus*, *Osmia* and other Aculeata (Balfour-Browne, 1922) as well as of certain Diptera, more especially *Caliphora*."
- in den Bosch, H. A. J. See Bosch, H. A. J. in den
- Itino, T. 1986. Comparison of life tables between the solitary eumenid wasp *Anterhynchium flavomarginatum* and the subsocial eumenid wasp *Orancistrocerus drewseni* to evaluate the adaptive significance of maternal care. *Researches on Population Ecology* 28:185-199.
- Notes: *Melittobia* sp. is a parasitoid of *A. flavomarginatum* (Hymenoptera: Vespidae).
- Ittyeipe, K., and C. A. Taffe. 1982. The biology and population dynamics of *Monobia mochii* Soika - a rare, solitary eumenid in Jamaica. *Caribbean Journal of Science* 17(1-4):45-58.
- Notes: *Melittobia* sp. (*hawaiiensis* group) (= *M. australica*) is the major single mortality

- factor of *Monobia mochii* (Hymenoptera: Vespidae) in Jamaica. However, the parasitoid does not act density-dependently. Hence developmental mortality does not explain the low densities of *Monobia*.
- Iwata, K. 1975. *Field Notes of a Naturalist*. Tokyo: Asahi-Sinbunsha. 250 pp.
Notes: Japanese. General comments on *Melittobia*. *Melittobia japonica* (= *M. clavicornis*) is a general parasitoid of solitary bees and wasps. Japanese hosts of *M. clavicornis* and some life history details are mentioned.
- Iwata, K. 1980. *Field Notes of a Naturalist*. 2. Tokyo: Asahi-Sinbunsha. 263 pp.
Notes: Japanese. Comments similar to Iwata (1975).
- Iwata, K., and H. Katayama. 1966. Relation between a hunting wasp of hunting spiders (*Trypoxylon obsonator*) and its enemy (*Melittobia japonica* Masi) (Hymenoptera). *Kontyû* 34(2):172-174.
Notes: Japanese. Concerns *Melittobia japonica* (= *Melittobia clavicornis*).
- Iwata, K., and T. Tachikawa. 1966. Biological observations on 53 species of the super-families Chalcidoidea and Proctotrupeoidea from Japan (Hymenoptera: Apocrita). *Transactions of the Shikoku Entomological Society* 9(1):1-29.
Notes: *M. japonica* (= *M. clavicornis*) as a parasitoid of a few wasps and flies from Japan. Includes a description of the male.
- Jayasingh, D. B., and B. E. Freeman. 1980. The comparative population dynamics of eight solitary bees and wasps (Aculeata; Apocrita; Hymenoptera) trap-nested in Jamaica. *Biotropica* 12(3):214-219.
Notes: *Melittobia* causes severe density-dependent mortality of *Sceliphron* (Hymenoptera: Sphecidae). Authors postulate that because of small size, external feeding method, and fact that it can operate as a hyperparasite, *Melittobia* has eliminated many of its potential competitors (such as Chrysididae) in Jamaica, although both have been found to attack solitary aculeates in the U.S.A., Trinidad, and Brasil.
- Jelinski, F. W., and F. Wojtowski. 1984. *Melittobia acasta* Walker (Hym., Chalcidoidea, Eulophidae) a poorly known parasite on honey-bee brood. *Przegląd Zoologiczny* 28(4):507-511.
Notes: Polish with English abstract. Aspects of the biology of *Melittobia acasta* parasitizing honeybees, bumblebees and solitary bees in Poland are presented. *M. chalybii* is mentioned as parasite of bumblebees and solitary bees.
- Jenkins, D. A., and R. W. Matthews. 2004. Cavity-nesting Hymenoptera in disturbed habitats of Georgia and South Carolina: Nest architecture and seasonal occurrence. *Journal of the Kansas Entomological Society* 77(3):203-214.
Notes: *Melittobia digitata* was found parasitizing *Trypoxylon collinum* (Hymenoptera: Sphecidae) in trap nests.
- Johansen, C. 1967. Ecology of three species of bumble bee in Southwestern Washington. *Washington Agricultural Experiment Station Technical Bulletin* 57:1-12.
Notes: "Melittobia wasps can be very destructive in *Bombus* colonies."
- Kalina, V. 1989. Checklist of Czechoslovak insects. III. (Hymenoptera) Chalcidoidea. *Acta Faunistica Entomologica Musei Nationalis Pragae* 19:97-127.
Notes: *Melittobia acasta* is reported from the Bohemian area of Czechoslovakia.
- Kalinin, V. I., and V. A. Molchanov. 1987. Bee chalcid control. *Veterinariya* 1:46.
Notes: Russian. *Melittobia acasta* as pest of bees; control of Chalcidoidea; effect of pesticides.
- Kerr, W. E. 1962. Genetics of sex determination. *Annual Review of Entomology* 7:157-176.
Notes: Author notes that "endogamy is the rule" in *Melittobia*.
- Kerschner, J. 1946. Dominant lethals induced by X-rays in sperm of the wasp *Melittobia* sp. *Anatomical Record* 96(4):556.
Notes: Meeting abstract, with comments on experiments with *Melittobia* wasps using X-rays.
- King, B. H., and R. B. King. 1995. Sibmating and its fitness consequences in the parasitoid wasp *Spalangia cameroni* (Hymenoptera: Pteromalidae). *Journal of Insect Behavior* 8:723-730.
Notes: "Mother-son matings appear to be uncommon among parasitoid wasps but have been documented in *Melittobia*".
- Klunker, R., and K. Fabritius. 1992. Ergebnisse und erfahrungen mit der stammhal-

- tung und massenzucht einiger pupariumparasitoide von fliegen auf kaltekonservierten wirtspuparien. *Mitteilungen der Deutschen Gesellschaft für Allgemeine und Angewandte Entomologie* 8(1-3):287-294.
- Notes:* German with English abstract. *Melittobia acasta* and other parasitoids were successfully reared on freezer-stored pupae of hosts. The advantage of using freezer-stored pupae include simplification of rearing techniques, improvement of hygienic conditions for breeding, and a better management of commercial mass rearing according to market situation conditions.
- Knee, W. J., and J. T. Medler. 1965. The seasonal size increase of bumblebee workers (Hymenoptera: Bombus). *Canadian Entomologist* 97:1149-1155.
- Notes:* *Melittobia chalybii* is noted parasitizing *Bombus fervidus*.
- Kolesnikov, V. A., and H. A. Kolesnikova. 1974. On the biology of *Psenulus*. *Zashchita Rastenii (Moscow, Russia)*. 9:50.
- Notes:* Russian. *Melittobia* wasps are found in *Psenulus* (Hymenoptera: Sphecidae) cells.
- Kostyukov, V. V. 1978. Hymenoptera II. Chalcidoidea 13. Eulophidae (Tetrastichinae). In *Opredelitel' Nasekomykh Evropeiskoi Chasti SSSR, Tom III*, ed. Medvedev, G. S., 430-467. Leningrad: Nauka
- Notes:* Russian. Checklist, catalogue, and key to species. *Melittobia acasta* is noted to be the only species in Russia. Some hosts are mentioned. Figure of male antennae is provided.
- Kostyukov, V. V. 1987. Hymenoptera II. In *Keys to the Insects of the European Part of the USSR*, ed. Medvedev, G. S., 796-861. New Delhi: Amerind Publishing Co.
- Notes:* English translation of Kostyukov (1978). Figure of male antenna is identified as *M. acasia* (misspelling of *M. acasta*).
- Krombein, K. V. 1968. *Trap-nesting Wasps and Bees: Life Histories, Nests and Associates*. Washington, D.C.: Smithsonian Press. 570 pp.
- Notes:* *Melittobia chalybii* is reported as a parasitoid of several solitary wasps and bees collected using trap-nests in the eastern U.S. It is likely that more than one *Melittobia* species was involved, since many different hosts were collected in various states where other *Melittobia* species have been collected.
- Krunic, M. D., and I. T. Radovic. 1973. Some aspects of cold hardiness of the parasites *Monodontomerus obscurus*, *Pteromalus venustus* and *Melittobia chalybii* (Chalcidoidea: Hymenoptera) and their host *Megachile rotundata* (Megachilidae: Hymenoptera). *Archiv Bioloskih Nauka* 25(1-2):45-48.
- Notes:* General comments as *M. chalybii* as parasitoid of *M. rotundata*.
- Krunic, M. D., and I. T. Radovic. 1974. The effect of gut-content evacuation on the increase of cold-hardiness in *Megachile rotundata*. *Entomologia Experimentalis et Applicata* 17(4):526-528.
- Notes:* Leaf-cutting bees are attacked by *Melittobia chalybii*. Freezing temperatures (during supercooling, the temperature at which ice crystallization begins) of *M. chalybii* prepupae and pupae are -25.9 and -26.7 °C, respectively.
- Lapp, S. A. 1994. *The Mating System of Melittobia Parasitic Wasps: Fluctuating Asymmetry, Sexual Selection, and Comparative Courtship Behavior*. M.Sc. thesis. Athens, Georgia: University of Georgia. 63 pp.
- Notes:* Studies on fluctuating asymmetry (based on measurements of antennae and metathoracic tibiae) as related to mate selection in *Melittobia digitata*, and to comparative courtship of early and late males of *M. femorata*.
- La Salle, J. 1993. North American genera of Tetrastichinae (Hymenoptera: Eulophidae). *Journal of Natural History* 28:109-236.
- Notes:* Synonymy, hosts, and known distribution in North America of *Melittobia acasta*, *M. australica*, *M. chalybii*, *M. digitata*, *M. evansi*, *M. femorata*, *M. megachilis*, and *M. scapata* are discussed.
- Lever, R. J. A. 1964. Notes on some parasites, hyperparasites and predators of coconut pests in Malaya. *FAO Plant Protection Bulletin* 12(2):42-43.
- Notes:* *Melittobia* sp. near *hawaiiensis* was found as a hyperparasitoid of *Ptychomyia remota* (Diptera: Tachinidae).
- Lith J. P. van. 1955. Biologie van *Melittobia acasta* Walker (Hymenoptera, Chalcidoidea). *Tijdschrift voor Entomologie* 98:29-42.
- Notes:* Finnish. Observations on the biology

- of *Melittobia acasta* in Finland.
- Louis, J. 1975. Introduction a l'etude de la perte de la fonction de vol chez les insectes. *L'Annee Biologique* 14(7-8):353-386.
- Notes:* French. *Melittobia* males as example of wing reduction in some insects. Based on Picard (1923) it mentions that atrophy of wings in males of *M. acasta* is correlative with the atrophy of the eyes
- Mac Callan E. 1979. The Sphecidae (Hymenoptera) of New Zealand. *New Zealand Entomologist* 7(1):30-41.
- Notes:* *M. hawaiiensis* is mentioned as parasite of *Pison spinolae* (Hymenoptera: Sphecidae).
- Mac Farlane, R. P., and R. L. Palma. 1987. The first record for *Melittobia australica* Girault in New Zealand and new host records for *Melittobia* (Eulophidae). *New Zealand Journal of Zoology* 14:423-425.
- Notes:* *Melittobia australica* noted as a new record in New Zealand parasitizing *Vespula germanica* (Hymenoptera: Vespidae) and *Pison spinolae* (Hymenoptera: Sphecidae), with general comments on other *Melittobia* species (*M. hawaiiensis*, *M. acasta*). They mention that *Melittobia* has been underrated as a parasitoid of social wasps.
- Mac Farlane, R. P., and B. J. Donovan. 1989. *Melittobia* spp. as parasitoids of bumble and Lucerne leafcutting bees and their control in New Zealand. *Proceedings of the 42nd New Zealand Weed and Pest Control Conference* (1989):274-277.
- Notes:* Three species of *Melittobia* (*M. australica*, *M. hawaiiensis* and *M. acasta*) occur in New Zealand and were found attacking *Bombus* spp. and *Megachile rotundata* (Hymenoptera: Megachilidae).
- Mac Farlane, R. P., and R. P. Griffin. 1994. Detection of *Melittobia acasta* (Eulophidae) in bumble bees (*Bombus*, Apidae) colonies. *Melanderia* 50:28-31.
- Notes:* Describes the symptoms and sequence of *Melittobia acasta* parasitism on bumble bee colonies and mentions that some previous records of *M. chalybii* from North American bumble bee colonies were really *M. acasta*.
- Mac Farlane, R. P., and D. H Pengelly. 1977. *Brachichoma* spp. (Sarcophagidae) and *Melittobia chalybii* (Eulophidae) as parasites of the brood of *Bombus* spp. (Apidae) in southern Ontario. *Proceedings of the Entomological Society of Ontario* 108:31-35.
- Notes:* *Melittobia chalybii* (possibly *M. acasta*) is mentioned as an important parasitoid of larvae and pupae of *Bombus* spp. and also of *Megachile pacifica* (Hymenoptera: Megachilidae). The status of *Melittobia* and *Brachichoma* as parasitoids of *Bombus* in North America is reviewed.
- Mac Farlane, R. P., P. Roderick, and R. P. Griffin. 1994. Detection of *Melittobia acasta* (Eulophidae) in bumble bee (*Bombus*, Apidae) colonies. *Melanderia* 50:28-33.
- Notes:* *Melittobia acasta* is found attacking *Bombus* colonies.
- Maciel de Almeida Correia, M. D. L. 1976. Notes sur la biologie D'*Heriades truncorum* L. (Hymenoptera: Megachilidae). *Apidologie* 7(2):169-188.
- Notes:* French with English abstract. *Melittobia* is mentioned as one of the four parasites found in bamboo trap nests of *H. truncorum*.
- Mader, D. 1999. *Geologische und Biologische Entomöökologie der rezenten Seidebiene Colletes*. Köln: Logabook.
- Notes:* German. *Melittobia acasta* mentioned as a cleptoparasite of *Osmia caerulescens* and *O. bicornis* (Hymenoptera: Megachilidae), *Chrysis cyanea* (Hymenoptera: Chrysididae), *Colletes* spp. (Hymenoptera: Colletidae) and *Miltogramma punctatum* (Diptera: Sarcophagidae).
- Maeta, Y. 1978. A preliminary study on the physical control of *Melittobia acasta* (Walker) by cold treatment (Hymenoptera: Eulophidae). *Bulletin of the Tohoku National Agricultural Experiment Station* 58:211-229.
- Notes:* Comments on *Melittobia chalybii*, *M. australica*, *M. acasta* and *M. japonica* (= *M. clavicomis*). All but *M. chalybii* are found in Japan parasitizing many solitary bees and wasps. *Melittobia* females may enter the host cocoon prior to nest completion and also by cutting holes through the cocoon after the nest had been finished.
- Maeta, Y. 1985. Distributional records of four species of *Melittobia* in Japan. *Tohoku Kontyû Kenkyû* (23):4.
- Notes:* Japanese. General comments on

- world distribution of Japanese *Melittobia*. The species recorded from Japan are *M. acasta*, *M. australica*, *M. clavicornis* and *M. sosui*.
- Maeta, Y. 1999. Studies on the biology of *Megachile (Eutricharea) subalbata* Yasumatsu (Hymenoptera: Megachilidae). *Japanese Journal of Entomology* 2(3):127-147.
Notes: Japanese with English abstract. Figures and tables with headers in English. *Melittobia australica* and *M. acasta* parasitizing hosts collected in trap-nests in Southern Japan. It is mentioned that *Megachile subalbata* (Hymenoptera: Megachilidae) also has been recorded as parasitized by *Melittobia clavicornis*.
- Maeta, Y., R. Miyanaga, and N. Sugiura. 1996. Additional notes on the nesting habits of the Taiwanese bamboo carpenter bee, *Xylocopa (Biluna) tranquebarorum tranquebarorum* (Hymenoptera, Anthophoridae). *Japanese Journal of Entomology* 64(3):669 – 680.
Notes: *Melittobia sosui* was found as a parasitoid of the hunting wasps *Delta flavovictum formosanum* and *Sceliphron madraspatanum formosanum* (Hymenoptera: Vespidae). It is also a parasitoid of *Xylocopa tranquebarorum tranquebarorum* (Hymenoptera: Anthophoridae).
- Maeta, Y., and S. Yamane. 1974. Host records and bionomics of *Melittobia japonica*. *Bulletin of the Tohoku National Agricultural Experiment Station* 47:115-131.
Notes: Hosts of *Melittobia japonica* (= *M. acasta*) from Japan are presented, with comments on biology and bionomics of *M. chalybii* and *M. acasta*. *Melittobia* spp. enter the host cocoon before it is closed and also by cutting holes through it.
- Maldonado C. J., and C. A. Navarro. 1967. Additions and corrections to Wolcott's "Insects of Puerto Rico". *Caribbean Journal of Science* 7(1-2):45-64.
Notes: *Melittobia* sp. (possibly *M. australica*) is added as member of the fauna of Puerto Rico.
- Malyshev, S. I. 1911. Zur biologie der *Odynerus* - Arten und ihrer parasiten. *Horae Societatis Entomologicae Rossicae* 40(2):1-58.
Notes: Russian with German abstract. Comments on the biology of *Melittobia acasta* as an important parasitoid of *Odynerus* sp. (Hymenoptera: Vespidae) Figure 17 shows a schematic drawing of a female antenna. Figure 18, a male, clearly shows that it is *M. acasta*.
- Malyshev, S. I. 1968. *Genesis of the Hymenoptera and the Phases of their Evolution*. London: Methuen & Co., Ltd. 319 pp.
Notes: Many comments and observations on the biology of *Melittobia* spp. (especially *M. acasta* and *M. chalybii*) and their social attributes.
- Marlatt, C. L. 1891a. General notes. *Insect Life* 4(3-4):162.
Notes: "Mr. Ashmead read a paper on the peculiar chalcid genus *Melittobia*". *Anthophorobia* is mentioned as a synonym of *Melittobia*. *Melittobia megachilis* was reared on *Megachile centuncularis*; *M. pelopoei* on *Pelopoeus cementaria* (= *Sceliphron cementarium*) (Hymenoptera: Sphecidae); *M. chalybii* from *Chalybion caeruleum* (Hymenoptera: Sphecidae).
- Marlatt, C. L. 1891b. General notes. *Insect Life* 4(5-6):229.
Notes: "Mr. Howard read a paper on the 'Habits of *Melittobia*' " ... "He added an account of the rearing of *M. pelopoei* Ashmead ..." by Mr. A.N. Caudell [See Caudell (1892)].
- Masi, L. 1917. Chalcididae of the Seychelles islands. *Novitates Zoologicae* 24:121-230.
Notes: Latin with English comments. Introduction in English. General description of the females of *M. hawaiiensis*. Locality of collection: Mahé island. Comparison with the "European" *M. acasta*.
- Masi, L. 1936. On a supposed new species of *Melittobia* from Japan (Hymenoptera). *Mushi*9:38-39.
Notes: Description of *Melittobia japonica* (= *M. clavicornis*) from Japan, from females only. Comparison with *M. acasta*.
- Matthews, J. R. 1996. *What's Inside a Mud Dauber's Nest? A Teachers' Guide with Identification Keys*. Athens, Georgia: Riverview Press. 32 pp.
Notes: Booklet about the ecology and life history of mud dauber wasps and their nest inquilines. General comments on *Melittobia* and *M. digitata* (the WOW Bug).
- Matthews, R. W. 1965. The biology of *Heiriades carinata* Cresson (Hymenoptera, Megachilidae). *Contributions of the Ameri-*

- can Entomological Institute*. 1(3):1-33.
Notes: *Melittobia chalybii* were collected from cells of *Heriades carinata*. Infestation was mostly from the laboratory.
- Matthews, R. W. 1975. Courtship in parasitic wasps. In *Evolutionary Strategies of Parasitic Insects and Mites*, ed. P. Price, 66-86. New York: Plenum Press.
Notes: Male aggression "may be important for male nutrition as the opponent's body fluid could serve as an additional energy source". Occasional killing of females by males of *Melittobia chalybii* (= *M. australica*) is reported.
- Matthews, R. W. 1982. Courtship of *Melittobia* wasps. In *Insect Behavior: A Sourcebook of Laboratory and Field Exercises*, ed. J. R. Matthews and R.W. Matthews, 162-166. Boulder, Colorado: Westview Press.
Notes: A laboratory activity using *Melittobia*, including details on rearing and pre-lab preparation.
- Matthews, R. W. 1991. Evolution of social behavior in sphecid wasps. In *The Social Biology of Wasps*, ed. K. G. Ross and R.W. Matthews, 570-602. Ithaca: Cornell University Press.
Notes: Reviews papers reporting parasitism by *Melittobia* on *Sceliphron fistularium* (Hymenoptera: Sphecidae), suggesting that infestation levels are dependent on the substrate where the latter place their nest, being greater in two-dimensional habitats.
- Matthews, R. W. 1997a. Teaching ecological interactions with mud dauber nests. *The American Biology Teacher* 59(3):152-158.
Notes: Comments on three common mud dauber wasps and their nest inquilines. A student activity to identify species living inside a mud dauber nest is included, with a key to identify insects (including *Melittobia*) and other arthropods found inside the nest.
- Matthews, R. W. 1997b. Weird wonderful WOWBugs. *Carolina Tips* 60:9-11.
Notes: Biology, life cycle, care and classroom use of *Melittobia digitata* (the WOWBug). Photographs of pupae, males and females; male in Figure 2 is actually *M. australica*. On-line at: <http://www.carolina.com/tips/97mar/0397c.asp>
- Matthews, R. W. 1998. WOWBugs: Newest insect in the curriculum. In *Tested Studies for Laboratory Teaching*. Proceedings of the 20th Conference of the Association of Biology Laboratory Education (ABLE), ed. S. J. Karcher, 382-383. Tallahassee, Florida: June 9-13, 1998.
Notes: *Melittobia digitata* is introduced as the WOWBug, an unusual organism that readily engages student interest in biology.
- Matthews, R. W. 2000. Developing life science instructional materials using a parasitic wasp, *Melittobia digitata* Dahms (Hymenoptera: Eulophidae): A case study. In *Hymenoptera: Evolution, Biodiversity and Biological Control*, ed. A. D. Austin, and M. Dowton, 427- 433. Australia: CSIRO Publishing.
Notes: Description of the process by which organisms such as *Melittobia digitata* (the WOWBug) and *M. australica* (the Australian wowbug) are developed as a new teaching model.
- Matthews, R. W., and J. M. González. 2004. Nesting biology of *Zeta argillaceum* (Hymenoptera: Vespidae: Eumeninae) in Southern Florida, U.S. *Florida Entomologist* 87(1):37-40.
Notes: *Melittobia australica* is recorded as one of the mortality factors of *Z. argillaceum* and its nest inquilines *Pachodynerus nasidens* and *P. erynnis* (Hymenoptera: Vespidae).
- Matthews, R. W., and J. R. Matthews. 1978. *Insect Behavior*. New York: John Wiley & Sons. 507 pp.
Notes: Mentions courtship behavior of *Melittobia* and includes an illustration of a courting pair.
- Matthews, R. W., and J. R. Matthews. 1999. Teaching ecological concepts with mud dauber nests. *Australian Science Teachers Journal* 45(3):21-26.
Notes: Classroom activity. Comments and a key to identify parasitoids (including *Melittobia australica*) and inquilines of mud dauber wasps that occur in Australia.
- Matthews, R. W., and J. R. Matthews. 2003. Courtship and mate attraction in parasitic wasps. In *Exploring Animal Behavior in Laboratory and Field. An Hypothesis-Testing Approach to the Development, Causation,*

- Function, and Evolution of Animal Behavior*, ed. B.J. Ploger, and K. Yasukawa, 59-72. New York: Academic Press.
- Notes:* Thorough description of a laboratory activity examining courtship behavior and the cues by which the sexes recognize each other, using *Melittobia digitata*.
- Matthews, R. W., L. R. Flage, and J. R. Matthews. 1997. Insects as teaching tools in primary and secondary education. *Annual Review of Entomology* 42:269-289.
- Notes:* *Melittobia digitata* is mentioned as the subject of curricular materials under development to teach biological concepts.
- Matthews, R. W., T. R. Koballa Jr., L. R. Flage, and E. J. Pyle. 1996. *WOWBugs: New Life for Life Science*. Riverview Press, Athens, GA. 318 pp.
- Notes:* Introduces the WOWBug (*Melittobia digitata*) as a new experimental animal for biological education, with 20+ activities. Includes background on rearing and maintenance of *Melittobia* in the laboratory and classroom.
- Matthews, R. W., J. Yukawa, and J. M. González. 1985. Sex pheromones in male *Melittobia* parasitic wasps: Female response to conspecific and congeneric males of 3 species. *Journal of Ethology* 3:59-62.
- Notes:* Demonstrates that a sex pheromone is produced by males of *Melittobia australica*, *M. digitata*, and *M. femorata*. The chemical is not species-specific.
- Medina Gaud, S., and L. F. Martorell. 1973. New insect records for Puerto Rico. *Journal of Agriculture of the University of Puerto Rico* 57(3):247-254.
- Notes:* *Melittobia chalybii* (probably *M. australica*) reared from pupa of *Sceliphron caementarium* (Hymenoptera: Sphecidae) at Mayagüez.
- Medler, J. T. 1964. A note on *Megachile* (*Sayapis*) *pugnata pugnata* Say in trap-nests in Wisconsin (Hymenoptera: Megachilidae). *Canadian Entomologist* 96:918-921.
- Notes:* *Melittobia chalybii* is reported as a parasitoid of *Megachile pugnata*.
- Menke, A. S., and L. A. Stange. 1986. *Delta campaniforme rendalli* (Bingham) and *Zeta argillaceum* (Linnaeus) established in Southern Florida and comments on generic discretion in *Eumenes s.l.* (Hymenoptera: Vespidae: Eumenidae). *Florida Entomologist* 69(4):697-702.
- Notes:* *Melittobia* attacks *Zeta abdominale* and *Zeta argillaceum* (Hymenoptera: Vespidae).
- Molumby, A. 1995. Dynamics of parasitism in the organ-pipe wasp, *Trypoxylon politum*: Effects of spatial scale on parasitoid functional response. *Ecological Entomology* 20:159-168.
- Notes:* Levels of parasitism in *T. politum* by *Melittobia* were positively associated with the number of hosts per site, but negatively associated with the local density of hosts within sites and the local density of old nesting material within sites. Comments on *M. australica* and its ability to produce secondary infestations. *M. femorata* and *M. digitata* from northern Mississippi may be less prone to produce secondary infestations.
- Molumby, A. 1996. *The Evolutionary Ecology of a Gregariously Nesting Wasp, Trypoxylon politum*. Ph.D. dissertation. Chicago, Illinois: The University of Chicago. 161 pp.
- Notes:* The first four chapters are exclusively related to *T. politum* (Hymenoptera: Sphecidae); chapter five explores foundress number, kinship, and sex ratio adjustments in *Melittobia femorata*.
- Molumby, A. 1997. Why make daughters larger? Maternal sex-allocation and sex-dependent selection for body size in a mass-provisioning wasp, *Trypoxylon politum*. *Behavioral Ecology* 8(3):279-287.
- Notes:* *Melittobia* was one of the parasites that emerged from nests of *T. politum*.
- Morley, C. 1910. *Catalog of the British Hymenoptera of the Family Chalcididae*. London, British Museum (Natural History) 28 pp.
- Notes:* Checklist, catalog; includes *Melittobia acasta*.
- Morley, C., and W. Rait-Smith. 1933. The hymenopterous parasites of the British Lepidoptera. *Transactions of the Royal Entomological Society of London*. 81:133-183.
- Notes:* *Melittobia acasta* was reared from *Amphipyra pyramidea* (Lepidoptera: Noctuidae).
- Müller, A. 1994. Die bionomie der in leeren Schneckengehäusen nistenden biene *Osmia spinulosa* (Kirby 1802) (Hymenoptera, Megachilidae). *Veröffentlichungen für Naturschutz und Landschaftspflege in Baden-*

- Württemberg 68-69:291-334.
- Notes: German. *Melittobia acasta* mentioned as one of the parasitoids of *Osmia spinulosa*.
- Muthukrishnan, J. 1994. 4. Arthropoda-Insecta. In *Reproductive Biology of Invertebrates*, ed. K. G. Adiyodi, and R. G. Adiyodi, 167-295. New York: John Wiley & Sons.
- Notes: *Melittobia japonica* (sic; =*M. clavicornis*) is mentioned as having a sex ratio of 1:24 skewed towards females, based on Assem et al. (1980). Discussing mating frequency, a sex ratio of 1:19 is also mentioned, as well as the fact that each male is capable of inseminating over 100 females in quick succession.
- Muthukrishnan, J., M. P. Marian, and T. J. Pandian. 1983. Population dynamics in relation to breeding of the wasp *Speliphron* [sic] *violaceum* and its parasitoid *Melittobia* sp. *Entomon* 8(2):115-122.
- Notes: A low incidence of *Melittobia* sp. (possibly *M. asseml*) infestation is reported.
- National Science Resource Center. 2003. *Organisms, from Macro to Micro*. Burlington, North Carolina, Carolina Biological Supply Company. 262 pp.
- Notes: Sourcebook for middle school students uses *Melittobia digitata* (the WOW-Bug) to teach microscope use, dry-mount preparation, behavioral observation, and preparation of scientific drawings.
- Naumann, I. D. 1991. Hymenoptera. In *The Insects of Australia. 2nd edition*, ed. CSIRO (Australia) Division of Entomology, 916-1000. Cornell University Press, Ithaca, N.Y.
- Notes: Mentions that "Melittobia is a polyphagous parasite in nests of aculeate Hymenoptera."
- Nelson, J. M. 1968. Parasites and symbionts of nests of *Polistes* wasps. *Annals of the Entomological Society of America* 61(6):1528-1539.
- Notes: Cites *Melittobia* sp. parasitizing *Polistes* (Hymenoptera: Vespidae) from Missouri and *Melittobia chalybii* (possibly an erroneous identification) parasitizing three species of *Polistes* in Illinois.
- Newport, G. 1849a. *Anthophorabia retusa*. *Gard-eners Chronicle, London* 1849(12):183.
- Notes: Comments on *Anthophorabia retusa* (= *Melittobia acasta*).
- Newport, G. 1849b. On the identification of a new genus of parasitic insects, *Anthophorabia*. *Annals and Magazine of Natural History* 3:513-517.
- Notes: Comments on the new genus *Anthophorabia* (= *Melittobia*) and the species *Anthophorabia retusa* (= *M. acasta*).
- Newport, G. 1849c. On the identification of the parasitic genus of insects *Anthophorabia*. *Annals and Magazine of Natural History* 4:122-124
- Notes: Comments on *Anthophorabia retusa* (= *Melittobia acasta*) and differences with *Melittobia audouinii*.
- Newport, G. 1852a. The anatomy and development of certain Chalcidoidea and Ichneumonidae, compared with their special oecology and instincts; with descriptions of a new genus and species of bee-parasites. *Transactions of the Linnean Society of London* 21:61-77.
- Notes: Description of the genus *Anthophorabia* (= *Melittobia*), with *Anthophorabia retusa* (= *M. acasta*) as the type species.
- Newport, G. 1852b. Further observations on the genus *Anthophorabia*. *Transactions of the Linnean Society of London* 21:79-83.
- Notes: Comments on *Anthophorabia fasciata* (= *Melittobia acasta*).
- Newport, G. 1853. On the ocelli in the genus *Anthophorabia*. *Transactions of the Linnean Society of London* 21:161-165.
- Notes: Description and comments on the regular and lateral ocelli of *Anthophorabia* (= *Melittobia*).
- Noble, N. S. 1942. *Melittobia* (*Syntomosphyrum*) *indicum* (Silv.) (Hymenoptera, Chalcidoidea), a parasite of the Queensland fruit fly, *Strumeta tryoni* (Frogg.). *Proceedings of the Linnean Society of New South Wales* 67:269-276.
- Notes: *Melittobia indicum* (or *Syntomosphyrum indicum* as described by Silvestri) is really *Aceratoneuromyia indica*.
- Nong, L., and R. I. Sailer. 1986. Arrhenotokous reproduction of *Pediobius foveolatus* (Hymenoptera: Eulophidae). *Annals of the Entomological Society of America* 79(4):737-741.
- Notes: *Melittobia acasta* is mentioned as an organism where mother/son mating occurs.

- Obin, M. S. 1983. *Behavior and Nesting Biology of the Blue Mud-dauber Chalybion californicum (Saussure) (Hymenoptera: Sphecidae)*. M.Sc. thesis. Gainesville: University of Florida. 139 pp.
- Notes: *Melittobia* sp. (possibly *M. digitata*) is recorded as the most common cause of brood mortality of *C. californicum*.
- Oku, S., and T. Nishida. 2001. Presence of single-sex broods under local mate competition in *Trypoxylon malaisei* (Hymenoptera: Sphecidae): Adaptation or maladaptation? *Annals of the Entomological Society of America* 94(4):550-554.
- Notes: "Thick outermost walls might be advantageous to trap-nesting wasps and bees to protect them from parasitoids, such as *Melittobia*, which invade nests by digging into the mud walls after the nests are completed."
- O'Neill, K. M. 2001. *Solitary Wasps: Behavior and Natural History*. New York: Cornell University Press. 406 pp.
- Notes: *Melittobia* is mentioned as a parasitoid of solitary wasps, with references to *Melittobia*, *M. australica* and *M. chalybii*.
- Orzak, S. H. 2002. Using sex ratios: The past and the future. In *Sex Ratios. Concepts and Research Methods*, ed. I. C. W. Hardy, 383-398. Cambridge: Cambridge University Press.
- Notes: "Hamilton emphasized that evolution of a female-biased sex ratio in response to LMC depends upon females being more vagile than males. Yet, in his paper on the wasp *Melittobia chalybii* ... Buckell (1928) stated that 'the females, although fully-winged, were never seen to fly, and could not be induced to do so.' ..."
- Packard, A. S. 1864. Humble bees of New England and their parasites; with notices of a new species of *Anthophorabia*, and a new genus of Proctotrupidae. *Proceedings of the Essex Institute* 4:107-140.
- Notes: Description of *Anthophorabia megachilis* (= *Melittobia megachilis*). Comparisons are made with *Anthophorabia fasciata* (= *M. acasta*). *Megachile centuncularis* (Hymenoptera: Megachilidae) is mentioned as host. Drawings of a larva and a pupa are included. *Pteratomus putnamii* (= *Anagrus putnamii*) (Hymenoptera: Mymaridae) is described as an egg parasitoid of *A. megachilis* (= *Melittobia megachilis*).
- Packard, A. S. 1869a. *Guide to the Study of Insects*. New York: Holt and Company. 715 pp.
- Notes: Mentions *Anthophorabia* (= *Melittobia*) and *A. megachilis* (= *M. megachilis*). Comments and figures are based on Packard (1864).
- Packard, A. S. 1869b. The parasites of the honey bee. *American Naturalist* 2:195-205.
- Notes: *Anthophorabia megachilis* (= *Melittobia megachilis*) is mentioned as a possible honeybee parasite because it attacks *Megachile* bees. Notes *Pteratomus putnamii* [sic] (= *Anagrus putnamii*) (Hymenoptera: Mymaridae) as a hyperparasite attacking *A. megachilis*. Comments and illustrations of larva and pupae of *A. megachilis* (= *M. megachilis*) are based on Packard (1864).
- Parker, R. L., and W. R. Thompson. 1928. Contribution a la biologie des chalcidiens entomophages. *Annales de la Societe Entomologique de France* 97:425-465.
- Notes: Mentions that *Melittobia acasta* females need "repeated matings" for deposition of their complement of eggs. (Our observations on various *Melittobia* species, including *M. acasta*, affirm that females require only a single mating.)
- Peck, O. 1951. *Superfamily Chalcidoidea*. In: *Hymenoptera of America North of Mexico. Synoptic catalogue* (2), ed. C. F. W. Muesebeck, K. Krombein, and H. K. Townes, 410-594. Washington: U.S. Department of Agriculture.
- Notes: *Melittobia chalybii* and *M. megachilis* and their synonyms.
- Peck, O. 1963. A catalogue of the Nearctic Chalcidoidea (Insecta: Hymenoptera). *Canadian Entomologist Supplement* 30:1-1092.
- Notes: Synonyms and hosts of *Melittobia acasta*, *M. chalybii*, and *M. megachilis* are presented.
- Peck, O. 1969. Chalcidoid (Hymenoptera) parasites of the alfalfa leaf-cutter bee, *Megachile rotundata* in Canada. *Canadian Entomologist* 101:418-422.
- Notes: Comments and a key to identify parasitoids of *Megachile rotundata* (Hymenoptera: Megachilidae) in Canada are presented. *Melittobia chalybii* (possible erroneous identification) is one of the parasitoids.

- toids included.
- Peck, O., Z. Bouček, and A. Hoffer. 1964. Keys to the Chalcidoidea of Czechoslovakia (Insecta: Hymenoptera). *Memoirs of the Entomological Society of Canada* 34:1-120.
- Notes: Keys to distinguish *Melittobia* from other genera within Eulophidae. *M. acasta* is mentioned as the only species in Czechoslovakia.
- Perkins, R. C. L. 1907. *Melittobia hawaiiensis* sp. n. *Proceedings of the Hawaiian Entomological Society* 1:124-125.
- Notes: Description of *Melittobia hawaiiensis* from Oahu and *M. hawaiiensis peles* from Kilauea, Hawaii. Perkins mentions that the latter is "a single specimen ... (that) is probably a distinct species."
- Perugueti, R. C., and M. A. del Lama. 2003. Notas sobre a socialidade e a biologia de nidificação de *Trypoxylon* (*Trypoxylon*) *asuncicola* Strand, 1910 (Hymenoptera, Sphecidae). *Revista Brasileira de Entomologia* 47(2):297-301.
- Notes: Portuguese with English abstract. In this study done in Viçosa, Minas Gerais, Brazil, *Brachymeria* sp. (Hymenoptera: Chalcididae) was found to be the most important mortality factor of *Trypoxylon asuncicola* (80% of parasitized nests). The second most important factor was *Melittobia* sp. (17% of parasitized nests).
- Peterson, S. S., C. R. Baird, and R. M. Bittner. 1992. Current status of the alfalfa leafcutting bee, *Megachile rotundata*, as a pollinator of alfalfa seed. *Bee Science* 2(3):135-142.
- Notes: *Melittobia* sp. attacks the alfalfa leafcutting bee. Ultraviolet light traps are discussed as a method to attract and drown most parasitoids.
- Picard, F. 1922. Note préliminaire sur l'atrophie de l'oeil chez le male d'un Hyménoptère Chalcidien *Melittobia acasta* (Walk.). *Bulletin de la Société Zoologique de France* (1922):404-414.
- Notes: French. Comments on the simple eyes present in males of *Melittobia acasta*.
- Picard, F. 1923. Recherches biologiques et anatomiques sur *Melittobia acasta* Walker (Hymenoptere, Chalcidien). *Bulletin Biologique de la France et de la Belgique*. 57:469-508.
- Notes: French. Comprehensive discussion of many aspects of the biology, behavior, and morphology of *Melittobia acasta*.
- Pinto, N. P. O., M. Scaglia, N. Gobbi, G. G. Zacarin, and A. Zanardo. 2001. Observações sobre os ninhos, células, casulos e a ação de inimigos naturais de *Pison aureofaciale* Strand, 1910 (Grupo *pilosum*) (Hymenoptera: Sphecidae, Crabroninae, Trypoxylonini). *Arquivos do Instituto de Biologia, Sao Paulo* 68(2):49-55.
- Notes: Portuguese with English abstract. *Melittobia* sp. was found to parasitize some nests of *P. aureofaciale*.
- Plath, O. E. 1922. Notes on *Psithyrus*, with records of two new American hosts. *Biological Bulletin* 43:23-45.
- Notes: *Melittobia* sp. is mentioned as a parasitoid of *Psithyrus laboriosus* (Hymenoptera: Apidae).
- Pouvreau, A. 1973. Les ennemis des bourdons I. Etude d'une Zoocenose: le nid de bourdons. *Apidologie* 58:211-229.
- Notes: French. *Melittobia acasta* attacking *Bombus* (Hymenoptera: Apidae) colonies.
- Purves, R. G., P. T. P. Clifford, and B. J. Donovan. 1998. Preliminary observations of *Osmia caerulescens* as a pollinator of herbage seed crops. *Proceedings of the New Zealand Grassland Association* 60:161-164.
- Notes: *Melittobia* spp. mentioned as a destroyer of large numbers of developing bees from the nesting of 2nd generation bees.
- Pyle, E. J., T. R. Koballa Jr., R. W. Matthews, and L. R. Flage. 1997. Bugs in the laboratory: Decisions, decisions.... or the lady or the tiger? *Science Activities* 34:25 - 30.
- Notes: Classroom inquiry activity developed with *Melittobia digitata* and a two-choice maze.
- Pyle, E. J., T. R. Koballa Jr., R. W. Matthews, J. R. Matthews, and L. R. Flage. 1998. The lady or the tiger? Insect decision-making investigations. *Science Scope* 21(4):12-16.
- Notes: Classroom inquiry activity to investigate how *Melittobia digitata* can choose between alternative stimuli presented in a simple maze.
- Quicke, D. L. J. 1997. *Parasitic Wasps*. Chapman & Hall, London. 470 pp.
- Notes: The polymorphism, polyandry, and sex ratios of *Melittobia* are mentioned. *Melittobia chalybii*, *M. acasta*, and *M. australica* are mentioned as being frequently kept in

- culture and studied in some detail.
- Ranger, S. L. 1996. *Role of surface hydrocarbons in host acceptance by Melittobia digitata and the use of morphology and behavior in creating a phylogenetic tree of Melittobia*. M.Sc. thesis. Athens, Georgia: University of Georgia. 53 pp.
- Notes: First chapter reviews literature, then reports an investigation into the role of host surface hydrocarbons in host acceptance by *Melittobia digitata*. The final chapter presents a phylogeny of *Melittobia* based on behavior and morphology.
- Rau, P. 1940. The life history of the American cockroach, *Periplaneta americana* Linn. (Orthoptera: Blattidae). *Entomological News* 51:223-227.
- Notes: *Melittobia chalybii* (possible erroneous identification) was found parasitizing some cockroach egg cases in the laboratory. The parasitoid was probably brought into the laboratory with mud nests of *Sceliphron caementarium* (Hymenoptera: Sphecidae).
- Rau, P. 1941. Observations on certain Lepidopterous and Hymenopterous parasites of *Polistes* wasps. *Annals of the Entomological Society of America* 34:355-366.
- Notes: "*Melittobia* sp. is a dreadful pest to *Polistes* larvae in the laboratory where the source of infestation is other hymenopterous larvae brought in for study, but in their natural habitat *Polistes* wasps seem not to be troubled by them."
- Rau, P., and N. Rau. 1916. The biology of the mud-daubing wasps as revealed by the contents of their nests. *Journal of Animal Behavior* 6:27-63.
- Notes: Asserts that *Melittobia* is the most destructive parasite of mud-daubing wasps. The "...adults bore holes through the neighboring walls and enter other cells and the life cycle is repeated."
- Rau, P. 1928. Field studies in the behavior of the non-social wasps. *Transactions of the Academy of Science of St. Louis*. 25(9):325-489.
- Notes: States that "...only a very few [*Trypoxylon texense* (Hymenoptera: Sphecidae)] were parasitized by the chalcid *Melittobia* [sic]."
- Riek, E F., and J. C. Cardale. 1974. *Hymenoptera (Wasps, bees, ants)*. In: *The Insects of Australia. Supplement 1974*, ed. Commonwealth Scientific and Industrial Research Organization, Division of Entomology, 107-111. Melbourne University Press: Australia.
- Notes: "Dahms (1973) described the courtship behaviour of *Melittobia australica* (Eulophidae-Tetrastichinae), a dimorphic species whose male has abbreviated wings and modified antennae."
- Risbec, J. 1951. Les Chalcidoides de l'Afrique occidentale française. *Mémoires de l'Institut Français d'Afrique Noire, Ifan-Dakar* 13:7-409.
- Notes: French. Description of *Melittobia cosmopterygi* (= *Cirrospilus cosmopterygi*).
- Risbec, J. 1952. Contribution à l'étude des chalcidoides de Madagascar. *Mémoires de l'Institut Scientifique de Madagascar (E)* 2:1-448.
- Notes: French with English abstract. Description of *Melittobia bekiliensis*. Drawings of male and female and their antennae.
- Risbec, J. 1956. Hyménoptères parasites du Cameroun (2e contribution). *Bulletin de l'Institut Français d'Afrique Noire (A)* 18(1):97-164.
- Notes: French. *Melittobia diopsisephila* (= *Tachinobia diopsisephila*) is mentioned as being close to *Melittobia bekiliensis*.
- Rivers, D. B. 2004. Evaluation of host responses to envenomation as a means to assess ectoparasitic Pteromalid wasp's potential for controlling manure-breeding flies. *Biological Control* 30(2):181-192.
- Notes: *Melittobia digitata* is used for comparison in some of the experiments with different Pteromalids.
- Rocha, I. R. D. 1981. Inquilinos em células de *Zeta argillacea* (Linnaeus, 1758) (Eumenidae; Hymenoptera). *Anais da Sociedade Entomológica do Brasil* 10(2):175-186.
- Notes: Portuguese with English abstract. Among the inquilines found in nests of *Zeta argillacea* (= *Z. argillaceum*) (Hymenoptera: Vespidae) in Brazil, the most common are *Pachodynerus nasidens* (Hymenoptera: Vespidae) and *Trypoxylon* sp. (Hymenoptera: Sphecidae). One of the mortality factors (2.5%) of these two inquilines is a "Chalcididae". We believe the author is referring to a *Melittobia* sp.
- Rocha, I. R. D., and A. Raw. 1982. Dinâmica

- das populações da vespa solitária *Zeta argillacea* (Linnaeus, 1758) (Hymenoptera: Eumenidae). *Anais da Sociedade Entomologica do Brasil* 11(1):57-78.
- Notes: Portuguese with English abstract. Mortality by *Melittobia* sp. was higher in small size nests containing *Zeta argillaceum* (Hymenoptera: Vespidae) andinquilines of *Trypoxylon* (Hymenoptera: Sphecidae) and *Pachodynerus* (Hymenoptera: Vespidae). The percentage of mortality by *Amobia* (Diptera: Sarcophagidae) can be explained by the absence of *Melittobia*.
- Rosenheim, J. A. 1990. Density-dependent parasitism and the evolution of aggregated nesting in the solitary Hymenoptera. *Annals of the Entomological Society of America* 83(3):277-285.
- Notes: Reviews field studies (based mainly on several studies by Freeman and collaborators) suggesting that density dependence of *Melittobia* sp. foraging and nest parasitism selectively favors gregarious nesting by mud dauber wasps in Trinidad and Jamaica. *Sceliphron assimile*, *S. asiaticum*, and *S. fistularium* (Hymenoptera: Sphecidae) are mentioned as hosts of *Melittobia* sp.
- Ruhnke, H. 1998. *Zur verbreitung, Bionomie und Gefährdung der Blattschneiderbiene Megachile genalis Mor.* (Hymenoptera: Megachilidae). Diplomarbeit, Martin Luther Universität Halle-Wittenberg, Sachsen-Anhalt, Deutschland. 76 pp.
- Notes: German. Thesis. *Melittobia acasta* is mentioned among the different European parasitoids able to attack *Megachile genalis* inside the nest.
- Salle, J. La See La Salle, J.
- Santis, L. de. 1949. Dos notas sobre Calcidoideos Argentinos (Hymenoptera: Chalcidoidea). *Revista del Museo de La Plata (Zoología)* 14:275-281.
- Notes: Spanish. *Melittobia sceliphronidis* n. comb. (= *Melittobia hawaiiensis*).
- Santis, L. de. 1957. Anotaciones sobre calcidoideos Argentinos. *Notas del Museo de Historia Natural. Zoología.* 19(173):107-119.
- Notes: Spanish. *Melittobia acasta* parasitizing *Trypoxylon* sp. and *Sceliphron figulus* (Hymenoptera: Sphecidae). *Sphecophagus sceliphronidis* placed as synonym of *M. acasta*.
- Santis, L. de. 1967. *Catálogo de los Himenópteros Argentinos de la Serie Parasítica, incluyendo Bethyloidea.* La Plata: Comisión de Investigación Científica. 337 pp.
- Notes: Spanish. Catalogue. Checklist. *Melittobia indicum* (= *Aceratoneuromyia indica*); *M. acasta*.
- Santis, L. de. 1979. *Catálogo de los Himenópteros Calcidoideos de América al sur de los Estados Unidos.* Buenos Aires: Comisión de Investigaciones Científicas Provincia de Buenos Aires. 488 pp.
- Notes: Spanish. Catalogue. Checklist. *Melittobia indicum* (= *Aceratoneuromyia indica*); *M. hawaiiensis*. *M. chalybii* (the references used actually refer not only to *M. chalybii* but to four other *Melittobia* species; as far as we know *M. chalybii* has not been found outside of the U.S.A.)
- Santis, L. de. 1981. Dos notas sobre insectos Bonaerenses polinizadores de la alfalfa y sus parasitoides. *Revista del Museo de La Plata (N.S.)* 12:227-237.
- Notes: Spanish. Catalogue. Checklist. *Melittobia acasta* and *M. hawaiiensis* as parasitoids of *Megachile* sp. (Hymenoptera: Megachilidae) in Argentina. According to the author, Boucek and Dahms confirmed identifications.
- Santis, L. de. 1983. Catálogo de los Himenópteros Calcidoideos (Hymenoptera) de América al sur de los Estados Unidos, Primer Suplemento. *Revista Peruana de Entomología* 24(1):1-38.
- Notes: Spanish. Catalogue. Checklist. *Melittobia chalybii* is mentioned south of the U.S. According to the papers used as references in this checklist, the *Melittobia* species from this area of the world are *M. australica*, *M. hawaiiensis* and *M. acasta* but not *M. chalybii*.
- Santis, L. de. 1989. Catálogo de los Himenópteros Calcidoideos (Hymenoptera) al sur de los Estados Unidos, Segundo Suplemento. *Acta Entomológica Chilena* 15:9-90.
- Notes: Spanish. Catalogue. Checklist. *Melittobia australica* mentioned from Jamaica.
- Schauff, M. E., J. La Salle, and L. D. Cote. 1997. *Eulophidae.* In *Annotated Keys to the Genera of Nearctic Chalcidoidea* (Hymenoptera), ed. G. A. P. Gibson, J. T. Huber, and

- J. B. Woolley, 327-495. Ottawa: NRC Research Press.
- Notes:* Illustrated keys to families and genera. Description and general comments on families and genera. Illustrations of *Melittobia* spp. male antennae.
- Scheloske, H. W. 1974. Studies on occurrence and nest construction of the silk bee *Colletes daviesanus*. *Zoologische Jhrbuecher Abteilung fuer Systematik Oekologie und Geographie der Tiere* 101(2):153-172.
- Notes:* *Melittobia* as one of the parasitoids of *C. daviesanus* (Hymenoptera: Colletidae).
- Schmid-Hempel, P. 1998. *Parasites in Social Insects*. Princeton, New Jersey: Princeton University Press. 409 pp.
- Notes:* *Melittobia* mentioned as one of the parasitoid genera of broods (including pupae) for Hymenopteran and Dipteran species. *Melittobia acasta*, *M. chalybii*, *M. europaea* (*nomen nudum*) [this is a misreference from Alford (1975) who actually refers to *Mutilla europaea* (Hymenoptera: Mutillidae)] attacking *Bombus* and *Psithyrus* (Hymenoptera: Apidae)]. *Melittobia australica*, *M. chalybii*, *M. acasta*?, *M. sp.* attacking Vespidae (*Vespula*, *Polistes*). *M. australica* is mentioned attacking incipient colonies of social wasps.
- Schmid-Hempel, P. 2001. On the evolutionary ecology of host-parasite interactions: Addressing the question with regard to bumblebees and their parasites. *Naturwissenschaften* 88:147-158.
- Notes:* *Melittobia acasta* and *M. chalybii* are mentioned as parasites of bumblebees. This paper discusses the use of bumblebees and their parasites as a model system.
- Schmiedeknecht, O. 1909. Hymenoptera fam. Chalcididae. *Genera Insectorum* 97:1-550.
- Notes:* Catalogue. Checklist. *Melittobia acasta*.
- Schmieder, R.G. 1933. The polymorphic forms of *Melittobia chalybii* Ashmead and the determining factors involved in their production (Hymenoptera: Chalcidoidea, Eulophidae). *Biological Bulletin of the Marine Biological Laboratory, Woods Hole* 65:338-352.
- Notes:* Description of the two morphs of females of *M. chalybii* (type form = typical = macropterous; second form = brachypterous). States that males have two morphs. Schmieder actually had more than one species of *Melittobia* (see González & Matthews 2002; also see notes in Whiting 1947).
- Schmieder, R.G. 1938. The sex ratio in *Melittobia chalybii* Ashmead, gametogenesis and cleavage in females and in haploid males (Hymenoptera: Chalcidoidea). *Biological Bulletin of the Marine Biological Laboratory, Woods Hole* 74:256-266.
- Notes:* Data and comments on sex ratio of *Melittobia chalybi*. Schmieder actually had more than one species of *Melittobia* (see González & Matthews 2002; also see notes in Whiting 1947). This paper also includes aspects of the embryological development of cells of different tissues of larvae, males, and females.
- Schmieder, R. G. 1939. The significance of the two types of larvae in *Sphecoptera burra* (Cresson) and the factors conditioning them (Hymenoptera: Ichneumonidae). *Entomological News* 50:125-131.
- Notes:* Comments on biology of *Melittobia* as compared to *Sphecoptera burra*. Mention of the long diapause of larval *Melittobia chalybii* suggests that he was actually working with *M. femorata*; the only species known to us that has a long diapause.
- Schmieder, R. G., and P. W. Whiting. 1946. Reproductive economy in the chalcidoid wasp *Melittobia*. *Genetics* 31:641.
- Notes:* "In ... *Melittobia* close inbreeding is the rule, but outcrossing may occur. Unmated females lay very few eggs, and these are male-producing. After mating occurs, an abundance of eggs are laid which, for the most part, develop into females, males constituting less than three percent of the offspring." This is not a paper, but the abstract of Schmieder and Whiting (1947). It appears in a section called "Summaries from forthcoming papers"
- Schmieder, R. G., and P. W. Whiting. 1947. Reproductive economy in the chalcidoid wasp *Melittobia*. *Genetics* 32:29-37.
- Notes:* The economy of male production by uniseminated females is considered as an adaptation for conservation of food supply.
- Schulz, W. A. 1906. *Spolia Hymenopterologica*.

- Paderbom. 355 pp.
- Notes: German. *Melittobia megalochilae* (sic; =*Melittobia megachilis*) from Kansas.
- Schmitz, J., and R. F. A. Moritz. 1994. Sequence analysis of the D1 and D2 regions of 28S rDNA in the hornet (*Vespa crabro*) (Hymenoptera, Vespinae). *Insect Molecular Biology* 3(4):273-277.
- Notes: The two variable domains D1 and D2 near the 5' end of the 28S ribosomal RNA gene have been sequenced for *Vespa crabro*. The sequence was aligned to corresponding rDNA of various wasps' species including *Melittobia digitata*.
- Silva-Torres, C. S. A. 2004. *Host location by Melittobia digitata* Dahms (Hymenoptera: Eulophidae), a larval parasitoid of mud daubers, *Trypoxylon politum* (Hymenoptera: Sphecidae). M.Sc. thesis. Athens, Georgia: University of Georgia. 66 pp.
- Notes: Third chapter investigates olfactory cues involved in host finding by *M. digitata* using an olfactometer. Fourth chapter examines the role of chemical cues and natal rearing effect in host recognition by *M. digitata*.
- Silva-Torres, C. S. A., and R. W. Matthews. 2003. Development of *Melittobia australica* Girault and *Melittobia digitata* Dahms (Hymenoptera: Eulophidae) parasitizing *Neobellieria bullata* (Diptera: Sarcophagidae) puparia. *Neotropical Entomology* 32(4):645-651.
- Notes: *Melittobia digitata* produced more offspring compared to *M. australica* parasitizing *Neobellieria bullata*, and both species had reduced progeny at increased parasitoid densities per host. Sex ratios remained more or less constant at all foundress parasitoid densities.
- Silva-Torres, C. S. A., R. W. Matthews, J. R. Ruberson, and W. J. Lewis. 2005. Olfactory cues in host finding by *Melittobia digitata* Dahms (Hymenoptera: Eulophidae). *Annals of the Entomological Society of America* (In Press)
- Notes: *Melittobia digitata* successfully located hosts (*Trypoxylon politum* prepupae, *Megachile rotundata* prepupae, *Sarcophaga bullata* puparia) even when visually and physically isolated from the parasitoid inside a three-choice arena. Evidence is provided for arrestment of *M. digitata* in response to host-related chemicals.
- Silvestri, F. 1910. Introduzione in Italia di un imenottero indiano per combattere la mosca dell'arance. *Bolletino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura, Portici* 4:228-245.
- Notes: Italian. Description of *Syntomosphyrum indicum* (= *Aceratoneuromyia indica*). Another species of *Aceratoneuromyia* was later considered to be a synonym of *Melittobia indica* (See Gahan 1938).
- Smith, F. 1853. Notes on the habits of a bee-parasite, *Melittobia acasta*. *Transactions of the Entomological Society of London (N.S.)* 2:248-253.
- Notes: Synonyms of *Melittobia acasta* and comments on its biology are presented. The wasp is mentioned as a parasitoid of *Anthophora* sp. (Hymenoptera: Anthophoridae) and as a hyperparasitoid of *Monodontomerus* sp. (Hymenoptera: Torymidae).
- Spradberry, J. P. 1973. *Wasps*. Seattle: University of Washington Press. 408 pp.
- Notes: Reviews literature on *Melittobia acasta* as a chalcid parasitoid of several insects, including solitary and social Vespoidea and Diptera.
- Stephen, W. P. 1979. A natural light *Sapyga* and parasite emergence trap in leafcutting bee management (*Megachile rotundata*). *Station Bulletin, Agricultural Experiment Station, Oregon State University, Corvallis*. 636:1-2.
- Notes: *Melittobia* sp. as pest of *Megachile rotundata* (Hymenoptera: Megachilidae).
- Stolvov, N. M., and S. M. Palevich. 1988. Ways of controlling chalcid infestation of bees. *Veterinariya* 1988(8):38-39, 41.
- Notes: Russian. Chalcidoid wasps (including *Melittobia acasta*) as pests of bees. Hosts, and effect of pesticides discussed.
- Sudheendrakumar, V. V., and T. C. Narendran. 1984. Bio-ethology of an undescribed species of *Melittobia* (Hymenoptera: Eulophidae) parasitic on sphecoid wasps of Malabar (Kerala). *Indian Journal of Parasitology* 7(2):143-148.
- Notes: *Melittobia* sp. (= *Melittobia asemi*) as a parasitoid of *Chalybion bengalense* and *Sceliphron coromandelicum*. Comments on invasion of nests, oviposition, and male pugnacity.

- Sudheendrakumar, V. V., and T. C. Narendran. 1989. Biology of the immature stages of *Chalybion bengalense* (Dahlbom) (Hymenoptera: Sphecidae). *Entomon* 14(3-4):177-181.
- Notes: *Melittobia assemi* is mentioned as a parasitoid of *Chalybion bengalense*.
- Sweeney, J. D., K. M. Brockerhoff, M. Kenis, and J. J. Turgeon. 2002. *Strobilomyia nenthracina* Michelsen and *S. appalachensis* Michelsen, spruce cone maggots (Diptera: Anthomyiidae) In *Biological Control Programmes in Canada, 1981 – 2000*, ed. P. G. Mason, and J. T. Huber, 253-258. Canada: CABI Publishing.
- Notes: *Melittobia acasta* is mentioned as a parasitoid of North American *Strobilomyia nenthracina* and/or *S. appalachensis*. However, the authors' key reference (Fidgen et al. 1999) does not mention this parasitoid. According to Sweeney (personal communication) the mention was a mistake and they obtained *Melittobia acasta* from *S. nenthracina* on Vancouver Island, Canada.
- Swezey, O. H. 1906. Observations on insects during a recent trip on Hawaii. *Proceedings of the Hawaiian Entomological Society* 1:16-17.
- Notes: *Pimpla hawaiiensis* (= *Melittobia hawaiiensis*?) as parasitoid of *Omiodes accepta* (sugar cane leaf-roller) (Lepidoptera: Crambidae).
- Swezey, O. H. 1907a. *Odynerus* parasites (Hymen.). *Proceedings of the Hawaiian Entomological Society* 1:121-122.
- Notes: *Melittobia hawaiiensis* from Moanalua Valley, Hawaii, as a parasitoid of *Odynerus nigripennis* (Hymenoptera: Vespidae), *Pison hospes* and *Sceliphron caementarius* (Hymenoptera: Sphecidae).
- Swezey, O. H. 1907b. Notes and exhibitions. *Proceedings of the Hawaiian Entomological Society* 1:173-174.
- Notes: *Melittobia hawaiiensis* parasitizing *Megachile palmarum* (Hymenoptera: Megachilidae).
- Swezey, O. H. 1911. Miscellaneous notes. *Proceedings of the Hawaiian Entomological Society* 2(5):193-194.
- Notes: Comments on parthenogenesis in *Melittobia* (very probably *M. hawaiiensis*). *Sceliphron* sp. is mentioned as host.
- Taffe, C. A. 1978. Temporal distribution of mortality in a field population of *Zeta abdominale* (Hymenoptera) in Jamaica. *Oikos* 31:106-111.
- Notes: *Melittobia* sp. (*hawaiiensis* complex) (= *M. australica*) has a delayed density-dependent effect on populations of the solitary eumenid wasp, *Zeta abdominale* (Hymenoptera: Vespidae).
- Taffe, C. A. 1979. The ecology of two West Indian species of mud-wasps (Eumenidae: Hymenoptera). *Biological Journal of the Linnean Society* 11:1-17.
- Notes: *Melittobia* sp. (*hawaiiensis* complex) (= *M. australica*) is one of the major mortality factors of *Zeta abdominale* in Jamaica and *Zeta canaliculatum* (= *Z. argillaceum*) in Trinidad.
- Taffe, C.A. 1983. The biology of the mud-wasp *Zeta abdominale* (Drury) (Hymenoptera: Eumenidae). *Zoological Journal of the Linnean Society* 77:385-393.
- Notes: The genus *Melittobia* is mentioned as "the major predator of *Zeta*."
- Taffe, C. A., and K. Ittyeipe. 1976. Effect of nest substrata on the mortality of *Eumenes colona* Saussure (Hymenoptera) and its inquilines. *The Journal of Animal Ecology* 45:303-311.
- Notes: States that *Melittobia* search by flying and show a functional response to the nest substrata of the hosts. *Melittobia* is mentioned as one of the most important mortality factors in *Eumenes colona* (= *Zeta abdominale*) (Hymenoptera: Vespidae).
- Tasei, J. N. 1978. Action de deux insecticides sur *Melittobia acasta* Walk. et son hôte: *Megachile pacifica* Pz. (Hymenoptera Eulophidae, Megachilidae). Méthode de prévention du parasitisme. *Apidologie* 9(2):101-110.
- Notes: French with English abstract. *Melittobia acasta* as a parasitoid of alfalfa leaf-cutter bees. Endosulfan (Thiodan) and carbaryl (Sevin) were tested to control the parasitoid.
- Taylor, J. S. 1963. Notes on the leaf-cutter bee *Megachile (Eutricharaea) gratiosa* Gestaecker (Hymenoptera: Megachilidae). *The Pan-Pacific Entomologist* 39(2):129-134.
- Notes: *Melittobia* sp. "probably *hawaiiensis*" (= *M. australica*) was found parasitizing *Megachile gratiosa* (Hymenoptera: Megachilidae) in Port Elizabeth, South

- Africa.
- Tepedino, V. J., and D. R. Frolich. 1982. Mortality factors, pollen utilization, and sex ratio in *Megachile pugnata* Say (Hymenoptera: Megachilidae), a candidate for commercial sunflower pollination. *New York Entomological Society* 90(4):269-274.
Notes: *Melittobia* sp. parasitizing *Megachile pugnata*.
- Terán, J. B. 1980. Lista preliminar de Hymenoptera parásitos de otros insectos en Venezuela. *Revista de la Facultad de Agronomía (Maacay)* 9(1-4):283-389.
Notes: Spanish. Catalog. Checklist. *Melittobia* sp. as hyperparasite based on Box (1952) and Guagliumi (1959).
- Thomas, C. R. 1960. The European wasp (*Vespa germanica* Fab.) in New Zealand. *Information Series, New Zealand Department of Scientific and Industrial Research* 27:1-73.
Notes: *Melittobia* recorded as one of the enemies of *Vespa germanica* in New Zealand.
- Thompson, W. R. 1944. *A Catalogue of the Parasites and Predators of Insect Pests. Section 1. Parasite Host Catalogue. Part 5. Parasites of the Lepidoptera (A - CH)*. 1-130 pp. Ottawa, Ontario, Canada: Imperial Agricultural Bureaux, Institute of Entomology, Parasite Service.
Notes: Catalogue. Checklist. *Melittobia acasta* on *Amphipyra pyramidea* (Lepidoptera: Noctuidae).
- Thompson, W. R. 1945. *A Catalogue of the Parasites and Predators of Insect Pests. Section 1. Parasite Host Catalogue. Part 6. Parasites of the Lepidoptera (CI - F)*. 131-258 pp. Ottawa, Ontario, Canada: Imperial Agricultural Bureaux, Institute of Entomology, Parasite Service.
Notes: Catalogue. Checklist. *Melittobia hawaiiensis* on *Ereunetis flavistriata* (Lepidoptera: Tineidae).
- Thompson, W. R. 1946. *A Catalogue of the Parasites and Predators of Insect Pests. Section 1. Parasite Host Catalogue. Part 8. Parasites of the Lepidoptera (N - P)*. 415-523 pp. Ottawa, Ontario, Canada: Imperial Agricultural Bureaux, Institute of Entomology, Parasite Service.
Notes: Catalogue. Checklist. *Melittobia acasta* on *Pieris brassicae* (Lepidoptera: Pieridae), and *Porthetria dispar* (Lepidoptera: Lymantriidae).
- Thompson, W. R. 1950a. *A Catalogue of the Parasites and Predators of Insect Pests. Section 1. Parasite Host Catalogue. Part 4. Parasites of the Hymenoptera, Isopoda and Isoptera. 2nd Edition*. 1-130 pp. Ottawa, Ontario, Canada: Commonwealth Agricultural Bureaux, The Commonwealth Institute of Biological Control.
Notes: Catalogue. Checklist. *Melittobia acasta* on *Chrysis ignita* (Hymenoptera: Chrysididae), *Eulimneria alkae* and *Pimpla robotator* (= *Exeristes robotator*) (Hymenoptera: Ichneumonidae), *Megachile* sp. and *Osmia rufa* (Hymenoptera: Megachilidae), *Odynerus callosus*, *Odynerus spinipes* (Hymenoptera: Vespidae), *Psen* sp. and *Trypoxylon figulus* (Hymenoptera: Sphecidae); *Melittobia hawaiiensis* on *Brachymeria salomonis* (Hymenoptera: Chalcididae), *Sceliphron caementarium* (Hymenoptera: Sphecidae).
- Thompson, W. R. 1950b. *A Catalogue of the Parasites and Predators of Insect Pests. Section 1. Parasite Host Catalogue. Part 10. Index of Parasites of the Lepidoptera*. 1-120 pp. Ottawa, Ontario, Canada: Commonwealth Agricultural Bureaux, the Commonwealth Institute of Biological Control.
Notes: Catalogue. Checklist. *Melittobia* sp., *M. acasta*, *M. hawaiiensis*.
- Thompson, W. R. 1954. *A Catalogue of the Parasites and Predators of Insect Pests. Section 2. Host Parasite Catalogue. Part 3. Hosts of the Hymenoptera (Calliceratid to Evaniid)*. 191-332 pp. Ottawa, Ontario, Canada: Commonwealth Agricultural Bureaux, the Commonwealth Institute of Biological Control.
Notes: Catalogue. Checklist. *Melittobia* sp., *M. acasta*, *M. hawaiiensis*.
- Thompson, W. R., and H. L. Parker. 1927. The problem of host relations with special reference to entomophagous parasites. *Parasitology* 19(1):1-34.
Notes: An analysis of host selection and definition of the "normal" host in *Melittobia acasta*.
- Thomson, C. G. 1878. *Hymenoptera Scandinaviae 5. Pteromalus (Svederus) continuatio*. Schweden, Lundae: Typis Expressit Haqv. Ohlsson. 307 pp.
Notes: Descriptions in Latin, comments in Swedish. *Tetrastichus melittobius*

- (=*Melittobia acasta*); *Tetrastichus metittobius* (sic; =*M. acasta*); *Melittobia osmia* (= *M. acasta*).
- Thornhill, R., and J. Alcock. 1983. *The Evolution of Insect Mating Systems*. Cambridge, Massachusetts: Harvard University Press. 547 pp.
- Notes: Comment on *Melittobia* male fights, and that males emerge before females from the host.
- Torchio, P. F. 1963. A chalcid wasp parasite of the alfalfa leaf-cutting bee. *Utah Farm and Home Science* 24(3):70-71.
- Notes: *Melittobia chalybii* is reported from Utah parasitizing *Megachile rotundata*. Photographs of males, females, eggs, larvae and pupae on host, females on host (one laying eggs), and a courting couple. Males in one of the pictures might actually be males of *Melittobia acasta*.
- Trexler, J. C. 1982. *Host Density and Intra-generational Parasitism Rates by a Eulophid Parasitoid*. M.Sc. thesis. Tallahassee, Florida: Florida State University. 59 pp.
- Notes: Studies using *Melittobia* sp. (= *M. digitata*) as a parasite of *Sceliphron caementarium*. The type specimen of *M. digitata* comes from the voucher material for this thesis (see Dahms 1984a).
- Trexler, J. C. 1985. Density-dependent parasitism by a eulophid parasitoid: Tests of an intragenerational hypothesis. *Oikos* 44:415-422.
- Notes: Field experiments show that the intragenerational rate of parasitism by *Melittobia* (= *M. digitata*) is independent of host density. The dispersion of *Melittobia* in the laboratory suggests that the mud walls of the host's nest limit the number of nests a female *Melittobia* can search for a host. In spite of this, *Melittobia* sometimes enter empty nests. Olfactometer experiments provided no evidence that *Melittobia* use chemical cues to locate their hosts.
- Tudor, C., I. Teodorescu, and G. Ciurdarescu. 1978. Parasites and pests in wild bee *Megachile rotundata* nests.
- Notes: Romanian. *Melittobia acasta* is mentioned as one of the insects that negatively influence growth of *Megachile rotundata* (Hymenoptera: Megachilidae).
- Valkeila, E. 1959. Beitrage zur erwespenfauna (Hymenoptera, Chalcidoidea) Finnlands. *Annales Entomologici Fennici* 25(3):180-181.
- Notes: Finnish. *Melittobia acasta* parasitizing *Megachile rotundata*.
- van den Assem, J. See Assem, J. van den.
- van Lith, J. P. See Lith, J.P. van.
- Varanda, E. A., C. S. Takahashi, and A. E. E. Soares. 1981. Efeito da radiação gamma na viabilidade dos ovos de *Melittobia hawaiiensis*. *Archivos de Biologia y Medicina Experimentales* 14(10):88.
- Notes: Portuguese. At higher radiation levels, egg eclosion was lower in *Melittobia hawaiiensis*.
- Varanda, E. A., C. S. Takahashi, and A. E. E. Soares. 1985a. A study of radioresistance in *Melittobia hawaiiensis* (Hymenoptera: Eulophidae). *Revista Brasileira de Genetica* 8(4):653-668.
- Notes: No selection for radioresistance occurred after several generations of exposure to gamma ray radiation.
- Varanda, E. A., C. S. Takahashi, and A. E. E. Soares. 1985b. Effect of gamma radiation on eggs, larvae and pupae of *Melittobia hawaiiensis* - detection of a body color mutation. *Revista Brasileira de Genetica* 8(3):439-448.
- Notes: Egg and larvae but not pupae were highly affected after being treated with 2,500 R. At 1,000 R, a mutant male of different color was found. At doses of 10,000 R or more, females stopped laying eggs.
- Varanda, E. A., C. S. Takahashi, and A. E. E. Soares. 1985c. Effect of gamma radiation on the hatching rate and sex ratio of *Melittobia hawaiiensis* (Hymenoptera, Eulophidae). *Revista Brasileira de Genetica* 8(1):61-69.
- Notes: Males of *Melittobia hawaiiensis* were irradiated with ⁶⁰Co gamma ray doses from 1,000 to 150,000 R and mated with non-irradiated females. Egg hatching rate diminished after 15,000 R, however, from this to higher doses only males were obtained.
- Varanda, E. A., C. S. Takahashi, A. E. E. Soares, and L. A. de O. Campos. 1984. Considerations of the courtship and copulation behavior, sex ratio and life cycle of *Melittobia hawaiiensis* (Hym. Eulophidae). *Revista Brasileira de Genetica*

- 7(1):65-72.
Notes: Information on courtship behavior and copulation of *M. hawaiiensis* is presented, as well as the duration of each phase of metamorphosis.
- Vicens, N., J. in den Bosch, and M. Blas. 1994. Biology and population structure of *Osmia tricornis* Latreille (Hym., Megachilidae). *Zeitschrift für Angewandte Entomologie* 117(3):300-306.
Notes: *Melittobia* sp. as one of the several parasitoids found in the nests of *Osmia tricornis*.
- Viereck, H. L. 1916. Guide to the insects of Connecticut. *State Geological and Natural History Survey* (22):1-1642.
Notes: *Melittobia* and *Miotropis* mentioned as genera of Elachertidae. A diagnosis of the female of *Miotropis megachilis* (= *Melittobia megachilis*) is presented. *Megachile*, *Ceratina*, *Anthophora* and *Monodontomerus* (Hymenoptera) are mentioned as its hosts. *Anthophora*, *Osmia*, *Chalicodoma*, *Stelis*, *Anthidium*, *Bremus*, *Hylaeus*, *Odynerus*, *Vespula*, *Trypoxylon*, *Monodontomerus* and *Leucospis* (Hymenoptera) are mentioned as hosts of *Melittobia* sp.
- Wael, L. de, M. de Greef, and O. van Laere. 1993. *Melittobia acasta* and *Bombacarus buchneri*, dangerous parasites in the *in vitro* rearing of bumble bees. *Apiacta* 28:93-101.
Notes: A list of hosts and comments on biology of *Melittobia acasta* from Belgium is given. It is mentioned also as an important pest of leaf-cutting bees [*Megachile* (Hymenoptera: Megachilidae)]. Ultraviolet light traps are recommended for control. Other control methods are discussed.
- Wael, L. de, M. de Greef, and O. van Laere. 1995. Biology and control of *Melittobia acasta*. *Bee World* 76(2):72-76.
Notes: Comments on *Melittobia acasta* in Europe particularly as an important pest of bumblebee colonies in Belgium. Good control was obtained by placing ultraviolet light traps between colonies. Other published control methods are discussed. Figures include schematic drawings of the two sexes and photographs of a female, a bumblebee punctured by *M. acasta*, and a bumblebee brood cell with many exuviae of *M. acasta*.
- Walde, S. J., and W. W. Murdoch. 1988. Spatial density dependence in parasitoids. *Annual Review of Entomology* 33: 441-466.
Notes: In a table that shows parasitoid-host species pairs, *Melittobia chalybii* appears as a density dependent parasitoid. The reference given for that association is Freeman and Parnell (1983) [sic]. The reference is actually Freeman and Parnell (1973) which refers to *M. chalybii* (= *M. australica*).
- Walker, F. 1839. *Monographia Chalciditum*. London: H. Bailliere. 333 pp.
Notes: Taxonomy of Eulophidae. Description of *Cirrospilus acasta* (= *Melittobia acasta*).
- Ward, G. L. 1973. *Melittobia chalybii* Ashmead (Hymenoptera: Eulophidae) as a parasite of *Chalybion zimmermanni* Dahlbom (Hymenoptera: Sphecidae). *Proceedings of the Indiana Academy of Science* 82:233-234.
Notes: *Melittobia chalybii* is found as a parasitoid of *C. zimmermanni*.
- Waters, N. D., H. W. Homan, and C. R. Baird. 1980. Recognizing insect enemies of alfalfa leafcutting bees. *University of Idaho Current Information Series* No. 163.
Notes: *Melittobia* sp. is among the parasitoids of leafcutting bees (Hymenoptera: Megachilidae).
- Waterston, J. 1917. Notes on the morphology of Chalcidoidea bred from *Calliphora*. *Parasitology* 9:190-198.
Notes: A very accurate description of *Melittobia acasta* is given.
- Weaving, A. J. S. 1995. A comparison of nesting success and nesting habits in some afrotropical aculeate wasps, with particular reference to nest parasites (Hymenoptera: Sphecidae, Eumenidae). *Annals of the Cape Provincial Museums, Natural History* 19(4):181-224.
Notes: Attacks by *Melittobia* sp. are one of the most important identifiable causes of nest/cell failure.
- Wegener, B., B. Löhr, A. Reineke, and C.P.W. Zebitz. 2002. Molecular identification of *Diadegma* species (Ichneumonidae) parasitizing Diamondback Moth *Plutella xylostella* (Plutellidae) in eastern and southern Africa. *Proceedings of the International Symposium on Improving Biocontrol of*

- Plutella xylostella*. 2002
- Notes: "...The presumptive boundaries of the split 5.8S and 28S rDNA were deducted from comparisons of alignments with sequences of *Melittobia digitata* (Westwood)." On-line at: <http://dbm2002.cirad.fr/papers/wagener.doc>
- Werren, J. H. 1987. Labile sex ratios in wasps and bees. *Bioscience* 37(7):498-506.
- Notes: *Melittobia* species have a strongly female-biased sex ratio but do not alter sex ratio with foundress number.
- Westwood, J. O. 1840. An introduction to the modern classification of insects; founded on the natural habits and corresponding organisation of the different families. London: Longman, Orme, Brown, Green and Longmans, Vol. 2:587.
- Notes: General comments on the biology of *Melittobia audouinii* (= *M. acasta*).
- Westwood, J. O. 1847. *Melittobia audouinii*. *Proceedings of the Entomological Society of London* (1847):xvii.
- Notes: Comments on a species named *Melittobia audouinii* (= *Melittobia acasta*).
- Westwood, J. O. 1848. 5TH July 1847. Exhibitions, Memoirs, etc. [*Melittobia audouinii*] *Proceedings of the Entomological Society of London* 5:xviii.
- Notes: Exhibition of *Melittobia audouinii* (= *Melittobia acasta*).
- Westwood, J. O. 1849a. *Melittobia audouinii*. *Gardeners Chronicle* (19):295.
- Notes: Comments on *Melittobia audouinii* (= *M. acasta*).
- Westwood, J. O. 1849b. Memoirs, Exhibitions, & c. *Proceedings of the Entomological Society of London* (1849):lxv.
- Notes: Characters given to *Anthophorabia retusa* (= *Melittobia acasta*) by Newport were erroneous. This species is the same as *Melittobia audouinii* (= *M. acasta*).
- Westwood, J. O. 1849c. On the *Melittobia audouinii* (*Anthophorabia retusa* Newport). *Proceedings of the Entomological Society of London* 5:lxv.
- Notes: *Anthophorabia retusa* of Newport is *Melittobia audouinii* of Westwood. (Both species are actually synonyms of *Melittobia acasta*).
- Westwood, J. O. 1849d. Description of *Melittobia audouinii*, a bee parasite. *Proceedings of the Linnean Society* (1849):37.
- Notes: *Melittobia audouinii* (= *M. acasta*) is described.
- Westwood, J. O. 1849e. On the identification of a genus of parasitic Hymenoptera. *The Annals and Magazine of Natural History, Second Series* 4(19):34-41.
- Notes: States that previous papers by the same author (Westwood J.O.) demonstrate that the correct genus name is *Melittobia* and not *Anthophorabia* as Newport (1849b) claims.
- Whitfield, J. B., and S. A. Cameron. 1993. Comparative notes on Hymenopteran parasitoids in bumble bee and honey bee colonies (Hymenoptera: Apidae) reared adjacently. *Entomological News* 104(5):240-248.
- Notes: *Melittobia chalybii* (possible erroneous identification) was found parasitizing *Bombus bimaculatus* and *B. impatiens* but was unable to infest honeybee colonies placed beside those of the bumblebees.
- Whiting, P. W. 1947. Some experiments with *Melittobia* and other wasps. *Journal of Heredity* 38:11-20.
- Notes: X-rayed male pupae and adults of four *Melittobia* species produced male skewed sex ratios. After females were paired with males of their own species and those of the other species, there was no significant difference in the number of eggs laid. The foreign sperm were shown to enter the eggs, which then shriveled, with no hybrid offspring resulting. A photograph of a male of *Melittobia* sp. (clearly *M. digitata*) is shown. It is mentioned that in Schmieder's laboratory there were possibly 4 *Melittobia* species, all called *M. chalybii* (see González & Matthews 2002).
- Whiting, P. W., and B. M. Blauch. 1948. The genetic block to free oviposition in the Chalcidoid wasp *Melittobia* sp. *Biological Bulletin* 95:243-244.
- Notes: After seven generations of inbreeding and crossings, highly male skewed cultures of *Melittobia* were obtained.
- Wolff, M., and A. Krausse. 1920. *Melittobia strandi* n.sp. *Archiv für Naturgeschichte* (A) 86:16 - 21.
- Notes: German. Description of *Melittobia strandi* (= *M. acasta*). The new species is

- compared with *M. acasta* Walker and its synonymy (*M. audouini*, *Anthophorabia r-tusa*, *Anthophorabia fasciata*) is mentioned. Drawings of males and females and their various body parts (antennae, legs, heads, wings, and abdomen) are included. Wasps of the newly described species were reared from pupae of *Chrysis cyanea* (Hymenoptera: Chrysididae). *Monodontomerus* (Hymenoptera: Torymidae) and *Leucospis* (Hymenoptera: Leucospidae) are also mentioned as hosts.
- Wolff, M., and A. Krausse. 1922. Nachtrag zu unserem Aufsatz über *Melittobia strandi* n.sp. *Archiv für Naturgeschichte (A)* 86:140-141.
- Notes: German. General comments on the biology and hosts of *Melittobia acasta* from Germany and comparison to *M. strandi* (= *M. acasta*).
- Woodward, D. R. 1994. Predators and parasitoids of *Megachile rotundata* (F.) (Hymenoptera: Megachilidae), in South Australia. *Journal of the Australian Entomological Society* 33:13-15.
- Notes: *Melittobia australica* is mentioned as a parasitoid of introduced leaf-cutting bees [*Megachile rotundata* (Hymenoptera: Megachilidae)]. *M. hawaiiensis* is also mentioned as a parasitoid of such bees; *M. acasta* was found in a shipment of those bees that was imported to New Zealand. Comments on control of *M. australica* are included.
- Yamane, S. 1980. A revision of the Japanese Eumenidae (Hymenoptera, Vespidae). *Insecta Matsumurana, New Series* 43:1-189.
- Notes: *Melittobia* sp. is mentioned as parasitoid of *Allodynerus delphinalis delphinalis* (Hymenoptera: Vespidae). *Melittobia acasta* as parasitoid of *Anterhynchium flavomarginatum micada*, *Discoelius japonicus*, and *Symmorphus apiciornatus* (Hymenoptera: Vespidae).
- Yoshimoto, C. M. 1965. Synopsis of Hawaiian Eulophidae including Aphelininae (Hym.: Chalcidoidea). *Pacific Insects* 7(4):665-699.
- Notes: *Melittobia peles* (= *M. hawaiiensis peles*), *M. hawaiiensis*. The figure of a stylized *M. hawaiiensis* female (mentioned as a male) is shown.
- Zabriskie, J. L. 1894. Notes on some parasitoid sites of *Vespa*. *Journal of the New York Entomological Society* 2:81-86.
- Notes: *Melittobia* sp. is mentioned as a parasitoid of *Vespa germanica* (= *Dolichovespula arenaria*) (Hymenoptera: Vespidae). A female, one female antenna, and the four terminal segments of the female antenna are depicted. According to those figures the species is clearly in the *acasta* group (see Dahms 1984a).
- Zerova, M. D., N. M. Stolbov, and S. M. Palevich. 1986. A dangerous honeybee parasite (*Melittobia acasta*). *Pchelovodstvo* 11:13-14.
- Notes: Russian. General comments on *Melittobia* and *M. chalybii* are given. *M. acasta* is noted as a parasitoid of honeybees (Hymenoptera: Apidae) and two organophosphate pesticides are mentioned as useful for control of this wasp.