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# SPHECOS 23

A FORUM FOR ACULEATE WASP RESEARCHERS

## MINUTIAE FROM THE MUD D'AUB

Apologies to Fernando Fernández of Bogota, Colombia. He was responsible for the "*Pepsis*" cartoon on the last page of **Sphecos** 22, but his name got left off.

We have not been getting much research news lately, and the Forum has languished also. How about some feedback from the more than 600 of you out there that read this rag!

The first issue of the new **Journal of Hymenoptera Research** should be out sometime in August. This journal should be subscribed to by any active hymenopterist – where else will you find so many papers under one cover on your favorite animals? If you have not yet subscribed see pages 21-22 of **Sphecos** 22 for details and application form.

## RESEARCH NEWS

**Michael Archer** (Dept. of Biology, College of Ripon and York St. John, York YO3 7EX, England) has just published two papers on *Vespa* (see Archer 1991 in Recent Literature). His goal is to try and cover all of the species of Vespinae in terms of taxonomy and bionomics. The next paper dealing with *Vespa crabro* and *V. dybowskii* is in press.

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**Ølsteln Berg** (Båstadveien 73, N-1370 Asker, Norway) writes: "Last winter I spent a couple of months in South East Asia, chiefly Malaysia, collecting some 230 aculeates. Most families are represented. If any **Sphecos** readers could help in identifying some of these, I would be grateful. I also have problems identifying Norwegian Chrysididae and *Ancistrocerus*."

**Folke K. Larsson** (Dept. of Zoology, Uppsala University, P.O. Box 561, S-751 22 Uppsala, Sweden) is still working with thermoregulation and mating behaviour in bees and digger wasps. During a trip to the Galapagos Islands, Ecuador, in March 1991 he studied the endemic Galapagos carpenter bee, *Xylocopa darwini*. At his study site at Isla Santa Cruz he observed colonies of a digger wasp that Mr. Colin Vardy at The British Natural History Museum later identified as *Bicyrtes variegata* (Olivier). This species occurs throughout the Neotropical region, but has not previously been reported from the species-poor Galapagos. Dr. Larsson is now most interested in further reports concerning this species at the Galapagos Islands.

**Peter van Ooijen** (Gekko Software, Voorstraat 5b, 3512 AH Utrecht 030 – 340149) reports "I am sending you some research news. To be honest, the lack of news. For some years now I have been running a small software company. After staring at my monitor all day (and night) I don't have the energy to stare through a microscope. So I have made a decision to stop all entomological work. Not all biological work: in a couple of aquaria I keep a collection of (mainly) catfish. Very interesting from a systematical point of view, and very relaxing as company.

"I donated my collection of Pompilidae to the museum of ITZ in Amsterdam. My collection of Sphecidae, including the type of *Tachysphex picnic*, has merged into the collection of Mr. Raimond Hensen.

"My collection of literature remains. Through the years I have collected a complete (for the Palearcitic region) number of reprints and photocopies on pompilids. They would be helpful to anyone interested in these wasps. I am offering them to anybody who is willing to pay for the shipping costs. I guess it is well over 6 kilograms in weight. Anybody interested?

"**Sphecos** has always been (and still is) very nice reading. Thank you very much for the inspiration it gave. I hope it will help my literature find its way to a new home."

**Arnold Menke** is going to have **Sphecid Wasps of the World** scanned into his Macintosh computer. **Terry Nuhn** will be responsible for this job. Once it is in the computer Arnold plans on revising the book with much help from other specialists. Initial plans are to upgrade all of the species checklists and

perhaps produce a separate catalog of Sphecidae.

## HELP NEEDED

### *Polistes* in the Galapagos Islands

I have been contacted recently by an Ecuadorian student, Maria Teresa Iasso, who is working with Dr. Sandra Abedrabbo on the Galapagos Islands. They are studying the introduction and spread of *Polistes versicolor* throughout the Galapagos with the aim of controlling this species before it endangers endemic species. Maria writes:

"The wasp seems to show some aggressiveness against humans and may be difficult to control. This wasp may have a significant impact on the Galapagos ecosystems, including the native and endemic bees and wasps. . . .we are asking for your help. We need more information about this species. . . ."

They need information on life history, possible biological control agents, and effective chemical control (preferably not threatening to endemic species). This problem is beyond my expertise, and I would appreciate any help from hymenopterists with knowledge of this or related species that have created similar problems in the neotropics. Maria speaks and writes English well. If you have any pertinent information (anecdotal or publications), please send it to her. The full address is: Srta. Maria Teresa Iasso, Assistant of Entomology, Area of Invertebrates, Charles Darwin Research Station, Galapagos, Ecuador. I appreciate any and all assistance rendered.

**Dr. Susan J. Weller**
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## PEOPLE IN THE NEWS

**Astrid Løken**, at the age of 80, has moved out of her office at the University of Oslo. Her home address is: 96, N-0768 Oslo, Norway.

**Roy Snelling** (Dept. of Entomology, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007) says: "The malaria is apparently now under control - finally. Had yet another relapse (#3) in August. Pretty unpleasant and discouraging. So, after dithering about saying "It can't be!", the quacks decided on the cure 'im or kill 'im approach and doubled the dosage of primaquin. Survived that. A relapse is now two weeks overdue. So, maybe. . . . We'll see."

## NECROLOGY

**Dr. Friedrich Schremmer** died in December of 1990.

**Dr. Jacobus ("Jack") van der Vecht** (July 5, 1906 – March 15, 1992) passed away after a long debilitating illness. We should have an obituary for him in the next issue.

## NEW ADDRESSES

**John Beardsley**: 1026 Oakdale Lane, Arcadia, California 91006 USA.
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## MISSING PERSONS

**Gary French** of Gainesville, Florida.
**Dr. Jossif A. Khalifmen** of Pushkina, formerly USSR.
**Dr. Nikolaus Mohr** of Berglsch Gladbach, Germany.
**Dr. Katherine M. Noonan** of Albany, California.
**Megan Pallett** of Mississauga, Ontario.

## SCIENTIFIC NOTES

### New Information about *Dolichovespula* (Vespinae)

by
**Dr. M. E. Archer**
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Recently Dr. Huber (Ottawa Museum, Canada) sent me 600 specimens listed under *Dolichovespula norvegicoides* (Sladen). On examination these specimens could be separated into five species including a queen of *D. pacifica lochenae* Eck from Norway and three queens and a male of *D. adulterina artica* Rohwer. Also included were 29 specimens of *D. norwegica albida* Sladen consisting of 29 queens, one male and two workers with the two workers lacking the orange spots on the second gastral tergum. However the largest error was the misidentification of 187 specimens of *D. alpicola* Eck. Presumably the specimens had been identified before *D. alpicola* had been separated from *D. norvegicoides*. Dr. Menke (National Museum of Natural History, Washington D.C., U.S.A.) also recently sent me a few Asiatic *Dolichovespula* which included what appeared to be two queens of *D. xanthicincta* Archer, the first queens that I have seen of this species. Fortunately these queens key out at the right place in my Key to the World Species of the Vespinae (Hymenoptera) (**Sphecos** 19:17-18). Further specimens included in this loan also extended my understanding of *D. sinensis* Archer and *D. saxonica* (Fabricius).

Examination of such a large number of specimens improved my understanding of the relevant species which will necessitate some changes in my Key to the genus *Dolichovespula* for the following reasons:

1. The shape of the gonostipes of *D. alpicola* is rather more variable so changes to couplet 26 and 28 are required.
2. The presence of tyloids on the male antenna is not so simple as indicated in couplet 26.
3. Two queens with ivory white colouration seemed to be *D. norvegicoides* rather than *D. norwegica albida*. Examination of nest populations is really needed to establish this observation but, if correct, then all keys to North American *Dolichovespula* separating the two species will be incorrect! The oculo-malar

space of *D. norwegica* is also more variable so that the HW/OMS ratio can overlap that of *D. norvegicoides*. These observations now create real difficulties in trying to write keys to separate females of *D. norvegicoides*, *D. alpicola* and *D. norwegica* (Fabricius) in North America. I have made couplet 19 into a rather extended triplet 19 and dropped couplet 20.

4. The variability of the colouration of the gastral terga and gena of *D. sinensis* has to be extended so necessitating changes in couplets 15 and 17.

5. The size of the oculo-malar space of *D. sinensis* is more variable so that the HW/OMS ratio can become less than 6 (couplet 7) so that couplet 13 needs to be modified. In addition specimens of *D. norwegica*, both nominate and subspecies *albida*, can have the HW/OMS ratio less than 6 (couplet 7) so additional notes are needed at couplet 13.

The changes to my key of *Dolichovespula* are as follows:

13. Gena with a continuous yellow band sometimes interrupted by light brown colouration, but not interrupted by black markings. . . . . *sinensis* Archer, 1987

— Gena usually without a continuous anterior yellow or light brown band, gena black with yellow spot(s). . .13A

13A. Black projections more developed and increasing in prominence from the second to the fifth gastral terga, sometimes detached spots present (Fig. 49). North American species. . . . . *norvegicoides* (Sladen, 1918)

— Black projections less and of similar prominence from the second to the fifth gastral terga (Fig. 59). Asian species. . . *xanthicincta* Archer, 1980

[*D. norwegica* (Fabricius, 1781) may key out at 13A. *D. norwegica* can be separated from *D. norvegicoides* by the characters given in triplet 19 and from *D. xanthicincta* which has a longer oculomalar space, HW/OMS: 5.2-5.7 on workers and 4.5-5.0 on queens.]

15. Gena with a continuous yellow band sometimes interrupted by light brown colouration, but not interrupted by black markings. Clypeus yellow or with a small central brown or black spot, sometimes the black spot is elongated but it does not reach both the dorsal and ventral margins of the clypeus. . . . . .16

— Gena usually without a continuous anterior yellow or light brown band, gena black with yellow spot(s). Clypeus yellow with central black stripe often connected to both the dorsal and ventral margins of the clypeus. . . . . .18

17. Centre of clypeus covered with micro-punctures. Apical gastral yellow bands increasing in width from the second to the fifth terga (Fig. 51A,B). Apical yellow bands of the gastral terga covering 50% or more of their surface, sixth tergum almost entirely yellow. . . . . *asiatica* Archer, 1981

— Centre of clypeus not covered with micro-punctures. Apical gastral yellow bands of similar width from the second to the fifth gastral terga (Fig. 51C). Apical yellow bands of the gastral terga covering less than 50% of their surface, sixth tergum at most with lateral yellow spot. Basal lateral yellow spot may be present on the first and second gastral terga and the yellow spot may be connected to the apical yellow band. . . . . *sinensis* Archer, 1987

19. Light colouration of body yellow but sometimes ivory-white. Lower genal light coloured spot usually wider than the upper spot and usually extending for half-way or more across the gena. The light coloured bands of the second to the fifth gastral terga usually of similar width although the width of the light coloured bands varies greatly from specimen to specimen (Fig. 49). No orange marks present on second gastral tergum. Fifth gastral tergum rarely with isolated black spots. HW/OMS ratio (Fig. 46) almost always less than 6.4 on workers (5.0-6.4) and 5.0-6.0 on queens (and thus unlikely to key out here). North American species. . . *norvegicoides* (Sladen, 1918)

— Light colouration of body yellow. Lower genal yellow spot usually narrower than the upper spot, and usually extending for less than half-way across the gena. The yellow bands of the second to fifth gastral terga usually clearly becoming wider (Fig. 53). No orange marks present on second gastral tergum. Fifth gastral tergum often with isolated black spots. HW/OMS ratio (Fig. 46) almost always more than 6.4 on workers (6.4-7.8) and greater than 6.0 on queens (6.1-7.2). North American species. . . . . *alpicola* Eck, 1984

— Light colouration of body ivory-white on North American and yellow on Eurasian specimens although pale yellow to ivory-white on eastern Asian specimens. Lower genal spot either absent or, if present, narrower than the upper spot and usually extending for less than half-way across the gena. The light coloured bands of the second to the fifth gastral terga either similar or increasing in width. Yellow subspecies often with orange marks present on the second gastral tergum on the queen and worker but on the ivory-white subspecies orange mark on the second gastral tergum absent from the queen but usually present on the worker. Fifth gastral tergum often with isolated black spots on the yellow subspecies but usually without isolated black marks on the ivory-white subspecies. HW/OMS ratio (Fig. 46) 5.5-7.8 on workers and 5.8-6.8 on queens (and thus not all workers and queens will key out here). . . . . *norwegica* (Fabricius, 1781)

[In practice these three species can usually be separated readily].

26. Dorsal inner margin of the gonostipes only projecting inwards slightly (Fig. 56A), sometimes more strongly on *D. alpicola*. Sixth and seventh antennal flagellar segments with one tyloid each. . . . . 27

— Dorsal inner margin of the gonostipes strongly projecting inwards (Figs. 56B,C). Sixth and seventh antennal flagellar segments with two tyloids each, although the second tyloid not always clear, except for *D. pacifica* which may have one or two tyloids per segment. . . . . 28

27. Light colouration of body ivory-white on North American and ivory-white or yellow on Eurasian specimens. An orange mark usually present on the second and often the first gastral terga. Clypeal black stripe usually complete being connected to the dorsal and ventral margins (Fig. 60C) although the dorsal part of the stripe can be very thin; apical clypeal margin straight; oculo-malar space longer, HW/OMS (Fig. 46) between 5.3 and 5.9. . . . . *norwegica* (Fabricius, 1781)

— North American species. The light colouration of the body yellow and orange marks not present on the first and second gastral terga. Clypeal black stripe often incomplete being absent dorsally (Fig. 60D); apical cly-

peal margin slightly concave (both species needed for comparison); oculomalar space shorter, HW/OMS between 5.6 and 6.5. . . . . *alpicola* Eck, 1984

28. Add [*D. alpicola* keying here with *D. saxonica* have POL/PBHL greater than unity.]

Some of the species of *Dolichovespula* are known from very few specimens. Thus *D. lama* (du Buysson) is known by six specimens (3 queens, 3 workers), *D. panda* Archer by five specimens (1 queen, 4 workers) and *D. baileyi* Archer by three specimens (3 queens). In addition the males are unknown for the following species: *D. flora* Archer, *D. panda*, *D. lama*, *D. xanthicincta* and *D. baileyi*. The males of *D. panda* and *D. lama* would be particularly interesting to see. If anybody has undetermined Asian *Dolichovespula* I would be very pleased to identify them.

My College has given me the opportunity to publish a second edition of my Key so it will be possible to incorporate the above and other changes in the second edition. Suggestions for further changes and improvements would be welcomed from those who have attempted to use the Key.

## Time-sharing, Drifting, and Pilfering: Inter-nest Activities of *Polybia occidentalis* Foragers

*by*

**Sean O'Donnell**
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Colony integrity involving discrimination of and attacks on conspecifics which infiltrate the nest is a behavioral feature common to many social insects. The biology of nestmate discrimination is therefore of great interest from mechanistic (biochemical, genetic and environmental determination) an evolutionary (relatedness, cost-benefit analysis) perspectives. Over the course of four field seasons of behavioral studies on the swarm-founding wasp *Polybia occidentalis* in Central America I have noted several instances of movement between colonies by individually marked foragers which raise questions about the nature of colony integrity from the invader's, as well as the invadee's, point of view.

1. Time sharing: During my 1989 field season in Guanacaste, Cost Rica I conducted studies on individually marked workers in four colonies. Near the end of these observations a worker recognizable by the distinctive pattern of her paint marks began arriving at a colony 30 m distant from the one in which she was marked. On nearly all arrivals at the 'foreign' nest this forager transferred nectar to workers; she was not attacked or treated differently from other foragers as far as I could tell. She continued to do this for several days, while still arriving at the nest at which she was marked on the same days. Both colonies were well into the brood-rearing phase when we arrived, but it is possible that one of these colonies formed as a reproductive swarm of the other and workers that had swarmed still remembered the location of the older nest. If discrimination cues are at all genetically determined and relatedness is higher within than among colonies (and their offspring swarms) then ease of acceptance of foragers from offspring colonies at parent colonies might be high. Individual revisiting former homes might also retain discrimination cues independently of relatedness.

2. Drifting: The issue of relatedness is further clouded in these observations and those in the following section because they were made on workers reared from combs in the lab and introduced into observation colonies. If introduced workers are less than 24 h old they appear to be accepted by the observation colonies and enter the active worker force with a very high rate of success. In all field seasons (2 in Costa Rica, 1 in Panama) marked workers introduced into one colony switched, apparently permanently, to another observation colony. As a rough estimate this occurs in 1 of every 200 introduced workers. Observation colonies were often close to each other (within 20 m). Though the interpretation of drifting based on relatedness is unclear in this case, the drifting workers probably spent at least several days in the original nest. I conclude this because *P. occidentalis* workers begin foraging at a mean of 19 days of age (though a few forage as early as 4 days of age), and workers rarely fly before the onset of foraging. Therefore it might be expected that introduced workers would adopt the discrimination cues of their home colonies before drifting.

3. Pilfering: In 1991 in Costa Rica a single marked worker introduced into an observation colony appeared to actively steal from a second colony for several days. The colonies were approximately 15 m distant and both were located under *Citrus* sp. trees. The worker in question was distinctively marked. She repeatedly arrived at the 'victim' colony; I could not help but interpret her movements on the victim nest as 'sheepish' but she was never obviously attacked or challenged by the native workers. In all cases she entered the nest then reemerged with a visibly distended gaster in less than 1 min and flew off, often returning within 5 min. I found that she flew directly to her 'home' nest and transferred liquid to nestmates. Surprising to me was the fact that she appeared to be stealing water (based on her posture during liquid transfer). Though water is perhaps not a very difficult material to locate, its collection engages several foragers at high work rates on most days. This type of kleptoparasitism of conspecific colonies could be very costly and may represent a selective force favoring colony integrity and nestmate discrimination ability.

My thanks to Robert Jeanne and Karen London for their thoughtful discussions of the observations addressed above.

## Remarks on Stridulatory Organs in Mutillids

*by*

**Till Osten**
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Since 1974, when Willi Hennig suggested that I study functional morphology and phylogenetics in "Scolioidea", I have always observed both living and preserved material. Knowledge of habits, special morphological structures and their functions in combination seems very valuable to me in searching for phylogenetic relationships.

For many reasons I began my studies of mutillids by going to the sandy, dry dunes of the Camargue in the south of France for several years in a row.

On many occasions, especially in the afternoon, I studied the different habits of mutillids (*Tropidotilla littoralis*, *Smicromyrme viduata*, *Dasylabris maura* and others) in their natural surroundings: searching for their hosts, for food, or for their partners. This was one part

of my program of "morphological structure and function".

I also brought back more then 100 individuals to the institute (at that time the Zoologische Institut, München) to continue my observations on living material.

The results: neither in my field studies nor my observations in the laboratory did I at any time observe "singing" behaviour in mutillids, males or females, unless they were almost in body contact (distance 2 cm or less) or were directly struggling or mating. "Singing" in mutillids can be induced by artificial disturbances, for example by grabbing the wasp with a pair of tweezers. I have never observed a reciprocal action to "singing", that is, an attraction and a kind of response from the partner reported by Spangler and Manley (1978, Annals of Ent. Soc. Am. 71:389-392). Therefore "singing" in mutillids, males or females, is not comparable to the "singing" in grasshoppers or cicadas. It seem to be an expression of more or less aggressive or nervous moods and has nothing to do with attracting the partner or with mating behavior. In mutillids pheromones seem to play the main role in finding a partner.

From my point of view it seems very interesting to ask about the evolution of the stridulatory organs, because there should be a correlation between morphology and function. I think that the idea of the "double function" of organs will help us to understand the function of stridulatory organs in mutillids.

## Off-nest Gastral Rubbing Observed In *Mischocyttarus immarginatus* (Hymenoptera: Vespidae) In Costa Rica

*by*
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The biology of the diverse solitary-founding wasp genus *Mischocyttarus* is poorly known, perhaps in part due to its largely Neotropical distribution (Richards 1978). This genus is of interest to students of the evolution of social behavior and communication in the Polistinae because it is the sister group to a large clade containing all of the swarm-founding wasp genera (Carpenter, pers. comm.).

West-Eberhard (1982) proposed a scenario for the evolution of trail pheromones used in swarming by the Neotropical tribe Epiponini which included marking of nest substrates away from the nest by non-swarming wasps as an intermediate stage. The occurrence of this stage was evinced by Litte's (1981) observations of gastral rubbing (presumably involving chemical marking) near disturbed nests and between old and new sites by queens of *M. labiatus*. Here I report off-nest gastral rubbing in another species, *M. immarginatus*.

*Mischocyttarus immarginatus* is a common nesting associate of the swarm-founding wasp *Polybia occidentalis* in Guanacaste Province, Costa Rica; colonies of *M. immarginatus* are rarely found more than 0.5 m distant from *P. occidentalis* nests (Windsor 1972, Starr 1988). On 30 July 1991 a colony of *M. immarginatus* was initiated by at least two females approximately 10 cm from a *P. occidentalis* observation colony at Hacienda La Pacífica near the town of Cañas, Guanacaste. Both nests were in a *Citrus* sp. tree at a height of 1.3 m from the ground.

At least one of the *M. immarginatus* cofoundresses rubbed her gastral venter on the upper surfaces of leaves in the nest tree on six occasions between 1430 and 1530 on 30 July. The posture and motion employed in rubbing was similar to that described for trail marking workers observed during swarm movements of epiponine wasps (Naumann 1975; Jeanne 1981): the gaster was extended with the distal tip slightly elevated and the sternites pressed against the leaf, and the wasp walked forward wagging the gaster from side to side at a rate of several wags/second. Three different leaves were rubbed, all within 1 m of the nest. All observed rubbing was performed by wasps that flew directly from the nest to the leaf. On five occasions the rubbing wasp flew off after several seconds; on one occasion the rubbing wasp returned directly to the nest. I did not observe wasps investigating rubbed leaves, and could not detect any odor on rubbed leaves. The *M. immarginatus* colony was joined by at least four additional females over the following two day period, though no further rubbing was observed.

If a chemical secretion was applied during leaf rubbing, it is possible that it served either as an attractant, drawing potential cofoundresses to the nest vicinity, or alternatively as a territorial marker, the function of which might be to inhibit additional nest foundations in the area. The attraction/orientation properties of *Mischocyttarus* marking observed by Litte (1981), and the fact that *P. occidentalis* colonies at La Pacífica frequently have more than one associated *M. immarginatus* colony, suggest that the former may be the case.

### References

Jeanne, R.L. 1981. Chemical communication during swarm emigration in the social wasp *Polybia sericea* (Olivier) Anim. Behav. 29: 102-113.

Litte, M. 1981. Social biology of the polistine wasp *Mischocyttarus labiatus*: survival in a Colombian rain forest. Smithsonian Cont. Zool. 327: 27 pp.

Naumann, M.G. 1975. Swarming behavior: evidence for communication in social wasps. Science 189: 642-644.

Richards, O.W. 1978. The social wasps of the Americas. British Museum (Natural History), London. 571 pp.

Starr, C.K. 1988. The nesting association of the social wasps *Mischocyttarus immarginatus* and *Polybia* spp. in Costa Rica. Biotrop. 20: 171-173.

West-Eberhard, M.J. 1982. The nature and evolution of swarming in tropical social wasps (Vespidae, Polistinae, Polybiini). in P. Jaisson (ed) Social insects in the tropics, Vol. 2. University of Paris-Nord Press, pp. 97-128.

Windsor, D.M. 1972. Nesting association between two Neotropical polybiine wasps (Hymenoptera, Vespidae). Biotrop. 4: 1-3.

## Where have all the *Agelaia* males gone?

*by*
**Justin Schmidt**
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Although colonies of *Agelaia* are enormous with tens of thousands of individuals, and might have the most populous normal nests of social wasps, males are rare in collections. In fact, the males of several species are not even known. Why is this? Where are all the males? Two answers come to mind: 1) males are rare because very few are produced by a colony; and 2) males are produced, but then leave the colony and disappear, that is, have habits that do not lend themselves to casual collecting. I have

a few clues that reason (2) might be more likely. First, it seems improbable that a species with as large a worker population as *Agelaia* would not have the necessary latitude in resources to produce numerous males, or that the forces of sexual selection would not favor "cheater colonies" that produced more males. Rather, it seems that the mating system of species in the genus likely drives the system. Either there is little outbreeding, and the few required males are produced just before reproductive swarming (and then discarded), or there is outbreeding, but that males leave the colony, not to return. The latter scenario might occur if the species breed by a lek mechanism, much like many *Philanthus*, *Xylocopa*, etc., and that males permanently leave the colony for a lek area. In support of this possibility was an observation I made in Lomas Barbudal, Costa Rica in March 1991. We were studying a colony of *Agelaia myrmecophila* and noted an odd individual quietly resting and peering at us from the underside of a leaf of a tree about 100 m from the colony. At this time, the middle of the dry season, most of the trees were leafless. Upon capture, this odd individual was discovered to be a male. This male's behavior certainly suggested lekking behavior. Shortly after this observation, and before I could make more observations, the colony was destroyed by a large predator (presumably a tamandua) that had strewn the combs all over the ground. Could it be that males leave the colony soon after their emergence and spend the rest of their lives near a lek where they are not likely to be captured by net-swinging or malaise-trapping hymenopterists? Possibly others such as *Parachartergus* for which male records also are scarce have a similar behavior. Anybody have evidence to support or refute this idea?

**Chinese Wasp Venoms**

*by*

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Chinese people are much more interested in and aware of the potential uses of bee and wasp venoms than are North Americans. Consequently we have been investigating the venoms of *Polistes rothneyi* and *P. olivaceus*. Although our ultimate goal is to develop these and other wasp venoms into products of use for society, our immediate goals have been to develop collecting techniques for obtaining the venom and to discover fundamental information about the biochemistry and activities of these venoms.

Unlike snakes, which are large, easy to milk, and yield large quantities of venom, or honey bees, whose venom can be easily collected via electrical grids over plastic sheets thought which the bees sting, venoms of *Polistes* have eluded simple collection. Over the years there were various reports of electrical systems that were used for collecting vespid venoms (including *Polistes*); but none of these were really practical. Simple evidence of this can be observed by noting that Vespa Laboratories in Spring Mills, PA, the main world-wide supplier of social vespid venoms, still collects venom by homogenizing sacs of individually dissected wasps. Our first goal was to design an apparatus that can collect venom of *Polistes* en masse. The first author succeeded in constructing such a device (Figure 1), thereby making reasonable quantities of venom available for investigation, collaboration, and potential sale. Details of the collection system were described in Chinese Patent No. 88209335.5.

Stings of most *Polistes* are painful. This, however, does not necessarily mean that the venoms have interesting biochemical or pharmacological activities. For example, the second writer investigated the venom of the spectacularly impressive pompilid *Pepsis formosa*, whose enormous size and warning coloration should be enough to deter even the most determined predator. Backing that up is a sting that causes more intense immediate pain than any other insect known to the authors. Despite this, in pharmacological terms it turns out that *Pepsis* venom is essentially inactive in mammals. The LD50 is 65 mg/kg, or about 20 times less active than the ordinary honey bee venom. We tested the *Polistes* venoms for activity in mice after filtering the venom through .45 μ membranes to remove any sediment and potential bacteria. The lethalities were 14 and 11 mg/kg for *P. rothneyi* and *P. olivaceus* respectively, values similar to those for some North American *Polistes* (Schmidt, J. O. 1990. p 387-419 *in*: Insect Defenses (D. L. Evans & J. O. Schmidt, eds.) SUNY Press: Albany, NY., and unpublished). These results indicate that the electrically-collected venom is active and suitable for continued investigation.

Social vespid venoms are often highly hemolytic, that is, they cause the destruction of red blood cells. This is the main reason that people stung by large numbers of *Vespa* or *Vespula* often have bloody urine or kidney failure. *P. olivaceus* appear to be unusual among vespids in that their venoms contain very little hemolytic activity. Its activity is only about 3% that of honey bee venom and about 2% that of *Polistes annularis*.

Phospholipase A is the most toxic enzyme in insect venoms. It is widely distributed in venoms of vespids, apids, and ants, with the highest levels in ves-

Figure 1. *Polistes* on venom collecting apparatus

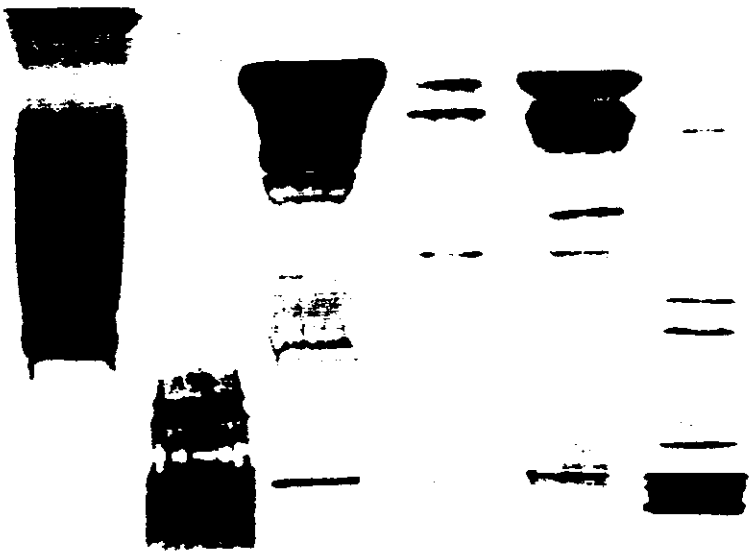

Figure 2. Isoelectric focusing pherogram (pH 3-10) of venoms. From left to right: purchased crude Chinese honey bee venom (very low purity); *Pogonomyrmex* harvester ant venom; *Polistes major castaneicolor* venom; *Polistes olivaceus* venom; *Polistes rothneyi* venom; standards. Basic proteins migrate toward the top and acidic proteins toward the bottom.

pids. The level of phospholipase in *P. olivaceus* is low, being about 15-20% that of *P. annularis*.

Venoms of stinging insects contain a host of proteins whose functions are not known. Since they have no known activities, there are no simple quantitative ways to compare these proteins among species. However, one way to obtain a qualitative indication of similarity of venoms is by electrophoresis or electrofocusing. It is well known in venoms that many active components are small peptides that are extremely difficult to study by electrophoresis. For this reason, we chose isoelectric focusing, a method that separates proteins by their relative acidity or basicity, rather than by size, for our comparison. In Figure 2 is shown the pherogram of the venoms of honey bees, *Pogonomyrmex rugosus* (harvester ants), *Polistes major castaneicolor*, *P. olivaceus*, and *P. rothneyi*. Several noticeable features are evident in the pherogram. First, the venoms of *P. rothneyi* and *P. major* are the most similar. *P. olivaceus* is probably similar to the other two *Polistes*, but the much lower venom loading produced a weaker banding pattern. All of the *Polistes* venoms have rather different patterns from those of the ant and honey bee venoms. Harvester ant and honey bee venoms are also dramatically different in appearance, with the ant venom containing mostly neutral or acidic proteins and the bee venom mostly basic to very basic proteins. These results indicate that *Polistes* from different species groups and different continents exhibit similarities and gross differ-ences from harvester ant or honey bee venoms.

At this early stage in our wasp venom research we do not really know the true value of *Polistes* venoms for research or medical or commercial use. We do know that *Polistes* venoms can now be collected and that at least the two Chinese venoms we have studied are not highly toxic and might well be good candidates for investigating via animal models potential benefits in treating various ailments including arthritis or other inflammatory diseases. Perhaps an even greater potential use for venoms is the generation of additional characters that can be used for taxonomic studies and genetics.

## Protection While Collecting Nests of Pugnacious Social Wasps

*by*

**Justin Schmidt**
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Several of us who enjoy reading **Sphecos** also have a predilection for collecting live colonies of stinging wasps (are the two characteristics related?). I remember once being warned by John Wenzel to be wary of (ie. avoid) colonies, especially large colonies, of *Agelaia* and not to try to collect them. He suggested that they literally "might kill you". Well, I tucked that advice away in my cranium somewhere and continued my usual marauding activities toward polybiine wasps. From a recent trip to Costa Rica and several previous trips, I have come up with what I think is a mostly "fool proof" protection for collecting stinging wasps and living through the ordeal. I say "mostly" because as scientists, we all know that there are almost no absolutes. I will give two examples of different problems and how I solve them.

The first problem concerns wasps that are just plain nasty. We all have our favorites. My current one is *Polybia simillima*, a large black *Polybia* that builds rather large nests. My first reaction to such a creature was awe. In my experience *Polybias* are not black; so a big and black-black *Polybia* should set off some warning alarms. The alarms are real!

Anyway, the first item of necessity for an encounter with any serious colony of wasps is a good bee suit. Don't say honey bees (commonly called "pollen pigs") and beekeepers have never done anything for vespologists – remember beekeepers invented and have refined the bee suit to its present state (more on that later). I prefer the fully zippered variety that have velcro fasteners on cuffs, around the zipper gap at neck, etc. They cost about $50-60, which is high, but worth it at times. Next you need some form of gloves and footwear and duct tape. For gloves you can use standard leather bee gloves or your own invention. One of my favorites is two or three (depending upon the size of the critter to be captured) layers of latex surgical gloves. These have the advantage that they allow dexterity of work, without allowing too many stings. They get sweaty inside, which is a minor drawback, and once in a while a sting will get through (I intentionally pissed off a variety of large colonies of Africanized pollen pigs to see if the gloves would hold – they did: I only got one sting through all three layers and over five hundred were in a colleagues shoes). The duct tape is for taping all gaps around gloves, boots, and anywhere. But this is not always enough.

Let's return to my example species: *Polybia simillima*. I was collecting in Bijaga, Guanacaste (see Menke's description, **Sphecos** 22:10-12) in one of Frank Parker's favorite screw worm collecting sites and Frank pointed out a colony of *P. simillima* that had chased him off. (Mention should be made of Nomie Bidias [a wonderful name to match her character], originally from Frisco [San Francisco for those purists] who has been in Costa Rica for about 18 years, runs a small pulperia, and whose husband owns the land and generously allows entomologists to collect there). I donned my outfit and went at it. I soon retreated with a variety of wasps inside my veil and Frank looking rather amused. Seems that this species, like so many Neotropical wasps, lands on you and wiggles through any small hole to get you. In my case it was the mesh of the veil. One must remember that although many wasps look big, they are often thin relative to the fatter pollen pigs for which the veils were designed. Attempt 2: put on an army type mosquito veil with much smaller mesh. Repeat of 1, with Frank further amused, but a little apprehensive as I was bringing wasps back to his shade canopy. The problem this time was that the wasps crawled under the elastic of the mosquito veil at places where the underlying suit had folds. Attempt 3: duct tape the base of the veil where the wasps were undercrawling. Same result, except Frank was no longer amused – he got stung by one of my "guests". Wasps were still getting under and through the poor tape job. Attempt 4: better job of duct tape, plus add the bee veil on top of the mosquito veil. Sweet success!

Based on the above you would think that all that is needed is a good, well fitting, finely meshed veil or double veil (to prevent accidental contact of the mesh with your skin, thereby allowing stings) and a good taping job to seal all gaps. Wrong! You need to know (or discover the hard way) some biology of your prospective species.

My second example is *Parachartergus fraternus*, another black wasp (does this say anything about black? remember black and/or red are the classic warning colors). This species not only has an effective sting, but it flies in front of your face and sprays venom into your eyes. I remember several times after bagging a nest, I had to crawl down a tree blindly because of my closed and painful eyes. The solution to this problem is easier: wear goggles (old freshman chem lab cast offs will do fine) or large framed glasses (I had neither available when I did my collecting). If it is a particularly nasty job, you might want to consider a dust mask or holding your breath (as I do) to keep the venom aerosol out of your nose and mouth.

In conclusion, if you are not too lazy like many of us tend to be, you can effectively and safely collect colonies of rather pugnacious wasps. One last appeal – I wish the Japanese (since they seem to be so good at creative innovations in consumer products), or somebody else, would invent a (bee) veil made of strong, flexible plastic that holds its shape and that does not get holes in it when crumpled in collecting bags, as do the present steel mesh veils.

## *Pison* in Costa Rica (Sphecidae)

*by*

**Arnold S. Menke**

Forty two species of *Pison* are known in the Neotropical Region (Menke, 1988, 1989, 1990a, b), and of these, 13 occur in Costa Rica. Two of the 13 are recorded from Costa Rica for the first time in this paper.

The following new records are based on material from the insect collection at the Universidad de Costa Rica (UCR), Utah State University (USU), University of California at Los Angeles, Henry Hespenheide (UCLA), and the National Museum of Natural History (USNM). The UCR material is from Malaise traps run at many different habitats by Paul Hanson, Director of the Insect Museum. The USU material is from Malaise traps run by Frank Parker at various Costa Rican locations, as well as wasps net-collected by him. The only Costa Rican species not listed below is *chrysops* Menke. For Costa Rican records of it see Menke (1988, 1990a).

### ***Pison abathes*** Menke

COSTA RICA, Alajuela Prov.: San Pedro de la Tigra, Cacao, March/April 1990, one female (UCR). Puntarenas Prov.: 3 km SW Rincon (Osa Peninsula), Feb./Nov. 1989, 33 females (UCR); 23 km N Puerto Jimenez (Osa Peninsula), Jan./April 1991, one female (UCR); Reserva Biologica Carara, Estacion Quebrada Bonita, Aug./Nov. 1989, one female (UCR); Parque Nacional Corcovado, Estacion Sirena, April/Aug. 1989, one female (UCR).

These are the first records of *abathes* from Central America. The species was described from Ecuador, Bolivia and Guyana. In spite of the large number of specimens in this sample, no males are present, so this sex remains unknown.

### ***Pison arachniraptor*** Menke

COSTA RICA, Alajuela Prov.: Bijagua (20 km S Upala), Jan./Feb. 1991, one female (USU). Puntarenas Prov.: 24 km W. Piedras Blancas, 200 m, Dec. 1990, one female (UCR).

These are the first Costa Rican records for *arachniraptor*, a widespread species in South America, and previously known as far north as Panama.

### ***Pison cameronii*** Kohl

COSTA RICA, Alajuela Prov.: Bijagua (20 km S Upala), Sept./Oct. 1990, one female (USU). Limon Prov.: Parque Nacional Tortuguero, Estacion Cuatro Esquinas, 0 m, April/Aug., 1989, 5 females (UCR). Puntarenas Prov.: 23 km N Puerto Jimenez, 10 m, Jan./April, 1991, one female (UCR); 3 km SW Rincon (Osa Peninsula), 10 m, June/Nov., 1990, two females (UCR); 10 km W Piedras Blancas, 100 m, March/Aug. 1989-1991, three females (UCR). San José Prov.: Ciudad Colon, 800 m, Jan./May, 1990, 4 females (UCR).

A common, widespread species in the Neotropical Region.

### ***Pison conforme*** Smith

COSTA RICA, Alajuela Prov.: Bijagua (20 km S Upala), Jan./Feb. 1991, one female (USU). Guanacaste Prov.: Estacion Maritza, W of Volcan Orosi, 600 m, 1988-89, 2 females (UCR). San José Prov.: Zurqui de Moravia, 1600 m, Feb. 1989, one female; San Antonio de Escazu, 1300 m, no date, one female (UCR).

A common species in Central America.

***Pison cooperi*** Menke

COSTA RICA, Heredia Prov.: La Selva Biological Station, 3 km S Puerto Viejo, April 1990, one female (UCLA). Limon Prov.: 16 km W Guapiles, 400 m, April/May, 1989, one female (UCR). Puntarenas Prov.: 3 km SW Rincon (Osa Peninsula), 10 m, one female (UCR).

Costa Rica is the known northern limit of the range of this common Neotropical species.

***Pison cressoni*** Rohwer

COSTA RICA, Alajuela Prov.: Finca Los Lagos, 7 km N Fortuna, Aug. 10, 1989 (USU). Guancaste Prov.: Estacion Maritza, W of Volcan Orosi, 600 m, 1988/89, 3 females (UCR). Heredia Prov.: La Selva Biological Station (3 km S Puerto Viejo), April 1990, one male (UCLA).

A common Neotropical species. The gaster is entirely black in these specimens – none of the terga have cream or yellow marginal bands.

***Pison eu*** Menke

COSTA RICA, Guanacaste Prov.: Cerro el Hacha, NW of Volcan Orosi, 300 m, 1988, one female (UCR); Estacion Maritza, W. of Volcan Orosi, 600 m, 1988/89, two females (UCR); Estacion Experimental Enrique Jimenez Nuñez (14 km SW Cañas), Feb./April 1990, 3 females, one male (USU).

This species is recorded from Mexico to Panama in Central America, and it is known from isolated records in northern South America. The upper interocular distance in these female specimens ranges from .79-.82X the lower interocular distance. The lower lip of the female clypeal lobe is not indented in one of the Estacion Exp. E. Jimenez Nuñez specimens.

***Pison gnythos*** Menke

COSTA RICA, Alajuela Prov.: Bijagua (20 km S Upala), Feb./March 1991, two females (USU). Puntarenas Prov.: 10 & 24 km W Piedras Blancas, 100 m, March/Oct. 1989/90, 5 females (UCR).

This species was described from northern South America (Menke, 1988), and was subsequently recorded by me from Costa Rica (Menke, 1990a). The hindmargin of tergum I is narrowly downturned in the five specimens from Piedras Blancas, but it lacks a raised, bead-like rim typical of material from South America. The two females from Bijagua have this bead-like rim. The propodeal side is delimited dorsally by a definite crenulate ridge in all of the Costa Rican material listed here. In South American specimens, there is only a row of shallow foveae. Unfortunately, no Costa Rican males have been taken so it is not possible to see if the genitalia are typical for *gnythos*.

***Pison krombeini*** Menke

COSTA RICA, Guanacaste Prov.: Estacion Experimental Enrique Jimenez Nuñez (14 km SW Cañas), Feb./March, 1990, April/May, 1991, 5 males, 4 females (USU). Puntarenas Prov.: 3 km SW Rincon (Osa Peninsula), 10 m, March/Nov. 1989/90, 7 males, 11 females (UCR); Parque Nacional Corcovado, Estacion Sirena, 50 m, April/Aug. 1989, two females (UCR).

A common species in Costa Rica. Known from Mexico to Colombia.

***Pison longicorne*** Menke

COSTA RICA, Guanacaste Prov.: Estacion Experimental Enrique Jimenez Nuñez (14 km SW Cañas), Aug. 1-12, 1990, one female (USU). Heredia Prov.: La Selva Biological Station, 3 km S Puerto Viejo, April/May, 1990, 3 females, one male (UCLA).

A commonly collected Neotropical species known from Mexico to Argentina.

***Pison maculipenne*** Smith

COSTA RICA, Heredia Prov.: La Selva Biological Station, 3 km S Puerto Viejo, April 2, 1988, one female (USNM), April/May 1990, 2 females (UCLA). Limon Prov.: 7 km SW Bribri, 50 m, Oct. 1989, one female (UCR).

Costa Rica is the northernmost outpost of this species whose range includes much of northern South America. The infuscation of the forewing in these specimens is blackish, and the body is black except for red on laterotergite I and sternum I of two of the three La Selva wasps.

In my revision (Menke, 1988) I discussed three different male species, anyone of which might be the male of *maculipenne*. I ended up recognizing the male with simple antennae (represented by two specimens, one from Panama, one from Venezuela) as *maculipenne* (see discussion on page 60-61). The ventral surface of the flagellum in the other two male species either had raised linear tyli on flagellomeres II-VI or welt-like tyli on flagellomeres III through VII. In the species with welt-like tyli, flagellomeres IV-VII were rounded out beneath making the articles asymmetrical. The genitalia of the male of *maculipenne* and the male with welt-like tyli and rounded out flagellomeres appear identical, and I am left wondering if the male antenna is simply variable in *maculipenne*. Perhaps the presence or absence of tyli varies with the species. However antennal features like these are usually indicative of different species, and that is the way I left things in my revision.

I have examined one male from Bijagua, Alajuela Prov., Costa Rica (USU) that has welt-like tyli and flagellomeres IV-VII are swollen ventrally. Its genitalia and sternum VIII agree with figures 172-176 (*maculipenne*) in my revision. This male is entirely black except that sternum I and the sides of tergum I are reddish brown, and the basitarsus on the mid and hindlegs is weakly suffused with yellowish white. The UID is 0.66X the LID, and the OOD is 0.76X the HOD. These values are outside those for the two male specimens of *maculipenne* reported in my 1988 revision, but certainly not outside the expected range of variation if more *maculipenne* were available for study.

Since my revision was published, an additional male of the Bijagua type has become available. It was collected in Venezuela, 40 km S of Puerto Ayacucho (USNM). Its antennae and genitalia agree with the Bijagua specimen. Of particular interest is the fact that the abdomen is reddish brown except for an infusion of black on terga III-VI. The hind margin of terga I-III has a cream colored band. The mid and hindtibiae are yellow brown above, and tarsomeres I-II on these legs are pale. The wing membrane has a yellow tint and the marginal infuscation is brownish. All of these

color traits resemble the female holotype of *maculipenne* (see my revision, p. 59-60), and suggest that perhaps the true male of this species is the one with welt-like tyli with rounded out flagellomeres. Resolution of this problem will probably require rearing of nest material to see which type of male is true *maculipenne*. The UID in the Ayacucho male is 0.68X the LID, and the OOD is 0.76X the HOD. The first value is essentially the same as what I gave for *maculipenne* (Menke, 1988, p. 60), but the OOD:HOD value is high, although not unreasonably so. The clypeus of the Bijagua and Ayacucho males is identical to that of *maculipenne* (see figs. 170-171 in my revision). This plus the fact that the genitalia are similar in all of these specimens, makes me wonder how constant male antennal features are in this complex.

***Pison pilosum*** Smith

COSTA RICA, Guanacaste Prov.: Estacion Experimental Enrique Jimenez Nuñez (14 km SW Cañas), Jan./May, Sept., Nov. 1990-91, 34 females, 6 males (USU).

A commonly collected species in Central America and northern South America.

Literature Cited

Menke, A. S., 1988. *Pison* in the New World: a revision. Contrib. Amer. Ent. Inst. 24(3):1-171.

Menke, A. S., 1989. New distribution records for *Pison*. Sphecos (18):12-13.

Menke, A. S., 1990a. Additional records of New World *Pison*. Sphecos (19):26.

Menke, A. S., 1990b. The status of *Pison doggonum*. Ent. News 101:154.

## Further Records of Neotropical *Pison*

*by*
**A. S. Menke**

I have recently examined material sent to me by Manfredo Fritz of Salta, Argentina (FRITZ), Martin Cooper of Lyme Regis, England (COOPER), Lynn Kimsey, University of California, Davis (UCD), Fernando Fernández, Bogota, Colombia (FF), and Marcio L. de Oliveira, Instituto Nacional de Pesquisas da Amazônia, Manaus, Brasil (INPA).

***Pison arachniraptor*** Menke

COLOMBIA, Amazonas: Mata Mata, February, 1989, one female (FF).

***Pison aranevorax*** Menke

BRASIL, Amazonas: Manaus, Aug. 21, 1989, one female (INPA), Nov. 12, 1989, one female (USNM).

***Pison cameronii*** Kohl

ARGENTINA, Tucuman: Trancas, Jan. 1987, one female (FRITZ). COLOMBIA, Amazonas, Mata Mata, February, 1989, one female (FF).

***Pison cooperi*** Menke

VENEZUELA, Zulia: El Tucuco, July 24, 1979, one female (UCD).

This is the first Venezuelan record for *cooperi*.

***Pison cressoni*** Rohwer

BRASIL, Amazonas: Manaus, May 23, 1989, one female (INPA).

***Pison eyvae*** Menke

COLOMBIA, Valle: Largo, July 25, 1975, one female (UCD).

***Pison gnythos*** Menke

BRASIL, Amazonas, Manaus, March 23, 1990, one female (INPA).

This is the first record for Brasil.

***Pison longicorne*** Menke

GUATEMALA, Peten: Ruinas Tikal, July 7-10, 1977, one female (UCD).

This is the first record of *longicorne* from Guatemala.

***Pison maculipenne*** Smith

PANAMA, Canal Zone: Barro Colorado I., July 7-8, 1978, two females (UCD).

These specimens are the yellow winged form.

***Pison stangei*** Menke

ARGENTINA, Salta: Rosario de Lerma, Jan.-April, Oct., Dec. various years, 38 males, 5 females (FRITZ); El Alisal, Jan.-Feb., 1989-90, 4 females (FRITZ); Cabra Corral, Feb. 1983, one female (FRITZ). Catamarca: Andalgala, Nov. 4, 1972, one female (UCD). PARAGUAY: Amambay, Cerro Corá, 350 m, Feb. 3-10, 1990, one male (COOPER).

Propodeal dorsum sculpture varies in these specimens from simply punctate to variably microridged (as indicated for the species in my revision, Menke, 1988: 42), but all have some fine longitudinal microridging on the upper part of the propodeal side. The Paraguay record is the first for that country.

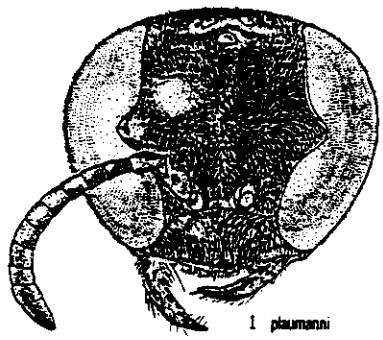
***Pison wasbaueri*** Menke

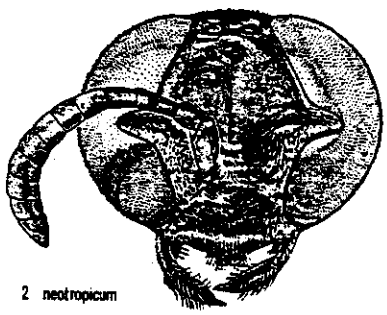
ARGENTINA, Salta: Rosario de Lerma, two males, Nov. 1986, one female Dec. 1986 (FRITZ).

The female is the second known specimen of that sex, and its mesopleural punctation is uniformly dense up to the mesopleural suture, a distinctive feature of female *wasbaueri*.

Literature

Menke, A. S. 1988. *Pison* in the New World: a revision. Contrib. Amer. Ent. Inst. 24(3):1-171.




Facial portraits of female *Pson*

# TECHNIQUES

## A Simple and Inexpensive Method for Anesthetizing Insects and Small Arthropods

*by*

**Stefano Turillazzi**
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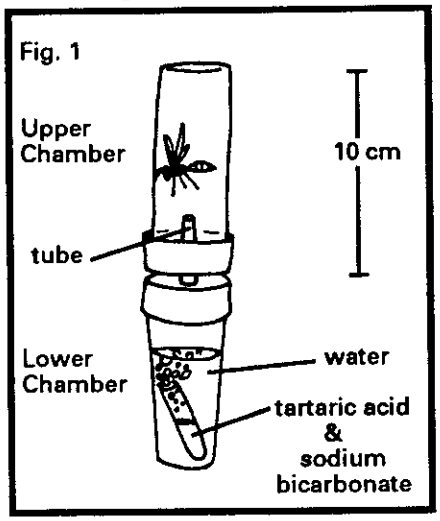
Carbon dioxide is widely used to anesthetize insects. This gas is contained in cylinders which are usually too big to carry in the field, must be refilled by specialized operators, and are expensive. Faced with these problems while studying social wasps (which are not easily handled subjects) I came up with a simpler way to obtain carbon dioxide.

My very first attempt, though, was to connect a small vial (with wasps inside) to the cap of a bottle Nocera Umbra® carbonated mineral water with a rubber tube. Shaking the bottle produced $CO_2$ and the wasps fell asleep in a few seconds. They recovered half a minute later. As one might suspect, the mineral water blend proved to be little different in its action from other carbonated beverages. In "controlled experiments," wasps fell asleep using even Coca Cola®, Pepsi Cola®, Dom Perignon®, etc. The different collateral effects due to the quality, nationality, popularity or exclusiveness of the beverages remain to be studied in depth.

Producing carbon dioxide is quite simple (as any chemistry student knows) and it's not necessary to carry boxes of soft drinks or to fill the laboratory with cases of champagne. A simple device that I experimented with is illustrated in fig. 1. It consists of two plastic vials with screw caps. The caps are joined by a short rigid plastic tube. The lower vial is 3/4 full of water. The insect(s) to be anesthetized is placed in the upper vial. A small glass vial containing a mixture of tartaric acid and sodium bicarbonate is put in the water and the device is quickly assembled. This method works quite well and the length of time that the insects remain anesthetized depends on the kind and size of the insects and on the time they are kept in the upper chamber. Small wasps (Stenogastrinae) submitted to the treatment were still alive and active after four months and none died while they were anesthetized.

No doubt the method can be greatly improved upon, and it may have already been developed and used by previous amateur and professional entomologists: to these persons I offer my excuses and acknowledgements.




## Computer Generated Labels — An Update

*by*

**Linda L. Sims** and **George L. Venable**
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Recently, it has become apparent there exists a need for quick, yet archival quality computer generated labels. Prior investigations by the primary author (**Insect Collection News** – 2, (2): 26; **Curation Newsletter**, 10:2-3) suggested that treated laser printer generated labels seemed "adequate as long as there is no abrasion, i.e. contact between the specimens and the label. . .". However, a recent experience by Dr. Terry Erwin (NMNH) exposed a flaw in this technique. While field pinning specimens, ethyl acetate came in contact with the label. This exposure caused the toner on the label (and hence the information on said label) to dissolve instantly. Further experiments in the laboratory shows this to be a common problem to all labels tested by the Smithsonian's Conservation Analytical Laboratory. Since ethyl acetate is commonly used before and after an entomological specimen is prepared, the risk of losing label information is of great concern. Therefore, laser printer generated labels can no longer be recommended.

Preliminary tests show that the H-P ink jet printer with their new indelible black ink cartridges may not suffer this problem. Anyone with experience in the use of this printer is invited to send their comments to the authors.

## Sex Determination in Early Instar Wasp and Bee Larvae

**Bryan Danforth** (Department of Entomology, NMNH, Smithsonian Institution, Washington, DC 20560) wishes to bring to the attention of **Sphecos** readers a recent paper describing very simple staining methods for determining the sex of wasp and bee larvae at any stage of development, from first instar to prepupa. M. J. Duchatear and P. van Leeuwen (1990, **Insects Sociaux**, 37:232-235) describe their use of the method to determine the sex of bumble bee larvae but speculate the method may work on other bees (and presumably wasps) as well.

The method relies on first fixing the larvae in Carnoy's fixative and then using Congo Red to stain the imaginal disks of the genitalia, which differ strikingly in morphology between males and females. The method works very well with *Perdita* last instar larvae, even when the staining step is eliminated. Bryan thanks Hayo H. W. Velthuis and George Eickwort for pointing this article out to him.

# COLLECTING REPORTS

## Galapagos and the *Polistes* Menace

*by*

**John Heraty**
(Dept. of Biology, Carleton University, Ottawa, Ontario, Canada, K1S 5B6)
and
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In the summer of 1991, Heraty had the opportunity to spend three months on the Galapagos Islands, Ecuador, as part of Stewart Peck's general survey of its insects. His focus was on the Hymenoptera, in particular, the smaller parasitic groups. Generally, the Aculeates fair rather poorly, and, excluding the 29 species of ants, account for only 12.3% (30 of 243 species) of all Hymenoptera that Heraty has been able to identify (Table). He has processed about 60% of the material, and no doubt the pro-

Aculeate Hymenoptera of the Galapagos Islands

| | Genera | Species | Endemics | Tramps |
|---|---|---|---|---|
| Formicidae | 16 | 29 | 4 | 16 |
| Bethylidae | 3 | 5 | 1 | ? |
| Dryinidae | 7 | 10 | 6 | ? |
| Sphecidae | 8 | 9 | 2 | ? |
| Vespidae | 2 | 2 | 0 | 2? |
| Pompilidae | 1 | 1 | 1 | ? |
| Mutillidae | 1 | 1 | 1 | ? |
| Tiphiidae | 1 | 1 | | ? |
| Apidae | 1 | 1 | 1 | |
| Total Hymenoptera | 155 | 244 | ? | ? |

portion of Aculeates may still drop slightly. Chalcidoidea presently account for 44.4%.

Bees are represented only by *Xylocopa darwinii*, and the sphecids by a mere 9 species that include *Oxybelus, Bicyrtes, Ectemnius, Pison, Tachysphex, Liris, Solierella,* and *Nitela*. Chrysidoids include three genera of bethylids (*Goniozus, Rhaphiditelus,* and *Sclerodermus*), and a number of dryinids, which include three species of aphelopines (*Anteon* and *Deinodryinus*). Pompilids have only one known species, *Aporinella galapagoensis.*

Until recently, vespids have made only a poor showing on the islands. Only one endemic species of *Pachodynerus* is known, and this species is about to be synonymized with a continental species. The only other mention of a vespid is a record of *Polistes jadwigae* collected on a boat about 200 km from the Galapagos Islands.

In 1986, the first record of *Polistes versicolor versicolor* was made on the island of Floreana. Over a five-year period, these wasps have spread to almost every island in the archipelago, except for a few of the more isolated northern islands. In part, the rapid spread has been due to an explosive growth in the populations of *Polistes.* We first encountered a few nests in the arid lowland scrub on Fernandina – nothing special – typical non-aggressive *Polistes.* Then we arrived at Caleta Iguana on the southwest corner of Isabela. We don't think anyone in our expedition will forget getting off the boat to be greeted by several thousand *Polistes* – all eager to drink our sweat and search us for caterpillars (they particularly liked Heraty's yellow backpack). A rough estimate would put 10 to 20 nests in every tree in the area. Stewart Peck's yellow trough traps collected over a gallon of wasps (nearly saturation) in four days. Adults were collected at all elevations up to about 1500 m, but numbers decreased proportionally with the height of the vegetation (here the pampa began at 400m).

What effect is *Polistes* going to have on the islands? We noted that there were almost no birds in the area of highest infestation (birds are extremely abundant almost everywhere else in the Galapagos). The famous Darwin finches rely on the insects as food and increased insect abundance accompanying rainfall and can let the finches have several broods in a single season. If wasps remove the caterpillars during lush periods, the finches (a precious aspect of the Galapagos) may soon be lost through competition for a limited resource. On top of the ecological effects, tourism also may be severely affected because of the absence of bird life and high incidence of stings.

One additional note for behaviorists. While on the rim of Volcan Alcedo (about 20 meters across, 1100m elevation) on the island of Isabela, Heraty observed what appeared to be a migration of *Polistes* moving along the rim in a south to north direction from Volcan Sierra Negra, an area of extremely high populations of wasps. Roughly, he counted over 300 wasps during a five-minute period, and this lasted for over two hours from when they were first noticed. It is easy to see why they have spread so rapidly. Oddly, about 1 in every 20 to 40 wasps was a yponomeutid moth!

For once, *Polistes* cannot be considered to be a beneficial insect that people should cultivate for control of pest insects. On top of fire ants, goats, pigs, cattle, dogs, cats, rats, and humans, this newest invasion may again bring the Galapagos Islands onto or over the brink of an ecological disaster. We would like to hear from anyone who has observed any similar population explosions of *Polistes*, especially where they have become a problem. If you need more information on the situation in the Galapagos, please contact one of the authors.

**Guana and Mona Islands**

*by*

**Roy Snelling**
(Dept. of Entomology, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007)

October 1991 was spent in the British Virgin Islands on a speck of real estate just north of Tortola called Guana Island (smile when you say that and pronounce it carefully!) courtesy of The Conservation Agency, "Skip" Lazell, and the owner of Guana Island, Dr. Henry Jarecki. Nothin' to do 'cept go out collecting, enjoying the warm sun, plenty of good food, and pleasant folks, mostly biologists. A list of Aculeata is included below. Worked out a neat way to find nests of *Polistes* and *Mischocyttarus*; when I find a likely looking shrub, investigate it elbow first. Very effective.

I'm also including a map of the island, with my collecting sites marked for posterity. It's a small island, only about 340 hectares (850 acres) and its greatest elevation only 246 meters (806 feet). There is a hotel and accommodations for staff on the hogback between White Bay and Muskmelon Bay ("hotel area" on the map), but the island is otherwise now largely dry tropical forest. A few sheep and runaway biologists are the only threat to the island biota!

The insects are pretty much the routine Virgin Islands stuff, but I suspect that there is much yet to be collected in these islands. The Caribbean generally seems to be poorly collected. I did pick up 2 specimens of a small bee (*Hylaeus*) that may well be undescribed and this

is the first *Hylaeus* for the Virgin Islands. Two things conspicuously absent were *Bembix* and Sphecinae, although both were collected on nearby islands (Necker, Eustacia, Virgin Gorda). *Stictia signata* was present and very common. *Bicyrtes spinosa* was found only at North Beach. Only two social wasps, *Polistes crinitus* and *Mischocyttarus phthisicus*, were found. But, I did find an old nest of a different *Polistes*, probably *P. major*. I also picked up an extraordinarily beautiful female *Psorthaspis* (Pompilidae) that may be new; Bishop Museum also has one collected on Guana by Scott Miller and I have another from Puerto Rico. Seems to me it's time somebody paid some attention to Caribbean spider wasps – there's some neat stuff out there and nobody has really studied them since Bradley worked on the Aporinae back in 1944.

On the return, I spent a week in Puerto Rico, staying with my good friends Juan and Maribel Torres. Juan and I visited dry forest at Guanica. Very poor collecting except for the *Camponotus* we were looking for. But, did find *Pachodynerus atratus* nesting in a cave!

More importantly, we spent 2 days on Mona Island. Fabulous place. Another list of its wasps appended. Mona is, again, hot dry forest with a very low profile and virtually no surface water. It does have some interesting limestone caves and shelters where the Taino Indians left some great pictographs. There is also supposed to be a Taino ballcourt, but I didn't have time to see that. Next time.

While we were on Mona, a boatload of refugees from Dominican Republic was picked up and brought to Mona: 14 people in a 10 foot, open boat, out-board motor crapped out, no oars, no food, no water! They were a pretty bedraggled group coming ashore. One of the men saw me and exclaimed to the effect of: My God, there are still Indians on this island! (In Spanish, of course). [one has to know Roy to fully appreciate this statement! edit.]

Oh yes, collecting on Mona was pretty good, especially for the short time there.

So much for the peregrinations.

Some new records:

*Episyron conterminus posterus* (Fox) (Pompilidae) - Mona Isl. - muy comun.

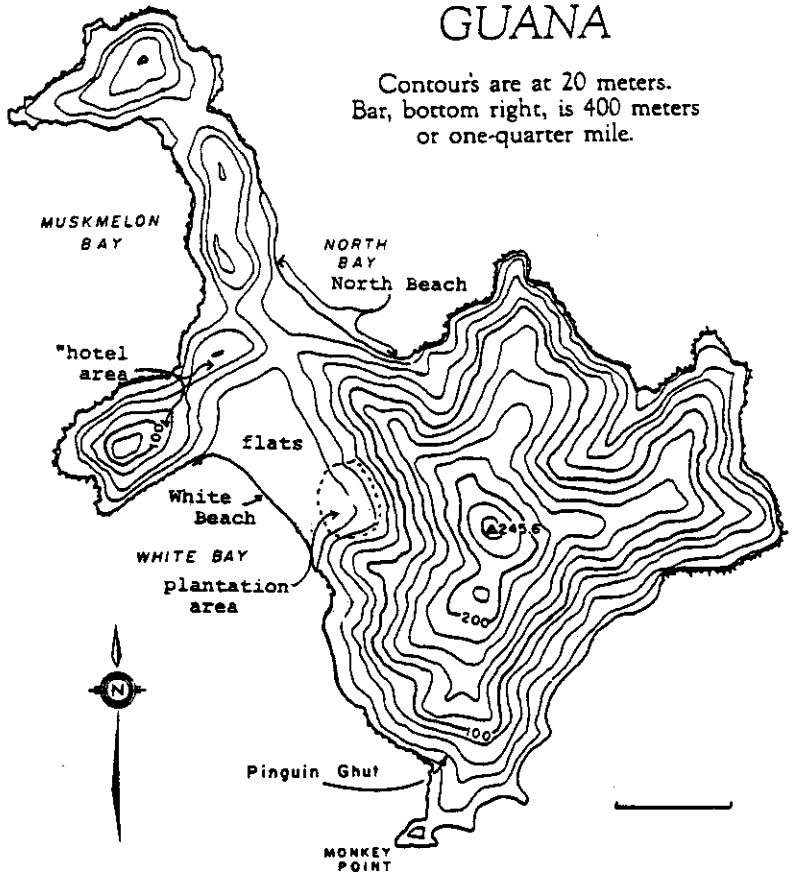
*Euodynerus apicalis* (Cresson) (Vespidae) - Mona Isl.

*Pachodynerus guadulpensis* (Saussure) (Vespidae) - Puerto Rico: Vega Baja and Puerto Nuevo.

*Vespula pensylvanica* (Saussure) (Vespidae) - Limpia Cyn., Davis Mts., Texas.

Incidentally, although I collected all groups of Hymenoptera on Guana, parasitics of all groups were hard to come by. For example, didn't see a single ophionine at night! Of the two species of Evaniidae collected, one is a *Brachygaster* (one specimen), the other, more common, is a *Hyptia*, probably *H. poeyi*, but with greatly reduced reddish areas (compared to Cuban specimens).

I should also make note of the fact that my acquisition of specimens on Guana was greatly aided by the enthusiastic assistance of several lovely ladies: Wenhua, Elizabeth, Robin, Roberta, Cory, and Lianna.




GUANA ISLAND
ACULEATE HYMENOPTERA

Formicidae
- *Leptogenys pubiceps* Emery
- *Pheidole fallax* Mayr
- *Monomorium floricola* (Jerdon)
- *Solenopsis geminata* (Fabricius)
- *Crematogaster steinheili* Forel
- *Wasmannia auropunctata* (Roger)
- *Cyphomyrmex minutus* Mayr
- *Dorymyrmex antillana* Forel
- *Brachymyrmex obscurus* Forel
- *Camponotus sexguttatus* (Fabricius)
  - " undescr. sp.
- *Paratrechina longicornis* (Latreille)

Tiphiidae
- *Myzinum haemorrhoidale* (Fabricius) ?

Scoliidae
- *Campsomeris dorsata* (Fabricius)

Vespidae
- *Polistes crinitus* (Felton)
  - " *major* Palisot de Beauvois [SIGHT RECORD]
- *Mischocyttarus phthisicus* (Fabricius)
- *Pachodynerus atratus* (Fabricius)

Pompilidae
- *Pepsis rubra* Drury
- *Aporus prolixus* Bradley
- *Psorthaspis* sp.

Sphecidae
*Tachysphex alayoi* Pulawski
*Tachytes chrysopyga* (Spinola)
" *tricinctus* (Fabricius)

*Liris ignipennis* F. Smith
" *luctuosus dahlbomi* (Cresson) ?
" sp. 1
" sp. 2
*Ectemnius craesus* (Lepeletier & Brulle)
" sp.
*Cerceris* sp.
*Stictia signata* (Linne)
*Bicyrtes spinosa* (Fabricius)

Colletidae
*Hylaeus* (*Hylaeana*) sp.

Halictidae
*Lasioglossum* (*Dialictus*) sp. 1
" " sp. 2
*Augochlora* sp. 1
" sp. 2

Megachilidae
*Megachile* (*Pseudocentron*) sp.
*Coelioxys abdominalis* Guerin-Méneville

Anthophoridae
*Centris haemorrhoidalis* Fabricius
" *lanipes* Fabricius
*Anthophora tricolor* (Fabricius)
*Exomalopsis* (*E.*) sp.
*Xylocopa mordax* F. Smith

BEES AND WASPS OF MONA ISLAND

Evaniidae
*Hyptia weithi* Ashmead

Vespidae
*Polistes crinitus* (Felton)
*Mischocyttarus phthisicus* (Fabricius)
*Zethus rufinodus* Latreille
*Euodynerus apicalis* (Cresson)
*Pachodynerus tibialis* (Saussure)

Pompilidae
*Priocnemis* sp.
*Episyron conterminus posterus* (Fox)
*Anoplius amethystinus* (Fabricius)
" *hispaniolae* Evans

Sphecidae
*Sphex ichneumoneus* (Linné)
*Sceliphron assimile* (Dahlbom)
*Prionyx thomae* (Fabricius)
*Trypoxylon* (*Trypoxylon*) sp.
*Liris* sp.
*Tachysphex alayoi* Pulawski
*Tachytes tricinctus* (Fabricius)
*Bicyrtes spinosa* (Fabricius)
*Stictia signata* (Linné)

Halictidae
*Lasioglossum* (*Dialictus*) sp.
*Agapostemon viequesensis* Cockerell

Megachilidae
*Megachile* (*Eutricharaea*) *concinna* F. Smith
" (*Pseudocentron*) sp.

Anthophoridae
*Anthophora tricolor* (Fabricius)
*Centris lanipes* Fabricius
*Xylocopa mordax* F. Smith

## BOOK NEWS

**Insect Defenses: Adaptive Mechanisms and Strategies of Prey and Predators** edited by D. L. Evans and J. O. Schmidt. 1990. SUNY Press, Albany, xv + 482 p. (Available from SUNY Press, State Univ. Plaza, Albany, NY 12246, $24.50 paper ) .

This book contains 15 chapters with much information of interest to the readers of **Sphecos**. Two chapters relate entirely to aculeate Hymenoptera: "Holding the fort: colony defense in some primitively social wasps" by Chris Starr; and "Hymenopteran venoms: striving toward the ultimate defense against vertebrates" by Justin Schmidt. Two more chapters contain extensive sections and tables relating to aculeate wasps and other Hymenoptera: "Allomones: chemicals for defense" by Douglas Whitman, Murray Blum, and David Alsop; and "Collective security: aggregation by insects as a defense" by Kevina Vulinec. In addition to these chapters, several others provide concepts and information relating to Hymenoptera. "The evolution of cryptic coloration" by Malcolm Edmunds sets the theoretical stage for "hiding" or inconspicuousness among insects (and yes, a lot of wasps are cryptic). "The evolution of aposematism" by Tim Guilford is likely to become a classic (yes too, a lot of wasps are aposematic in a variety of ways). Finally, George Uetz in "Prey selection in web-building spiders and evolution of prey defenses" and Robert Lederhouse in "Avoiding the hunt: primary defenses of lepidopteran caterpillars" present information on wasps as prey and as predators.

Overall, this book has lots of information on wasps and insect biology and is a bargain at $24.50.

**Bestimmungsschlüssel der Grabwespen Nord- und Zentraleuropas (Hymenoptera, Sphecidae)** by Hermann Dollfuss, 1991. Stapfia, No. 24, 247 p. (see advertisement on page 32 of this **Sphecos**).

Keys are provided for 392 sphecid wasps found in north and central Europe, although special emphasis has been given to those found in Austria. Abundant illustrations accompany the keys which should make identification of genera and species easy. Each genus is diagnosed, number of species noted, and important references listed. Each species is briefly treated (distribution, flight period, salient features, synonymy).

This is a large format publication and should be a welcome addition to the libraries of most European wasp workers.

**Collectiones Entomologicae** Horn, W; I. Kahle, G. Friese & R. Gaedike. 2 vols, 573 pp. Berlin, 1990. ISBN 3-7440-0067-2 ($105)

This is a supplement to the classic Horn & Kahle (1935-37) work on entomologists, entomological collections, and their history. This supplement covers the period from 1937 to 1961 and follows the style of the original. The main section is index of collections by owners (individuals & corporate), followed by an index of museums and institutions by city, bibliography of publications about collections, and plates of determination labels (some 2,000) and entomologists (113). The entomologists pictured are virtually all German except for two pictures of Alex Melander! These pictures represent just part of the almost 5,000 pictures currently in the Institute's collection. The work itself is stated to be based on a card catalog of some 25,000 cards including some 60,000 citations. While the publication bears the former name, Institut fur Pflanzenschutzforschung Kleinmachnow der Akademie

der Landwirtschaftswissenschaften der Deutschen Demokratischen Republik, the organization has changed its name back to the original Deutschen Entomologischen Instituts. Copies can be obtained from Koeltz Scientific Books USA, RR 7, Box 39, Champaign, Ill. 61821 for $105.00 paperbound, 2 vols. In Europe contact Antiquariat Goecke & Evers Inh. E. Bauer, Sprotplatzweg 5, Keltern – Weiler, D W 7538, Germany.

## LEFT-HANDED HYMENOPTERISTS or THE RIGHT-HANDED DO IT RIGHT!

Normally when a right-handed person puts labels on an insect pin, they are oriented such that when you pick up the specimen with your right hand, the words are readable without rotating the pin in your fingers. When working with museum material, I am often aggravated by locality and other labels that have been placed on the pin "backwards". That is, in order to read them, I have to twist the pin around in my fingers. As a consequence I often remove backward labels from specimens and repin them properly. It occurred to me that the reason for "backwards" labels on pins is simply that the labeler was left-handed. This interesting fact suggests that one can properly determine whether an entomologist is or was dextral or sinistral simply by observing insects that were labeled by him or her.

-The Mud D'aub

The Mud D'aub

## BIG BLUE BOOK ERRATA Part 18

p. 179, LC, L 4 from bottom: 1844 is correct, not 1845.
p. 179, RC, delete L 19 from bottom. Thomson did not describe *dahlbomi* as a n.sp.
p. 265, LC, L 6 from bottom: put parentheses around "Patton" and add (*Liris*) after "1892."
p. 297, fig. 84J: *soikai* is correct.
p. 368, RC, L 14: Pakistan is correct, not India.
p. 401, RC, line 6 from bottom: delete entire entry (see *krusemani* in *Crossocerus* on p. 426.)
p. 402, LC, L 19 from bottom: (*Coelocrabro*) is correct, not (*Crabro*).
p. 402, RC, L 10: 1880 is correct, not 1879; delete (*Crabro*).
p. 402, RC, L 23: change *punctus* to *punctum*. The name is a noun and its ending is invariable.
p. 403, RC, L 27: change (*Crabro*) to (*Crossocerus*).
p. 408, LC, L 30: 1892 is correct, not 1891.
p. 409, LC, L 23: insert (*Solenius*) after 1871. The species should probably be transferred to *Ectemnius* or *Lestica* preceded by a question mark.
p. 424, LC, L 18 from bottom: 1886 is correct, not 1887.
p. 424, LC, L 15 from bottom: 1886 is correct, not 1887.
p. 424, RC, L 5: 1918 is correct, not 1917.
p. 425, LC, L 25 from bottom: *subtilis* "Pérez" is correct.
p. 425, RC, L 28: 1941 is correct, not 1936.
p. 426, LC, L 19: delete entire entry (see *carinatus* on p. 424).
p. 426, LC, L 35: insert "new" at end of line.
p. 426, LC, L 43-44: delete "new synonymy by J. Leclercq" [it was published by Leclercq in 1974].
p. 426, RC, delete L 4-5. Dahlbom did not describe *borealis* as a n.sp.
p. 427, LC, L 4: delete entire entry; "transiens" was a Latin word, not a species name.
p. 427, LC, L 24 from bottom: Dewitz is correct.
p. 427, LC, L 25: 1886 is correct, not 1887.
p. 427, RC, L 4: *palitans* (without synonyms) was treated as ssp. of *nigritarsus* by Leclercq, 1958.
p. 427, RC, L 18 from bottom: 1886 is correct, not 1887.
p. 427, RC, L 8 from bottom: add "lapsus for *hector* Cameron" at end of line.
p. 428, RC, L 25: 1889 is correct, not 1899.
p. 430, RC, insert as synonym after penultimate line: *clypeata* Thunberg, 1815 (*Philanthus*), nec *clypeata* Schreber, 1759; see Schulz (1912:70).
p. 434, RC, insert as subspecies after penultimate line: ssp. *rufescens* Beaumont, 1950; Algeria.
p. 434, RL, last L: *kaufmani* is correct. Insert (*Enthomosericus*!) after "1877."
p. 434, RC, insert as synonym after last L: *kaufmanni* Beaumont, 1950, lapsus or emendation.
p. 496, LC, L 33: (*Harpactes*) is correct.
p. 496, LC, L 18 from bottom: 1884 is correct, not 1888.
p. 496, LC, L 14 from bottom: add at end of entry: nec Handlirsch, 1895. Place a † at beginning of entry.
p. 496, RC, L 10: 1933 is correct, not 1934.
p. 496, RC, L 25: Pakistan is correct, not India.
p. 521, LC, L 17: 1933 is correct, not 1934.
p. 527, LC, L 21 from bottom: *pluschtschewskii* is correct.
p. 528, RC, L 12 from bottom: 1846 is correct, not 1849.
p. 531, RC, L 25 from bottom: add parentheses around Mickel and insert (*Stizus*) after 1918.
p. 547, LC, L 33: 1877 is correct, not 1879.
p. 548, RC, L 3: Pakistan is correct, not India.
p. 580, LC, L 10 from bottom: *enodans* is correct.

## PROFILES

**Monica Russo**
(1 North Skilling Road, RR 4, Arundel, Biddeford PO, Maine 04005 USA)

While I am not a professional entomologist, I am an active amateur. I am the author/illustrator of the INSECT ALMANAC, published last year by Sterling; it's a seasonal guide to insect observation and collecting activities for young adults. I've also had a couple of articles in the Quarterly of the Young Entomologist's Society. I'm making an effort to keep up-to-date on everything from paleoentomology to entomophagy, since I may be doing further work with my publisher on natural science/educational books for an age group of up to 15 years.

Personal interests include the fact that I live in a log cabin surrounded by pompilids (7 species have been collected in Maine) indoors and out! Since this part of Maine consists of bare ledgerock and lots of light, fine clay, we also have blueberry bushes decorated with the pots of *Eumenes*.

**Jane van der Smissen**
(Jesse-Owens-Str. 10
D - 2407 Bad Schwartau, Germany)

I was born in Lübeck, Schleswig-Holstein (Germany) on April 5th, 1946. I attended secondary school, married and brought up two sons. Up to the age of forty, needlework, music and literature filled my pastime. To embellish our walks I got to know, together with my husband, the voices of the birds and grasshoppers of our country. A change in our routine, however, was brought about by the fascinating *Ectemnius sexcinctus*. My husband intended to take photos of these wasps, and I knew I would get acquainted with the aculeate Hymenoptera one way or another. Some friends and well-known experts helped me, for example: Dr. Wolfram Eckloff (Museum of Natural History, Lübeck), Studiendirektor i.R. Heinrich Wolf (Pompilidae) and Prof. Dr. Volker Haeseler (University Oldenburg).

With their help and support I succeeded in finding (since 1987) about 360 kinds of aculeates, among them 4 new ones for NW-Germany. Three publications and one commission of research (by the office of environment, Lübeck) would have been impossible without the help of these people. I am very grateful to them for this success, and I am very glad of being allowed to take part in the investigation of the aculeate Hymenoptera.

## BEE BUZZ

[From the London Times]

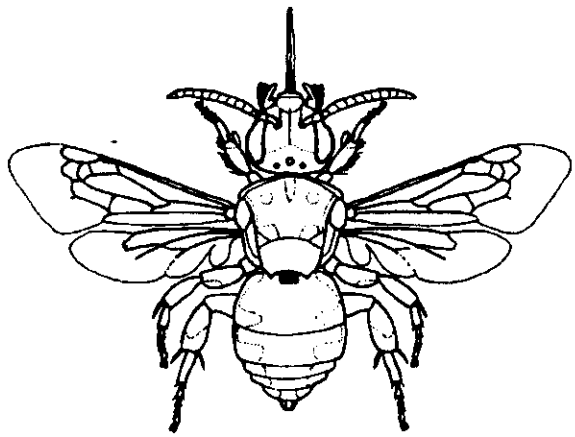
Sir, This morning I went into my garden shed to find a bumble bee (*Bombus terrestris*) buzzing on the inside of the window. When I enclosed it in a cloth to help its exit I noticed that the pitch of its buzz went up one octave. After releasing it I went to the piano and found that its original note was the C sharp below middle C.

I wonder if any of your readers have observed the buzz-note of other Bombidae.

Yours sincerely,
G.B.R. Walkey,
14 Main Road, Newton Regis,
Tamworth, Staffordshire.

Notiziario Imenotterologico italiano

# HY-MEN



Redattori:
Guido Pagliano e Pier Luigi Scaramozzino
Editore:
Museo Regionale di Scienze Naturali
Via Giolitti 36 – 10123 TORINO

***Dear colleagues,***

***as you can see, we have started to bring out an Italian newsletter about Hymenoptera and Italian Hymenopterists.***

***We would like to receive any material that you believe helpful for the persuance of our project (announcements of congresses or meetings, new books about Hymenoptera ....) as well as other news that we could publish in Hy-men.***

***Many thanks***
***Hy-men editors***

# LITERATURE ON THE VESPINAE 1975 - 1991

(Compiled by Robin Edwards)

In **Sphecos** #1, Menke made the decision to include all literature references from 1975 in his "Recent Literature" section. Over the years I have helped to keep the Vespinae records up to near 100%, and now list some older records that I missed earlier. Also in this update are several recent publications: of particular importance are many papers by workers in New Zealand (a few others were recorded in **Sphecos** #20 and 22).

Now that I have retired, I am unable to search for more references, and so this is my last "update".

R.E. 10 March 1992.


Abe, T.
1985. [Hornet venoms - general biology of the hornets, properties of their venom and stinging damage.] Honeybee Science 6:13-24 (in Japanese).

Abe, T., Hariya, Y., Kawai, N., Miwa, A.
1989. Comparative study of amino acid composition in an extract from hornet venom sacs: high content of neuroactive amino acids in *Vespa*. Toxicon 27:683-688.

Adams, R. G.
1978. The first British infestation of *Reesa vespulae* (Milliron) (Coleoptera: Dermestidae). Entomologist's Gaz. 29:73-75.

Ahmadi, A. A.
1984. Incidence of honeybee (*Apis mellifera*) disease and parasites in southern Iran. Bee World 65:134-136.

Akre, R. D.
1982. Economics and control of yellowjackets (*Vespula, Dolichovespula*). In: Breed, M. D., et al. (Eds) The Biology of social insects. Proc. 8th. Int. Congr. IUSSI, Boulder. pp. 109-113. Westfield Press.

Akre, R. D.
1991. Critique. Wasp research: strengths, weaknesses, and future directions. N.Z. J. Zool. 18 No.2:223-227. Responses by Donovan, Moller, Gambino, Fordham, Spurr & Beggs. p 227-231

Aldiss, J. B. J. F.
1983. Chemical communication in British social wasps (Hymenoptera: Vespidae). Ph D thesis, Univ. Southampton. 252pp.

Andoni, V.
1975. Të dhëna paraprake mbi inventarizimin e himenopterëve tä nëndrenvit Aculeata. Buletini Shkenc. Nat. 29:99-108 (in Albanian with French summary).

Anon.
1975. The 1974 Annual Exhibition. Hymenoptera. Proc. Trans. Br. ent. nat. Hist. 8:19-20.

Anon.
1976. Wasps. N.P.C.A. Tech. Release ESPC 036350-7.

Anon.
1977. Blaze in nest of wasps. The Citizen (Gloucestershire), 6 Sept. 1977.

Anon.
1978. Wasps. Min. Agric. Fish. Fd, Advisory Leaflet GD 53.

Anon.
1981. Spoil sports of summer. Sunday Express Colour Magazine No.13, 5 July 1981. p.45.

Anon.
1982. E.T. call home? Pest Control Technol. 10(12):10. [Originally in the Buffalo Evening News] [Photograph of a wasps' nest built around a set of garage lights.]

Anon.
1990. Wasp control in and around structures. Pest Control Technology 18 (9):21-24. (PCT/DowElanco Training Guide 3.)

Antwerpen, C. L. van, Gospe Jr., S. M. & Wade, N. A.
1988. Myeloradiculopathy associated with wasp sting. Pediat. Neurology 4:379-380.

Appel, A. G.
1990. Knockdown efficiency and materials compatibility of wasp and hornet spray formulations to honey bees (Hymenoptera, Apidae). J. econ. Ent. 83:1925-1931.

Archer, M. E.
1977. Hornets on the decline. Daily Telegraph 16 July 1977.

Archer, M. E.
1982. A population dynamics hypothesis for *Vespula* in England, U.K. In: Breed, M.D., et al. (Eds) The biology of social inscts. Proc. 8th Int. Congr. IUSSI, Boulder. pp. 76-79. Westview Press.

Archer, M. E.
1987. A working cladogram for the Vespinae. In: Eder, J. & Rembold, H. (Eds). Chemistry and biology of social insects. Verlag J. Peperny, München. p. 74. [Also in Sphecos 1986, 11:5-6 and 9-10.]

Barr, S. E.
1976. Prolonged interval immunotherapy of Hymenoptera sting allergy. Ann. Allergy 36:308-312.

Barss, P.
1989. Renal failure and death after multiple stings in Papua New Guinea: ecology, prevention and management of attacks by vespid wasps. Med. J. Australia 151:659-663.

Beavis, I. C.
1989. Insects and other invertebrates in classical antiquity. University of Exeter. 269 pp. [Principally concerned with the names applied to wasps and bees.]

Beggs, J. R.
1991. Altitudinal variation in abundance of common wasps (*Vespula vulgaris*). N.Z. J. Zool. 18 No.2:155-158.

Ben-Shalom, A., Ishay, J. S.
1989. The hornet cuticle as a diode and an electric source. Physiol. Chem. Phys. Med. NMR 21:95-106.

Benshalom-Shimony, T., Ishay, J. S.
1990. Luminescence and thermoconductive properties of the oriental hornet (*Vespa orientalis*) cocoon: evidence for photoinduced electron transfer system. Comp. Biochem. Physiol. (A) 95:349-358.

Benshalom-Shimony, T., Ishay, J. S.
1990. Electric capacitance and current of the Oriental hornet silk cocoon cap. Comp. Biochem. Physiol. (A) 97:555-564.

Bernstein, D., I., Mittman, R. J., et al.
1989. Clinical and immunologic studies of rapid venom immunotherapy in Hymenoptera-sensitive patients. J. Allergy Clin. Immunol. 84:951-959.

Bettini, S. (Ed.)
1978. Arthropod venoms. Springer-Verlag, Berlin. [For Edery et al., Venoms of Vespidae.]

Blum, M. S.
1976. Pheromonal communication in social and semisocial insects. Proc. symp. ins. pheromones & their applications, Nagaoka & Tokyo, Dec. 8-11, 1976: 49-60.
Bousquet, J., Knani, J., et al.
1989. Evolution of sensitivity to Hymenoptera venom in 200 allergic patients followed for up to 3 years. J. Allergy Clin. Immunol. 84:944-950.
Brandstatter, J. H.
1990. Some aspects of the significance of the antennae as air-current sense organs in the measurement of flight speed in wasps. Zool. Jahrb. Abt. Zool. Phys. 94:323-332.
Brown, G. R.
1981. European wasp. Agfact A 9.9.1. Dept. of Agric., N.S.W.
Byers, J. A., Unkrich, M. A.
1983. Electronic light intensity control to simulate dusk and dawn conditions. Ann. ent. Soc. Am. 76:556-558.
Caeiro, M. H. S., Palma-Carlos, M. L., et al.
1981. Le test de degranulation des basophiles humains dans l'allergie aux piqñres d'hyménoptères. Allergie Immunologie 13:30,32.
Cannings, R. A.
1989. An Asian hornet, *Vespa simillima xanthoptera* (Hymenoptera: Vespidae) in North America. J. ent. Soc. British Columbia 86:91. [Captured in 1978: no records since.]
Carmean, D.
1989. Sex and deposition of the holotype of *Bareogonalos canadensis* (Harrington) (Hymenoptera: Trigonalyidae). Proc. ent. Soc. Wash. 91:287-288.
Carmean, D.
1991. Biology of the Trigonalyidae (Hymenoptera), with notes on the vespine parasitoid *Bareonogalos canadensis*. N.Z. J. Zool. 18 No.2:209-214.
Carpenter, J. M.
1989. Testing scenarios - wasp social behavior. Cladistics 5:131-144.
Casals, B. P.
1979. La avispa europea en Chile. Boletín Agricola Shell, Chile 39 (2):10-12. [Quoted by Giganti.]
Casals, B. P.
1979. La avispa "chaqueta amarilla". Informativo convenio Est. Exp. Quilamapu- Esc. de Agronomia. 4 pp. [Quoted by Giganti 1983.]
Cetkovic, A.
1985. A taxonomic-biogeographic review of the social wasps (Vespidae, Hymenoptera), with special reference to the fauna of Serbija. Diss. Univ. Belgrade.
Charpin, D., Vervloet, D., Haddi, E., et al.
1990. Prevalence of allergy to Hymenoptera stings. Allergy Proceedings 11:29-32.
Chinery, M.
1989. Garden creepy-crawlies. Whittet Books, London. 172 pp. [Vespinae, pp. 104-108.]
Clapperton, B. K., Alspach, P. A., et al.
1989. The impact of Common and German wasps (Hymenoptera: Vespidae) on the New Zealand beekeeping industry. N.Z. J. Zool. 16:325-332.
Clapperton, B. K., Lo, P. L., et al.
1989. Variation in colour markings of German wasps *Vespula germanica* (F.) and Common wasps *Vespula vulgaris* (L.)(Hymenoptera: Vespidae) in New Zealand. N.Z. J. Zool. 16:303-314.
Clapperton, B. K., Moller, H., Sandlant, G. R.
1989. Distribution of social wasps (Hymenoptera: Vespidae) in New Zealand in 1987. N.Z. J. Zool. 16:315-324.
Clay, P. and H.
1981. Wasps. Nature in Close-up series, Adam & Charles Black, London. 25pp. [For younger readers.]
Cleverley, A.
1990. A waspish experience. Amat. Ent. Soc. Bull. 49 (No.372):201-202. [Wasps (probably *vulgaris*) entering house 1 hour before daylight.]
Cloudsley-Thompson, J. L.
1976. Insects and history. Weidenfeld & Nicolson, London. p. 206.
Corbet, S. A., Cuthill, I., Fallows, M., Harrison, T.
1981. Why do nectar foraging bees and wasps work upwards on inflorescences? Oecologia (Berl.) 51:79-83.
Couptchicova, L. M., Ournichev, A. P.
1975. [Distribution of forage in the nest of *Dolichovespula saxonica* (Hymenoptera, Vespidae).] Zool. Zh. 54:231-239 (in Russian with English summary).
Craig, R.
1980. Sex investment ratios in social Hymenoptera. Am. Nat. 16:311-323.
Crobach, M. J. J. S., Dzn, J. D. M.
1989. Hymenoptera stings and beta-blockers. Lancet 2 (8668):916. [Correspondence - reply to Pedersen.]
Crocker, J.
1975. Classified reports. Arthropods. Heritage No. 60:14-16.
Das, B. P., Gupta, V. K.
1989. The social wasps of India and the adjacent countries (Hymenoptera: Vespidae). Oriental Insects Monograph No.11. [Vespinae, pp. 195-267.]
Davis III, E. J., Turner, W. J.
1978. Biology, distribution and abundance of flesh flies (Diptera: Sarcophagidae) of the Wallowa-Whitman National Forest in northeastern Oregon. Melanderia 30:111-159.
Davis, H. G., Johansen, C. A., Eves, J. D.
1975. The attractiveness to bees of synthetic wasp attractants. J. apicult. Res. 14:101-104.
Donovan, B. J.
1982. Progress with introduction of *Sphecophaga vesparum* (Curtis) for control of *Vespula germanica* (F.) in New Zealand. Proc. 9th Congr. IUSSI, Boulder, Suppl. p.3. [Abstract]
Donovan, B. J.
1989. Potential enemies of the introduced wasp parasitoid *Sphecophaga vesparum* (Hymenoptera: Ichneumonidae) in New Zealand. N.Z. J. Zool. 16:365-367.
Donovan, B. J.
1989. *Vespula germanica* (F.), German wasp and *Vespula vulgaris* (L.), Common wasp (Hymenoptera: Vespidae). In: Cameron, P. J., Hill, R. L. et al. (Eds) A review of biological control of invertebrate pests and weeds in New Zealand 1874 to 1987. [Publ. by CAB International Institute of Biological Control.]
Donovan, B. J.
1991. Nest initiation by German and common wasp queens (Hymenoptera: Vespidae) and nest fate at Christchurch, New Zealand. N.Z. J. Zool. 18 No.2:95-99.

Donovan, B. J.
1991. Life cycle of *Sphecophaga vesparum* (Curtis) (Hymenoptera, Ichneumonidae), a parasite of some vespid wasps. N.Z. J. Zool. 18 No.2:181-192.
Donovan, B. J., Marris, J. W. M., et al.
1990. Inoculation of wasp nests with the parasitoid *Sphecophaga vesparum*. Proc. 43rd N.Z. Weed & Pest Control Conf. 1990: 195-196.
Ebeling, W.
1975. Urban entomology. Univ. Calif., Div. of Agric. Sciences.
Edwards, R.
1975. *Vespula sylvestris* (Scop.) (Hym., Vespidae): a host for *Tyrophagus longior* (Gervais) (Acari, Tyroglyphidae). Entomologist's mon. Mag. 111:88.
Eickwort, G. C.
1990. Associations of mites with social insects. Ann. Rev. Ent. 35:469-488.
Einarsson, R., Inganas, M., et al.
1989. Detection of IgG4 antibodies by immunoblotting in patients on vespid venom immunotherapy. J. Immunol. Methods 120:265-269.
Else, G. R.
1975. An additional British breeding record of *Volucella zonaria* Poda (Diptera, Syrphidae) and two Hampshire records of this species at mercury-vapour lamps. Entomologist's mon. Mag. 111:184.
Else, G. R.
1989. Further records of *Dolichovespula media* in southern England. BEWARS Newsletter, August 1989.
Else, G., Felton, J., Stubbs, A.
1979. The conservation of bees and wasps. Nature Conservancy Council, London. 2nd Edn. 13 pp.
Engels, W. (Ed.)
1990. Social insects. An evolutionary approach to castes and reproduction. Chapter 3. Physiology and reproduction in social wasps by A. Strambi. Springer-Verlag, Berlin. 265 pp. (Chapter 3, pages 59-75.) [A reworking of his 1985 chapter in Watson, Okot-Kotber & Noirot.]
Es'kov, E. K.
1976. [Specificity of the dynamic structure of the spectra of acoustic communication signals in social insects.] Zh. obshch. Biol. 37:891-896 (in Russian).
Es'kov, E. K.
1982. [The temperature in the nest of wasps and its influence on the development of the wasp's colony.] Izv. Akad. Nauk S.S.S.R., Biol. Pt.1:135-140 (in Russian). [Apparently the same as Es'kov & Toroptsev, q.v.]
Fabritius, M.
1976. Experimentelle Untersuchung des Wärmeverhaltens der Hornisse (*Vespa crabro*). Dissertation, Univ. Frankfurt a. M. [See English quote in Koeniger 1977 (1329)]
Farris, M. E., Appleby, J. E.
1979. The Walnut caterpillar, *Datana integerrima* G & R. In: Kessler Jr., K. J. & Weber, B. C. (Coordinators) Walnut insects and diseases. Gen. Tech. Rep., Forest Service, USDA, NC-52, pp. 22-28.
Ferro, D. N. (Ed.)
1976. New Zealand insect pests. Lincoln Univ. Coll. Agric., Canterbury, N.Z. [For Timms, S. A. q.v.]
Field, R. P., Darby, S. M.
1991. Host specificity of the parasitoid, *Sphecophaga vesparum* (Curtis) (Hymenoptera, Ichneumonidae), a potential biological control agent of the social wasps, *Vespula germanica* (F.) and *V. vulgaris* (L.) in Australia. N.Z. J. Zool. 18 No.2:193-197.
Fordham, R. A.
1991. Vespulid wasps at the upper forest margin in Tongariro National Park - a threat to the native biota? N.Z. J. Zool. 18 No.2:151-153.
Fordham, R. A., Craven, A. J., Minot, E. O.
1991. Phenology and population structure of annual nests of the German wasp *Vespula germanica* (Fab.) in Manawatu, New Zealand, with particular reference to late summer and autumn. N.Z. J. Zool. 18 No.2:127-137.
Francke, W.
1981. Spiroacetale als Pheromone bei Insekten. Mitt. dt. Ges. allgemeine angew. Ent. 2:248-251.
Frankland, A. W.
1975. Insect allergy. Clin. Allergy 5:236-237.
Frankland, A. W.
1976. Bee sting allergy. Bee World 57:145-150. [A review.]
Franks, E. C.
1979. Ant, bee, and wasp control at Hummingbird feeders. Jack Pine Warbler 57:70-75.
Free, J. B.
1977. The social organisation of honeybees. Studies in Biology No. 81, Arnold, London. 68 pp.
Frisch, K. von.
1975. Animal architecture. Hutchinson, London.
Gabriel, K. R.
1975. Swallows feeding wasps to young. Br. Birds 68:248. [Possibly *V. vulgaris*. Fed to young even when still alive.]
Gambino, P.
1991. Reproductive plasticity of *Vespula pensylvanica* (Hymenoptera: Vespidae) on Maui and Hawaii Islands, U.S.A. N.Z. J. Zool. 18 No.2:139-149.
Gambino, P. V.
1989. Interactions between yellowjackets (Hymenoptera: Vespidae) and insect pathogens. Dissertation Abs. International B, Sci & Eng. 49:4669-B. [*pensylvanica, vulgaris v. Bacillus,Aspergillus, Penicillium, Beauveria*]
Gambino, P., Medeiros, A. C., Loope, L. L.
1990. Invasion and colonisation of upper elevations on East Maui (Hawaii) by *Vespula pennsylvanica* (Hymenoptera, Vespidae). Ann. Ent. Soc. Am. 83:1088-1095.
Gamboa, G. J.
1978. Intraspecific defense advantage of social cooperation among paper wasp foundresses. Science, N.Y. 199:1463-1465.
Gardiner, B. O. C.
1975. Wasps on high. Bull. amat. Ent. Soc. 34 (306):38.
Geller, R. G., Yoshida, H., Beaven, M. A., et al.
1976. Pharmacologically active substances in venoms of the bald-faced hornet, *Vespula* (*Dolichovespula*) *maculata*, and the yellow jacket *Vespula* (*Vespula*) *maculifrons*. Toxicon 14:27-33.
Getty, T.
1981. Poisson patterns in behavioural time series: the perception of randomness in complexity. Anim. Behav. 29:960.
Ghosh, K., Singh, S., Pereira, B. J. G., Singhi, S. C.
1988. Acute systemic toxic reactions caused by hornet stings. Pediatrics 25:796-798.

Gibbs, D. R.
1980. Predation of the spider *Araneus pustulata* by the German wasp, *Vespula germanica*. The Weta 3:13-14.
Gilbert, D. C.
1975. Coal tits feeding wasps to young. Br. Birds 68:248-249.
Giordani Soika, A.
1976. Vespidi ed Eumenidi (Hymenptera) raccolti in Mongolia dal Dr. Z. Kaszab. Acta zool. hung. 22:271-276.
Giordani Soika, A.
1976. Vespidi ed Eumenidi raccolti in Corea (Hymenoptera). Ann. hist.-nat. Mus. natn. hung. 68:287-293.
Goidanich, A.
1975. Uomini, Storie e Insetti Italiani nella Scienza del Passato. I. Redia 57:419-423.
Goldberg, A., Reisman, R. E.
1988. Prolonged interval maintenance venom immunotherapy. Ann. Allergy 61:177-179.
Golden, D. B. K.
1988. Guidlines for venom immunotherapy. [Editorial] Ann. Allergy 61:159-161.
Golden, D. B. K., Addison, B. I., et al.
1989. Prospective observations on stopping prolonged venom immunotherapy. J. Allergy Clin. Immunol. 84:162-167.
Graft, D. F.
1989. Stinging insect allergy. How management has changed. Postgrad. Med. 85:173-180.
Grant, W. D., Beggs, J. R.
1989. Carbohydrate analysis of beech honeydew. N.Z. J. Zool. 16 (3):283-288.
Greene, A.
1989. Colony dynamics of vespine wasps. Dissertation Abs. International, B. 49 (7) 2479-B. 347 pp. [Thesis, Univ. Maryland, College Park, MD., U.S.A.]
Grimshaw, J. J., Goldman, L.
1977. The treatment of bee stings. Practitioner 219:266-267.
Grinfel'd, E. K.
1977. The feeding of the social wasp *Polistes gallicus* (Hymenoptera: Vespidae). Ent. Rev., Wash. 56:24-29.
Grossman, J.
1990. Update: yellowjacket biological control in New Zealand. IPM Practitioner 12 (3):1-5.
Gusenleitner, J.
1982. Uberfamilie Vespoidea. In: Franz, H. Die Hymenopteren des Nordostalpengebietes und seines Vorlandes. Osterr. Akad. d. Wiss. Math.-Naturw. Kl. 124:223-345.
Gush, G .H.
1975. British Naturalists Association insect survey. Countryside 22:564. [*V. crabro* in Devon, SY 0692, 1972, 73, 74.]
Hagen, H.-H. von, Waldschmidt, M.
1982. Die Hornisse - Erfahrungen und Erfolge beim Schutz unsere grössten sozialen Wespe. OKO.L- 4:14-23. [Z. okologie, Natur- und Umweltschutz.]
Hamed, M. Y., Mohamed, M. G.
1975. Biological studies on the venom of the date wasp (*Vespa orientalis*). II. Effect of the venom on the oxygen consumption by isolated tissue slices. Assiut vet. med. J. 2:85-89.
Hammond, P. M., Smith, K. G. V., Else, G. R., Allen, G. W.
1989. Some recent additions to the British insect fauna. Entomologist's mon. Mag. 125:95-102. [Includes notes on *D. saxonica* and *D. media*.]
Haneda, Y.
1982. [Aculeate Hymenoptera collected on Amami-ôshima in 1981.] Hym. Communication 14:51-54 (in Japanese).
Hansell, M.
1991. Book review: "Biology of the Vespine wasps" by M. Matsuura & Sk. Yamane. Anim. Behav. 41:917.
Harris, J. L.
1979. A rapid method for colour-marking single honeybees with fluorescent paint. J. apicult. Res. 18:201-203.
Harris, R. J.
1989. An entrance trap to sample foods of social wasps (Hymenoptera: Vespidae). N.Z. J. Zool. 16:3669-372.
Harris, R. J.
1991. Diet of the wasps *Vespula vulgaris* and *V. germanica* in honeydew beech forest of the South Island, New Zealand. N.Z. J. Zool. 18 No.2:159-169.
Harris, R. J., Thomas, C. D., Moller, H.
1991. The influence of habitat use and foraging on the replacement of one introduced wasp species by another in New Zealand. Ecol. Ent. 16:441-448.
Harriss, F. C. L., Beattie, A. J.
1991. Viability of pollen carried by *Apis mellifera* L., *Trigona carbonaria* Smith and *Vespula germanica* (F.) (Hymenoptera, Apidae, Vespidae). J. Australian ent. Soc. 30:45-48.
Harwood, R. F., James, M. T.
1979. Entomology in human and animal health. Bailliere Tindall, London. 7th Edn. [Wasp venom and effect: pp. 422-430.]
Heinig, J. H., Mosbech, H., Engel, T., et al.
1989. A comparison of two RAST methods and skin prick testing in the diagnosis of wasp venom allergy. Allergy 44:260-263.
Heinrich, B. (Ed.)
1981. Insect thermoregulation. Wiley, New York & Chichester. [See also Seeley & Heinrich.]
Hermann, K., Ring, J.
1990. Hymenoptera venom anaphylaxis: may decreased levels of angiotensin peptides play a role? Clin. Experim. Allergy 20:569-570.
Herriot, R.
1989. Hymenoptera stings and beta-blockers. Lancet 2 (8672):1159-1160. [Correspondence - reply to Pedersen.]
Hindorf, G.
1979. [Spiroketals and effect on wasps.] Dissertation, Univ. Hamburg (in German).
Hoffman, D. R.
1977. Allergy to bee venom: in vitro diagnosis and identification and isolation of allergens. Cutis 19:763-767.
Hoffman, D. R., Dove, D. E., et al.
1988. Allergens in Hymenoptera venom. XXI. Cross-reactivity and multiple reactivity between fire ant venom and bee and wasp venoms. J. Allergy Clin. Immunol. 82:828-834.
Horel, A., Roland, C., Krafft, B.
1975. Dispositif pour l'enregistrement en continu des variations de poids d'un nid de Guàpes. Insectes sociaux

22:219-223. [See thesis. Device for recording weight of wasps nests.]
Howse, P. E., Clement, J.-L. (Eds)
1981. Biosystematics of social insects. Academic Press, London, etc. [See Pamilo, Pekkarinen & Varvio-Aho, pp. 37-48.]
Hutcheson, P. S., Slavin, R. G.
1990. Lack of preventive measures given to patients with stinging insect anaphylaxis in hospital emergency rooms. Ann. Allergy 64:306-307.
Ichinose, K.
1989. More insect eating. Nature, UK 337:513-514.
Iglisch, I.
1978. Zur Wirksamkeit von "Elektrischen Insektenvernischtungsgeräten". In: Döhring, E. & Iglisch, I. (Eds) Probleme der Insekten- und Zeckenbekämpfung. ökologische, medizinische und rechtliche Aspekte. Erich Schmidt Verlag, Berlin. pp. 85-93.
Inoue, T., Salmah, S., Sakagami, S. F., et al.
1990. An analysis of anthophilous insects in central Sumatra. In: Sakagami, S.F., Ohgushi, R., Roubik, D.W. (Eds) Natural history of social wasps and bees in Equatorial Sumatra. Hokkaido Univ. Press. [pp. 175-200. Lists the species of bees and wasps found.]
Irwin, A. G.
1975. Insects from a deserted bat colony in Co. Down, including a beetle new to Ireland. Ir. Nat. J. 18:226-227.
Ishay, J. S., Ganor, E.
1990. Comb cells and puparial silk in the Oriental hornet nest: structure and function. J. Morph. 203:11-19.
Ishay, J. S., Perna, B., Hochberg, Y., Goldstein, M.
1980. Photoelectric properties of the "yellow strips" in *Vespa orientalis*: a mathematical model. Bull. math. Biol. 42:681-690.
Ishay, J. S., Pines, E., Huppert, D.
1990. Time resolved photoluminescence study of hornet cuticle. Comp. Biochem. Physiol. (A) 95:497-500.
Ishay, J. S., Shimony, T. B., Kustanovitch, J. M., Berke, S.
1987. The thermoelectric properties of the integument in social wasps. In: Eder, J. & Rembold, H. (Eds). Chemistry and biology of social insects. Verlag J. Peperny, MÅnchen. pp. 231-234.
Jecu, A.
1977. Catalog Sistematic Sininimic si Zoogeographie al Vespidelor Romaniei (Vespidae). Pence V. Muzeul Delta Dunarii, Tulcea 55-64.
Jones, J. C.
1978. A note on the use of the terms Instar and Stage. Ann. ent. Soc. Am. 71:491-492.
Kadymov, V. A.
1981. [The hornet, *Vespa crabro*, in the Lenkoran zone of the Azerbaijan-SSR, USSR.] Izv. Akad. Nauk. SSR, Biol. ? (3):65-69 (in Russian).
Kam, J., Waron, M., et al.
1989. Intraocular pressure in cats is lowered by drops of hornet venom. Comp. Biochem. Physiol. (C) 92:329-331.
Kanawar, K. C., Kanawar, U.
1976. Submicroscopic organization of the venom gland of *Vespa orientalis*. In: Ohsaka, A., Hayashi, K. & Sawai, Y. (Eds) Animal, plant and microbial toxins. Vol. 2. Plenum, New York.
Kano, R.
1977. Hymenoptera. In: Sasa, M., Takahashi, H., Kano, R. & Tanaka, H. (Eds) Animals of medical importance in the Nansei Islands in Japan. Shinjuku Shobo, Tokyo. pp.133-135.
Kartsev, V. M., Mazokhin-Porshnyakov, G. A.
1989. [Variation in the individual learning reactions in insects.] Nauchnye Doklady Vysshei Shkoly, Biol. Nauki No. 3:5-18. [*Vespula* sp. and *Apis mellifera*.]
Katsu, T., Kuroko, M., et al.
1990. Interaction of venom mastoparan with biomembranes. Biochimica Biophysica Acta (M), Biomembranes 1027:185-190.
Kayes, B. M.
1978. Digestive proteases in four species of *Polistes* wasps. Can. J. Zool. 56:1454-1459.
Kelner-Pillaut, S.
1975. Une enquàte sur les piqêres d'abeilles et de guàpes. Entomologiste 31:182-183.
Kern, F., Sobotka, A. K., Valentine, M. D., et al.
1976. Allergy to insect stings. III. Allergenic cross-reactivity among the vespid venoms. J. Allergy Clin. Immunol. 57:554-559.
Keyel, R. E.
1983. Some aspects of niche relationships among yellowjackets (Hymenoptera: Vespidae) of the northeastern United States. PhD Dissertation thesis, Cornell Univ., Ithaca, New York. 161 pp.
Kifune, T., Maeta, Y.
1975. A new subgenus and new species of the genus *Xenos* (Strepsiptera, Stylopidae) from Japan. Kontyû 43:446-455.
Kishimura, H., Yasuhara, T., et al.
1976. Vespakinin-M, a novel bradykinin analogue containing hydroxyproline in the venom of *Vespa mandarinia* Smith. Chem. Pharm. Bull. 24:2896-2897.
Kleinpaste, R.
1980. Food of German wasp. The Weta 3:17.
Koehler, C. S. & Frankie, G. W. (Eds).
1978. Perspectives in urban entomology. Academic Press, New York.
Koeniger, N.
1975. Experimentelle Untersuchungen über das Wärmen der Brut bei *Vespa crabro* und *Apis mellifica*. Verh. dt. zool. Ges. 68:148. [See English quote in Koeniger, 1977 (1329).]
Koeniger, N., Weiss, J., Maschwitz, U.
1979. Alarm pheromone of the sting in the genus *Apis*. J. insect Physiol. 25:467-477.
Kojima, J., Reyes, S. G.
1984. A new subspecies of *Vespa tropica* from Cebu Island, the Philippines (Hymenoptera: Vespidae). Kontyû 52:260-261.
Kojima, J., Yamane, Sô.
1990. List of the subfamilies Vespinae and Polistinae collected in central Sumatra, with keys to the Sumatran species (Hymenoptera: Vespidae). In: Sakagami, S.F., Ohgushi, R., Roubik, D.W. (Eds) Natural history of social wasps and bees in Equatorial Sumatra. Hokkaido Univ. Press. [pp. 31-39.]

Korneev, A. S., Salikhov, Sh. I., Tuychibaev, M. U.
1989. [Amino acid sequence of orientotoxin I and orientotoxin II from the hornet *Vespa orientalis* venom.] Bioorganicheskaya Khimiya 15:127-129 (in Russian).

Koshte, V. L., Kagen, S. L., Aalberse, R. C.
1989. Cross-reactivity of IgE antibodies to caddis fly with Arthropoda and Mollusca. J. Allergy Clin. Immunol. 84:174-183.

Kowalczyk, J. K., Watala, C.
1989. Content of some heavy metal ions in various developmental stages of the social wasp, *Dolichovespula saxonica* (Fabr) (Hymenoptera: Vespidae). Bull. Environ. Contamination Toxicol. 43:415-420.

Krombein, K. V., Hurd Jr., P. D., et al.
1979. Catalog of Hymenoptera in America north of Mexico. Vol. 2. Apocrita (Aculeata). Smithsonian Institution, Washington, DC.

Krylova, V. N., Ivashchuk, G. I.
1975. [A study of mycoses of insects, ticks and mites in Kirgizia.] In: Protsenko, A. I. (Ed.) Entomologicheskie issledovaniya v Kirgizii. Vol. 10. Izdatel'stvo Ilim. pp. 122-124. (In Russian).

Kulike, H.
1981. Untersuchungen zur frage des Alarmierungs- und Abwehrverhaltens von Honigbienen (*Apis mellifera* L.) gegenüber Hornissen (*Vespa crabro* L.). Apidologie 12:96. [See also: Kulike, 1982.]

Lantner, R., Reisman, R. E.
1989. Clinical and immunologic features and subsequent course of patients with severe insect-sting anaphylaxis. J. Allergy Clin. Immunol. 84:900-906.

Lavigne, R., Tepedino, V. J.
1976. Checklist of the insects of Wyoming. I. Hymenoptera. Univ. Wyoming Agric. Exp. Sta. Res. J. 106:1-61.

Leclerq, J., Bourdon, V., Lecomte, J., Leclerq, M.
1975. Présence de noradrénaline conjuguée dans l'enveloppe du nid de *Vespula vulgaris* Linne. Bull. Soc. R. Sci. Liege 44:474-476.

Lecomte, J., Bourdon, V., Damas, J., et al.
1976. Présence de noradrénaline conjugée dans les parois du nid de *Vespula germanica* Linné. C. r. Séance. Soc. Biol. 170:212-215.

Ledru, E., Pestel, J, Tsicopoulos, A., et al.
1988. Lymphocyte-mediated regulation of platelet activation during desensitisation in patients with Hymenoptera venom hypersensitivity. Clin. Exp. Immunol. 73:198-203.

Lefeber, V.
1985. De invertebratenfauna van de Zuidlinsburgse kalkgraslanden. Natuurhist. Maandbl. 74:85-91.

Leluk, J., Schmidt, J., Jones, D.
1989. Comparative studies on the protein composiion of hymenopteran venom reservoirs. Toxicon 27:105-114.

Leong, K., Frey, D., Nagamo, C.
1990. Wasp predation on overwintering Monarch butterflies (Lepidoptera: Danaidae) in central California. Pan-Pacific Ent. 66:326-328.

Lesourd, B., Paupe, J., et al.
1989. Hymenoptera venom immunotherapy. II. T proliferative and T suppressive activities induced by *Vespula* immunotherapy: effects on long-term antibody responses. J. Allergy Clin. Immunol. 83:572-580.

Levine, H. D.
1976. Acute myocardial infarction following wasp sting. Report of two cases and critical survey of the literature. Am. Heart J. 91:365-374.

Light, W. C., Reisman, R. E.
1976. Stinging insect allergy - changing concepts. Postgrad. Med. 59:153-157.

Lim, B. H., Lee, M. L., Woo, K. S.
1989. [Studies on the control of hornets (*Vespa* spp.) by means of feeding attractants.] Korean J. Apiculture 4:19-33 (in Korean). [Grape juice fermented for 3 days gave best results.]

Lockey, R. F., Turkeltaub, P. C., et al.
1989. The Hymenoptera venom study II: skin test results and safety of venom skin testing. J. Allergy Clin. Immunol. 84:967-974.

Loveless, M. H.
1978. Once-in-a-lifetime venom injection therapy in bee allergy. Fedn Proc. Fedn. Am. Socs exp. 37:155.

MacDonald, J. F., MacDonald, J. A.
1980. The German yellowjacket: a recent immigrant to Indiana. Outdoor Indiana 45(9):16-22.

Macevicz, S., Oster, G.
1976. Modeling social insect populations II: optional reproductive strategies in annual eusocial insect colonies. Behav. Ecol. Sociobiol. 1:265-282.

Madero Montero, A., Tinaut Ranera, A.
1987. Fenologia de los vespidos (Hym. Vespidae) en Sierra Nevada (Granada, España). Bol. Asociacion Esp. Entomologia 11:159-169.

Magis, M. N.
1989. [*Pheromermis pachysoma* (Linstow, 1905), a mermithid nematode parasite of *Vespula*.] Bull. Ann. Soc. R. Belge Ent. 125 (publ. 1990):296 (in French).

Maier, C. T.
1978. Evolution of Batesian mimicry in the Syrphidae (Diptera). J. N.Y. Ent. Soc. 86:307.

Malham, J. P., Rees, J. S., et al.
1991. Traffic rate as an index of colony size in *Vespula* wasps. N.Z. J. Zool. 18 No.2:105-109.

Marchand, J. C., Battin, J.
1989. Allergie et desensibilisation au vevin d'hymenoptere chez l'enfant. Ann. Pediatrie 36:101-104.

Martin, S. J.
1990. Nest thermoregulation in *Vespa simillima*, *V. tropica* and *V. analis*. Ecol. Ent. 15:301-310.

Matheson, A., Clapperton, K., Moller, H., Alspach, P.
1989. The impact of wasps on New Zealand beekeeping - the 1986/87 wasp survey. N.Z. Beekeeper No. 203:28-31.

Matsuura, M.
1975. [Life history of hornets.] Anima 8:68-72 (in Japanese).

Matsuura, M.
1975. [Attack of the giant hornet, *Vespa mandarinia*.] Shizen 30 (352):68-69 (in Japanese).

Matsuura, M.
1976. [Notes on the social wasps and bees in Wakayama Pref.] Nankiseibutsu 18:5-11 (in Japanese).

Matsuura, M.
1990. Biology of three *Vespa* species in central Sumatra (Hymenoptera, Vespidae). In: Sakagami, S.F., Ohgushi,

R., Roubik, D.W. (Eds) Natural history of social wasps and bees in Equatorial Sumatra. Hokkaido Univ. Press. [pp. 113-124.]

Maynard Smith, J.
1978. The evolution of behaviour. Scientific American 239 (3):136-145.

Maynard Smith, J.
1980. A new theory of sexual investment. Behavl Ecol. Sociobiol. 7:247-???.

Mazokhin-Porshnyakov, G. A., Beiko, V.
1976. [Comparison of nest entrance visual markers in bumblebees and wasps.] Izv. Akad. Nauk. SSSR, Biol. 6:825-833 (in Russian).

Mazza, J. A., Moote, D. W., et al.
1991. Memory loss and pneumonitis after anaphylaxis due to an insect sting. Can. Med. Assoc. J. 144:175-176.

Medvedeva, G. S. (Ed.)
1978. [Key to the insects of the European part of the USSR. Vol. III. Hymenoptera. Part 1. Vespidae by N. V. Kurzenko. pp. 147-152.] Leningrad. (In Russian.) [ All 11 spp. mentioned.]

Mickalide, A. D., Valentine, M. D., et al.
1985. Insect sting allergy in children: what is the real cost of the disease? Int. Archs Allergy appl. Immunol. 77:206-209.

Mishra, R. C., Kumar, J., Gupta, J. K.
1989. A new approach to the control of predatory wasps (*Vespa* spp.) of the honeybee (*Apis mellifera* L.) J. apicult. Res. 28:126-130.

Mizoue, T.
1983. Attractive substances of giant hornet, *Vespa mandarinia*. Honeybee Science 4 (4):162.

Moller, H., Clapperton, B. K., et al.
1991. Comparative seasonality of *Vespula germanica* (F.) and *Vespula vulgaris* (L.) colonies (Hymenoptera: Vespidae) in urban Nelson, New Zealand. N.Z. J. Zool. 18 No.2:111-120.

Moller, H., Plunkett, G. M., et al.
1989. The wasp problem on the West Coast: second year report. Eco. Div. Report No. 24: 39pp.

Moller, H., Plunkett, G. M., et al.
1991. Establishment of the wasp parasitoid, *Sphecophaga vesparum* (Hymenoptera, Ichneumonidae), in New Zealand. N.Z. J. Zool. 18 No.2:199-208.

Moller, H., Tilley, J. A. V.
1989. Beech honeydew: seasonal variation and use by wasps, honey bees, and other insects. N.Z. J. Zool. 16:289-302.

Moller, H., Tilley, J. A. V., et al.
1991. Nest sites of common and German wasps (Hymenoptera: Vespidae). N.Z. J. Zool. 18 No.2:121-125.

Moller, H., Tilley, J. A. V., Thomas, B. W., Gaze, P. D.
1991. Effect of introduced social wasps on the standing crop of honeydew in New Zealand beech forests. N.Z. J. Zool. 18 No.2:171-179.

Müller, U.
1989. Insektenstichallergie - Klinik, Diagnose und Therapie. Wiener Med. Wochens. 139:150-156.

Müller, U. R.
1990. Insect sting allergy: clinical picture, diagnosis and treatment. Gustav Fischer Verlag, Stuttgart & New York. 183 pp. [Translated from German by B. N. Chandler-Lorenz.]

Müller, U., Helbling, A., Bischof, M.
1989. Predictive value of venom-specific IgE, IgG and IgG subclass antibodies in patients on immunotherapy with honey bee venom. Allergy (Copenhagen) 44:412-418.

Mumcuoglu, Y., Rufli, T.
1980. Dermatologische Entomologie. 13. Vespidae/Wespen. Schweiz. Rundschau Med. (Praxis) 69:1574-1579.

Nakahara, L. M.
1980. Western yellowjacket (*Vespula pensylvanica*) - first record of aerial nest in State. Coop. Plant Pest Rpt. USDA, APHIS 5 (14):270.

Nash, R., Boston, M, Nelson, B.
1990. The Hymenoptera Aculeata in the superfamilies Pompiloidea, Vespoidea, Sphecoidea and Apoidea of Murlogh National Nature Reserve, Co. Down. Irish Nat. J. 23:247-254.

Novak, D., Migota, M.
1975. Zur Wespen- und Hornissenbekämpfung. Angew. Parasit. 16:109-110.

O'Rourke, F. J.
1979. The social Hymenoptera of County Wexford. Proc. R. Ir. Acad. Sect. B. 79(1):1-14. [All six spp recorded.]

Oehling, A., Mathov, E., Glazer, I., Arbesman, C. (Eds).
1980. Advances in allergology and clinical immunology. Pergamon Press, Oxford. Acc. Nos. 1790-1797. [Cover and spine incorrectly titled - "clinical" altered to "applied".]

Ohgushi, R., Sakagami, S. F., Yamane, Sô.
1990. Nest architecture of the stenogastrine wasps: diversity and evolution (Hymenoptera, Vespidae). A comparative review. In: Sakagami, S.F., Ohgushi, R., Roubik, D.W. (Eds) Natural history of social wasps and bees in Equatorial Sumatra. Hokkaido Univ. Press. [pp. 41-72. Refers to Vespa spp. as predators.]

Okada, I.
1984. On the fighting behavior of honeybees against hornets in Japan. Honeybee Science 5:105-112.

Okada, I.
1990. [A Book on the Japanese Honeybee.] Tokyo. (A private publication). 81 pp. In Japanese.

Ono, M., Yamaguchi, T.
1990. [Nesting by *Vespa simillima xanthoptera* 16 years in a row.] Honeybee Science 11:45.

Owen, M. D.
1978. Venom replenishment, as indicated by histamine, in honey bee (*Apis mellifera*) venom. J. Insect Physiol. 24:433-437.

Owen, M. D.
1979. Relationship between age and hyaluronidase activity in the venom of queen and worker honey bees (*Apis mellifera* L.). Toxicon 17:94-98.

Owen, M. D.
1979. Chemical components in the venoms of *Ropalidia revolutionalis* and *Polistes humilis* (Hymenoptera, Vespidae). Toxicon 17:519-523.

Owen, M. D., Braidwood, J. L., Bridges, A. R.
1977. Age dependent changes in histamine content of queen and worker honey bees. J. ins. Physiol. 23:1031-1035.

Owen, M. D., Bridges, A. R.
1976. Ageing in the venom glands of queen and worker honey bees (*Apis mellifera* L.): some morphological and chemical observations. Toxicon 14:1-5.
Ozaki, Y., Matsumoto, Y., et al.
1990. Mastoparan, a wasp venom, activates platelets via pertussis toxin-sensitive GTP-binding proteins. Biochem. Biophys. Res. Communications 170:779-785.
Pabst, M. A., Kral, K.
1989. Effects of green and UV light and darkness on the ultrastructure of ocellar photoreceptors in the wasp *Paravespula germanica*. Z. Mikrosk.-Anatom. Forsch. 103:459-475.
Pallett, M. J.
1982. Effects of intraspecific competition on the foraging behavior of *Vespula arenaria*. (Abstract) In: Breed, M. D., et al.(Eds) The biology of social insects. Proc. 8th. Int. Congr. IUSSI, Boulder. p. 37. Westfield Press.
Pastorello, E. A., Incorvaia, C., et al.
1989. [Allergic reactions to Hymenoptera stings in children. Diagnosis and therapy.] Minerva Pediatrica 41:419-423 (in Italian).
Pawlikowski, T.
1990. Wasp communities (Hymenoptera: Vespidae) in the agricultural landscape of Chelmno Land (N Poland). Polskie Pismo Ent. 60:115-128.
Pedersen, D. L.
1989. Hymenoptera stings and beta-blockers. Lancet 2 (8663):619. [Correspondence] [See also: Crobach et al, Herriot, and Pollock for replies to this.]
Peña G., L. E., Arce, R. P. de, Cartagena C., L.
1975. La presencia de *Vespula maculifrons* (Buysson), (Hymenoptera: Vespidae) en Chile. Rev. Chilena Ent. 9:167-168. [A misidentification of *V. germanica*.]
Perianin, A., Snyderman, R.
1989. Mastoparan, a wasp venom peptide, identifies two discrete mechanisms for elevating cytosolic calcium and inositol triphosphates in human polymorphonuclear leukocytes. J. Immunol. 143:1669-1673.
Perna, B., Croitoru, N., Ishay, J.
1977. Dominance and hierarchy in *Polistes* colonies: correlation with photoelectric properties of the "yellow strips". Proc. VIII. Int. Congr. I.U.S.S.I., Wageningen. p. 155.
Perna, B., Croitoru, N., Ishay, J. S.
1978. Dominance and hierarchy in *Polistes gallicus* colonies attained through photoelectric properties. Experientia 34:1022-1023.
Perrott, D. C. F.
1975. Factors affecting use of mirex-poisoned protein baits for control of European wasp (*Paravespula germanica*) in New Zealand. N.Z. J. Zool. 2:491-508.
Peters, D. S.
1975. Vespoidea, Sphecoidea und Apoidea (Hymenoptera) von Messaure. Ent. Tidskr. 96:116-120. [Swedish Lapland]
Pflumm, W.
1975. Einfluss verschiedener Zuckerwasser - Konzentrationen und der Anwesenheit von Artgenossen auf das Sammelverhalten von Wespen (Hymenoptera: Vespidae). Ent. Germanica 2:7-21.
Pflumm, W.
1979. Temperaturabhängiges Verhalten bei Sammelbienen und -wespen. Biol. unserer Z. 9 Nr. 4 :118-122.
Piek, T.
1991. Neurotoxic kinins from wasp and ant venoms. Toxicon 29:139-149.
Plunkett, G. M., Moller, H., et al.
1989. Overwintering colonies of German (*Vespula germanica*) and Common wasps (*Vespula vulgaris*) (Hymenoptera: Vespidae) in New Zealand. N.Z. J. Zool. 16:345-354.
Poinar Jr., G. O.
1976. A new life cycle pattern in the Mermithidae. Proc. Int. Colloq. Invert. Pathol. 1:259-262.
Poinar Jr., G. O.
1976. Presence of Mermithidae (Nematoda) in invertebrate hosts. J. Parasit. 62:843-844.
Pollock, I.
1989. Hymenoptera stings and beta-blockers. Lancet 2 (8668):916. [Correspondence - reply to Pedersen.]
Przybilla, B., Ring, J., Griesshammer, B.
1989. Diagnostische Befunde bei Hymenopterengiftallergie: zur Bedeutung von Anamnese, Hauttest und RAST. Allergologie 12:192-202. [They conclude that diagnosis should not be based on single parameters.]
Puyana, J., Diez-Gomez, M. L., et al.
1990. Stinging insect allergy: sensitization to vespids in Madrid and surroundings. Cross-reactivity study. Allergy (Copenhagen) 45:126-129.
Rasnitsyn, A. P.
1975. [Hymenoptera Apocrita of the Mesozoic.] Trudy paleont. Inst. 147:1-134 (in Russian). [Description of *Curiosovespa magna*, apparently a Eumenid.]
Read, P. E. C., Donovan, B. J., Schroeder, N. C.
1990. Rearing and distribution of the introduced wasp parasitoid *Sphecophaga vesparum* throughout New Zealand. Proc. 43rd N.Z. Weed & Pest Control Conf. 1990: 191-194.
Reed, A.
1990. Yellowjacket pests - Honey bee sting desensitization. Am. Bee J. 130:670.
Reed, H. C., Akre, R. D.
1982. Divergent strategies of colony usurpation among two obligate vespine parasites (Hymenoptera: Vespinae). [Abstract] In: Breed, M. D., et al.(Eds) The biology of social insects. Proc. 8th. Int. Congr. IUSSI, Boulder. pp. 291-292. Westview Press.
Reid, H. A.
1975. Bites and stings in travellers. Postgrad. Med. J. 51:830-837.
Reisman, R. E.
1975. Insect stings - danger season opens. U.S. News & World Rep. 78 (16):65.
Reisman, R. E.
1988. Late onset reactions following venom immunotherapy and venom skin tests. Ann. Allergy 61:383-387.
Reisman, R. E., DeMasi, J. M.
1989. Relationship of serum venom-specific IgE titers to clinical aspects of stinging insect allergy. Int. Archs Allergy Appl. Immunol. 89:67-70.
Reisman, R. E., Light, W. C., et al.
1976. Immunological studies of the effect of whole body insect extracts in the treatment of stinging insect allergy. J. Allergy Clin. Immunol. 57:547-553.
Reisman, R. E., Livingston, A.
1989. Late-onset reactions, including serum sickness, after insect stings. J. Allergy Clin. Immunol. 84:331-337.

Ring, B., Slor, H., Ishay, J.
1976. Dnases in venom sac extract of *Vespa orientalis*. Israel J. med. Sci. 12: ?
Ring, J., Przybilla, B., et al.
1989. Richtlinien für die Diagnose und Behandlung von Uberempfindlichkeitsreaktionen auf Bienen- und Wespenstiche. Allergologie 12:43-45.
Roland, C.
1976. Approche éco-éthologique et biologique des Sociétés de *Paravespula vulgaris* et *germanica*. D.Sc thesis, Univ. Nancy.
Roland, C., Horel, A., Montagner, H.
1977. The relationship between ecological factors, activity and rate of foraging success in societies of *Paravespula vulgaris* and *Paravespula germanica* (Hym., Vespidae). Proc. VIII Int. Congr. I.U.S.S.I., Wageningen. pp. 71-74.
Rosini, G., Ballini, R., Marotta, E.
1989. Functionalized nitroalkanes in synthesis of 1,6-dioxaspiro[4.5]decane components of *Paravespula vulgaris* pheromone. Tetrahedron 45:5935-5942.
Ross, K. G.
1982. Investigations of the mating behavior of the Eastern yellowjacket, *Vespula maculifrons*. [Abstract] In: Breed, M. D., et al.(Eds) The biology of social insects. Proc. 8th. Int. Congr. IUSSI, Boulder. p. 399. Westview Press.
Rowe, S. F., Greer, K. E., Hodge Jr., R. H.
1979. Electrocardiographic changes associated with multiple yellow jacket stings. Southern med. J. 72:483-485.
Rühl, D.
1977. Rote Liste gefährdeter Tierarten in der Bundesrepublik Deutschland. Natur. Landsch. 52:99-104.
Sagi, D.
1976. Wasps find sting to Fortune's feast. The Vancouver Sun May 22:10.
Sagitov, A. K., Funduckiev, S. E.
1980. [Materials on the reproduction of the bee-eater, *Merops superciliosus* (Aves: Meropidae).] Vestn. Zool. ?? (5):88-89.
Saini, M. S., Dhillon, S. S.
1978. Functional modifications of the meta-tibial spurs in order Hymenoptera. J. Anim. Morph. Physiol. 25:54-60.
Sandlant, G. R., Moller, H.
1989. Abundance of Common and German wasps (Hymenoptera: Vespidae) in the honeydew beech forests of New Zealand in 1987. N.Z. J. Zool. 16:333-344.
Schaffer, W. M.
1978. A note on the theory of reciprocal altruism. Am. Nat. 112:250-253.
Schmidt, J. O., Blum, M. S.
1978. A harvester ant venom: chemistry and pharmacology. Science, N.Y. 200:1064-1066.
Schrembri, S. P.
1980. Vespoidea from the Maltese Islands (Hymenoptera Aculeata). Boll. Soc. ent. ital. 112:90-93. [*V.orientalis*, ?*V.crabro* and *V.vulgaris* suspected misidentifications.]
Schuberth, K. C., Golden, D. B. K., et al.
1981. Evaluation and treatment of insect sting allergy. In: Ring, J. & Burg, G. (Eds) New trends in allergy. Proc. symp. Munich, 1-3 Aug. 1980. pp. 260-268. Springer-Verlag, Berlin.
Scudo, F. M., Ghiselin, M. T.
1975. Familial selection and the evolution of social behavior. J. Genet. 62:1-31.
Seeley, T. D., Seeley, R. H.
1982. Colony defense strategies of the honeybees in Thailand. Ecol. Monograph 52:43-63.
Settipane, G. A., Chafee, F. H.
1979. Natural history of allergy to Hymenoptera. Clin. Allergy 9:385-390.
Shioya, T., Onodera, A., et al.
1988. [A case of coronary artery spasm following wasp sting: possible mechanism of coronary artery spasm.] Respiration & Circulation 36:1139-1144 (in Japanese).
Skytte, T.
1982. Stik og bid. Natur og Museum 21 (2). 23pp. (in Danish). [Title = "Stings and bites."]
Smith, K. G. V.
1975. The faunal succession of insects and other invertebrates on a dead fox. Entomologist's Gaz. 26:277-287.
Southcott, R. V.
1988. Some harmful Australian insects. Med. J. Australia 149:656-662.
Spoczynska, J. O. I.
1975. The world of the wasp. Muller, London. [Full of errors! Refers to all wasps.]
Spradbery, J. P.
1991. An orphaned colony of the European wasp *Vespula germanica* (F.) (Hymenoptera: Vespidae) in Australia resulting from repeated usurpation. N.Z. J. Zool. 18 No.2:101-103.
Spurr, E. B.
1991. Reduction of wasp (Hymenoptera: Vespidae) populations by poison-baiting; experimental use of sodium monofluoroacetate (1080) in canned sardine. N.Z. J. Zool. 18 No.2:215-222.
Stallwood, B. R.
1979. Observations on *Vespa crabro* L. (Hym. Vespidae) - the hornet and *Volucella zonaria* Poda (Dipt. Syrphidae). Bull. amat. Ent. Soc. 38:3-6.
Stocker, G., Lüps, P.
1984. Qualitative und quantitative Angaben zur Nahrungswahl des Dachses *Meles meles* im Schweizerischen Mittelland. Rev. Suisse Zool. 91:1007-1015.
Story, K.
1989. Stinging insects and their control. Pest Control Technology 17 (8):42-44, 48.
Story, K.
1991. Wasps and hornets. A breakthrough in control measures. Pest Control News No. 20, p. 8. March 1991.
Strung, N.
1976. The great whitetail hangup. Field & Stream 80 (9):68-71. [Describes nest of *D. maculata* inside a hollow tree with only a small access hole. This is a rare location.]
Takasaki, C., Fukumoto, M.
1989. Phospholipases B from Japanese yellow hornet (*Vespa xanthoptera*) venom. Toxicon 27:449-458.
Tano, T.
1985. [The Japanese Vespinae.] Fukui-ken Kôtôgakkô Rika-kenkyû-shi 28:31-38 (in Japanese).

Taylor, R. W., Brown, D. R., Cardale, J. C.
1985. Hymenoptera: Formicoidea, Vespoidea and Sphecoidea. Zool. Catalogue of Australia 2. 381 pp.
Thomas, C. D., Moller, G. M., et al.
1990. The prevalence of introduced *Vespula vulgaris* wasps in a New Zealand beech forest community. N.Z. J. Ecol. 13:63-72.
Thomson, J. D.
1989. Reversal of apparent feeding preferences of bumble bees by aggression from *Vespula wasps*. Can. J. Zool. 67:2588-2591.
Tikhomirova, A. L., Rasnitsyn, A. P.
1981. [Recapitulations in ontogenesis of *Dolichovespula saxonica* (Hymenoptera, Vespidae).] Zool. zhur. 60:1010-1024 (in Russian). [From the drawings, this is *Vespula vulgaris*]
Tilden, J. W.
1976. Observations of predation on Lepidoptera in Alaska, U.S.A. J. Res. Lepid. 15:100.
Timms, S. A.
1976. Medically important insects. In: Ferro, D. N. (Ed.) New Zealand insect pests. Lincoln Univ. Coll. Agric., Canterbury, N.Z. pp.202-204.
Tohkin, M., Yagami, T., Matsubara, T.
1990. Mastoparan, a peptide toxin from wasp venom, stimulates glycogenolysis mediated by an increase of the cytosolic free Ca2+ concentration but not by an increase of cAMP in rat hepatocytes. FEBS Letters 260:179-182.
Trivers, R. L., Hare, H.
1976. Haplodiploidy and the evolution of the social insects. Science, N.Y. 191 (4224):249-263.
Tsicopoulos, A., Tonnel, A. B., et al.
1988. Decrease of IgE-dependent platelet activation in Hymenoptera hypersensitivity after specific rush desensitisation. Clin. Exp. Immunol. 71:433-438.
Tsicopoulos, A., Tonnel, A. B., et al.
1990. Short-term decrease of skin-test sensitivity after rush desensitization in Hymenoptera venom hypersensitivity. Clin. Exp. Allergy 20:289-294.
Tuichibaev, M. U., Akhmedova, N. U., Muksimov, F. A.
1988. Hemolytic effect of Phospholipase A2 and orientotoxin from venom of the giant hornet Vespa orientalis. Biochemistry 53:373-381.
Valentine, M. D.
1989. Venom immunotherapy. Western J. Med. 150:335. [A summary of recent research.]
Vecht, J. van der.
1976. Evolution of nest architecture in social wasps (Hymenoptera: Vespidae). Neth. J. Zool. 26:436.
Vinson, S. B., Frankie, G. W., et al.
1978. Isolation, identification, and function of the Dufour gland secretion of *Xylocopa virginica texana*. J. chem. Ecol. 4:315-323.
Wagner, R. E.
1982. Factors influencing the annual abundance of yellowjackets. [Abstract] In: Breed, M. D., et al.(Eds) The biology of social insects. Proc. 8th. Int. Congr. IUSSI, Boulder. p. 67. Westview Press.
Wagner, R. E., Reierson, D. A.
1975. Clothing for protection against venomous Hymenoptera. J. econ. Ent. 68:126-128.
Walton, G. M., Reid, G. M.
1976. The 1975 New Zealand European wasp survey. N.Z. Beekeeper 38:26-30.
Wang, J. D., Zhang, W. H., et al.
1985. [Biological study of several species of wasps preying upon honey bees, and their control.] J. Fujian Agric. College (Fujian Nongxueyuan Xuebao) 14:43-51. [Notes on *V. mandarinia, bicolor, basalis, tropica haematodes, ducalis & affinis*.]
Warren, A. D.
1990. Predation of five species of Noctuidae at ultraviolet light by the western yellowjacket (Hymenoptera: Vespidae) J. Lepidopterists' Soc. 44:32.
Webb, P. D., Rice, M. J.
1978. A simple photoelectric event counter for entomological work and its use to monitor blowfly flight parameters. J. Aust. ent. Soc. 17:19-21.
Wehner, R.
1976. Structure and function of the peripheral visual pathway in Hymenopterans. In: Zettler, F. & Weiler, R. (Eds) Proc. in life sciences. Neural principals in vision. Symp., Munich, Sept 15-20, 1975. Springer-Verlag,Berlin.
Welch, H. E.
1976. Advances in insect nematology. Proc. Int. Colloq. Invert. Pathol. 1:221-224.
West Eberhard, M. J.
1975. The evolution of social behavior by kin selection. Q. Rev. Biol. 50:1-33.
West Eberhard, M. J.
1981. Book Review: Social insects, Vol. 1. Edited by H. R. Hermann. Anim. Behav. 29:312-313.
West Eberhard, M. J.
1982. Communication in social wasps: predicted and observed patterns, with a note on the significance of behavioral and ontogenetic flexibility for theories of worker . . . [etc.]. Coll. Int. U.I.E.I.S. Section Francaise, 16-18 Sept. 1982.
Wickler, W.
1978. Kin selection and effectiveness in social insect workers and other helpers. Z. Tierpsychol. 48:100-103.
Williams, D. J., Stuart, B. P., Gaskins, C. B.
1979. Insect stings in swine. Vet. Med. 74:1663-1664.
Wilson, E. O.
1975. Sociobiology: the new synthesis. Belknap Press, Harvard, Mass. [Abridged version, 1980.]
Wilson, E. O.
1975. The evolutionary significance of the social insects. In: Pimentel, D. (Ed.) Insects, science and society. Academic Press, New York & London.
Wolf, H.
1985. Zur Vespiden-Sammlung WEYRAUCHs im Museum Wiesbaden (Insecta: Hymenoptera). Jb. nass. Ver. Naturk. 108:63-64.
Wright, D. N., Lockey, R. F.
1990. Local reactions to stinging insects (Hymenoptera). Allergy Proceedings 11:23-28.
Wypych, J. I., Abeyounis, C. J., Reisman, R. E.
1989. Analysis of differing patterns of cross-reactivity of honeybee and yellow jacket venom-specific IgE: use of purified venom fractions. Int. Archs Allergy Appl. Immunol. 89:60-66.

Yamane, Sk.
1982. Vespoid wasps from Niigata Pref., Honshu, Japan. Trans. essa Ent. Soc. (Niigata) 53:3-14
Yamane, Sô, Ito, Y.
1987. Caste differentiation and social organisation in the Old World Vespidae. In: Eder, J. & Rembold, H. (Eds). Chemistry and biology of social insects. Verlag J. Peperny, München. pp. 265-266.
Yamane, Sô.
1977. [On the collecting technique of vespine nests, based chiefly on practices through a survey in Taiwan from 1972 to 1974 (Hym., Vespidae).] Seibutsu Kyôzai, Kikonai 12:42-59 (in Japanese).
Yamane, Sô.
1984. Nest architecture of two Oriental paper wasps, *Parapolybia varia* and *P. nodosa*, with notes on its adaptive significance (Vespidae, Polistinae). Zool. Jb. Syst. 111:119-141.
Yamane, Sô., Yamane, Sk.
1975. [Investigating methods of dead vespine nests (Hymenoptera, Vespidae). Seibutsu Kyôzai, Kikonai 10:18-39 (in Japanese).
Yoshida, H., Geller, R.G., Pisano, J. J.
1976. Vespulakinins: new carbohydrate-containing bradykinin derivatives. Biochem., Wash. 15:61-64.
Zahradnik, J.
1985. Bienen, Wespen, Ameisen. Die Hautflügler Mitteleuropas. Franckh'sche Verlagshandlung, Stuttgart.
Zhang, J. Z.
1989. [A checklist of the superfamily Vespoidea in Fujian Province, China.] J. Fujian Agric. Coll. 18:571-578 (in Chinese).

## RECENT LITERATURE

(Worth a look: Alexander, 1992, Dollfuss, 1991.)

Alexander, Byron A.
1992. A cladistic analysis of the subfamily Philanthinae (Hymenoptera: Sphecidae). Syst. Ent. 17:91-108.
Allen, G.W.
1992. Further observations on *Nitela borealis* Valkeila (Hym., Sphecidae). Ent. Mon. Mag. 128:10.
Antropov, Alexander V.
1991. On taxonomic rank of *Trypoxylon attenuatum* Smith (Hymenoptera, Sphecidae). Ent. Obozr. 70:672-684. (in Russian)
1991. To the knowledge of the fauna of the genus *Spilomena* (Hymenoptera, Sphecidae) of South America. Zool. Zh. 70:57-62. (in Russian with English summary)
1992. Digger wasps of the tribe Trypoxylini (Hymenoptera, Sphecidae) of Paleartica (fauna, morphology, biology, evolution). PhD thesis abstract, Gosudarstvennyi Univ. (in Russian)
Archer, Michael E.
1991. The number of species that can be recognised within the genus *Vespa* (Hym., Vespinae). Ent. Mon. Mag. 127:161-164.
1991. Taxonomy and bionomics of the *Vespa tropica* group (Hym., Vespinae). Ent. Mon. Mag. 127:225-232.
1992. A comparison of the solitary wasps and bees (Hym., Aculeata) of Charnwood Forest, Leicestershire and Lydford Moorland, Devon. Ent. Mon. Mag. 128:51-57.
Asís, J.D., S.F. Gayubo and J. Tormos
1990. Preimaginal stages of Iberian Sphecidae V. *Sphex rufocinctus* Brullé and *Ammophila laevicollis* Ed. André (Hymenoptera, Sphecidae). Ann. Hist.-Nat. Mus. Natn. Hung. 81:239-244.
1991. Description of mature larva and nesting behavior of *Pseudoscolia martinezi* Suárez (Hymenoptera: Sphecidae). J. New York Ent. Soc. 99:162-166.
1991. Notes of the natural history of *Stizus perrisii ibericus* Beaumont (Hymenoptera: Sphecidae). J. Natural History 25:1331-1337.
Azevedo, Celso Oliveira
1991. Espécie nove notas sobre *Bakeriella* Kieffer (Hymenoptera, Bethylidae) da região de São Carlos, SP. Revta Bras. Ent. 35:535-538.
Belokobylskij, S.A.
1990. Embolemidae - new family of bethylid wasps to the fauna of the Soviet Far East (Hymenoptera, Bethyloidea), p. 64-70 *in*: News of insects systematics of Soviet Far East, Acad. Sci. USSR, Far East Branch, Vladivostok. (in Russian)
Brockmann, H. Jane
1992. Male behavior, courtship and nesting in *Trypoxylon* (*Trypargilum*) *monteverdeae* (Hymenoptera: Sphecidae). J. Kansas Ent. Soc. 65:66-84.
Brockmann, H. Jane and Alan Grafen
1992. Sex ratios and life-history patterns of a solitary wasp, *Trypoxylon* (*Trypargilum*) *politum* (Hymenoptera: Sphecidae). Behav. Ecol. Sociobiol. 30:7-27.
Buckingham, Gary R., Virendra K. Gupta and Marjorie C. Townes
1991. Obituary: Henry K. Townes, Jr. Amer. Ent. 37:251-253.
Budrys, E.R.
1990. Digger-wasps of the genus *Mimumesa* Malloch (Hymenoptera, Sphecidae) of the fauna of the USSR. Ent. Rev. 70(7):99-106. (English translation of Entomologicheskoye Obozreniye)
Callan, E. McC.
1991. Nesting behaviour and prey of *Pseudoplisus* Ashmead (Hymenoptera: Sphecidae). J. Nat. Hist. 25:1611-1615.
Cambra T., Roberto and Diomedes Quintero Arias
Velvet ants of Panama: Distribution and systematics (Hymenoptera: Mutillidae), Ch. 25, p.459-478 in: Insects of Panama and Mesoamerica: Selected studies, edit. by Diomedes Quintero and Annette Aiello. Oxford Univ. Press, Oxford, 1992.
Cervo, Rita, Maria Cristina Lorenzi and Stefano Turillazzi
1990. *Sulcopolistes atrimandibularis*, social parasite and predator of an alpine *Polistes* (Hymenoptera, Vespidae). Ethology 86:71-78.

Chandrashekara, K. and R. Gadagkar
1991. Unmated queens in the primitively eusocial wasp *Ropalidia marginata* (Lep.) (Hymenoptera: Vespidae). Ins. Soc. 38:213-216.
1991. Behavioural castes, dominance and division of labour in a primitively eusocial wasp. Ethology 87:269-283.
Chiappa, Elizabeth and Macarena Rojas
1991. Observaciones en la nidificación de *Pachodynerus peruensis* (Saussure) (Hymenoptera: Vespidae: Eumeninae). Rev. Chilena Ent. 19:45-50.
Cowan, David P.
1991. New Michigan state record for a sphecine wasp, *Podium luctuosum* (Hymenoptera: Sphecidae). Great Lakes Ent. 24:183-184. (title is incorrect: should be *Podium rufipes*.)
Crellin, S.M.
1992. Some aculeate Hymenoptera new to the Isle of Man. Ent. Mon. Mag. 128:69-70.
Day, Michael C.
1991. Towards the conservation of aculeate Hymenoptera in Europe. Convention on the Conservation of European Wildlife and Natural Habitats, Nature and Environment Ser., No. 51. 44 p. + i - xxxiii. (includes aculeate Hymenoptera on European Red Data Lists)
Dollfuss, Hermann
1991. Bestimmungsschlüssel der Grabwespen Nord- und Zentraleuropas (Hymenoptera, Sphecidae). Stapfia No. 24. 147 p. (Keys to species)
Else, G.R.
1992. Further extension of the range of *Dolichovespula media* (Retzius) (Hym., Vespidae) in Britain in 1989 and 1990. Ent. Mon. Mag. 128:43-46.
1992. Two little-known wasps: *Homonotus sanguinolentus* (F.) and *Euodynerus quadrifasciatus* (F.) (Hym., Aculeata) in southern England in 1990 and a review of their occurrence in Britain. Ent. Mon. Mag. 128:67-68.
Etcheverry, María
1987. Sobre los noventa años de la Revista Chilena de Historia Natural 1897-1987. Rev. Chilena Hist. Nat. 60: 105-107.
1987. Datos biograficos y bibliograficos de Manuel Jesus Rivera (1875-1910). Rev. Chilena Ent. 15:89-92.
1988. Bibliografia producida por algunos entomologos Chilenos nacidos entre 1883 Y 1917. Bol. Soc. Biol. Concepción 59:37-45.
1987. Datos biográficos sobre don Carlos Emilio Porter Mossó (1867-1942). Rev. Chilena Hist. Nat. 61:127-128.
1990. Indice de las publicaciones del Museo Regional de Concepción. Rev. Chilena Hist. Nat. 63:119-124.
1990. Indice de los "Anales" y del "Boletín" (Museo Nacional de Historia Natural de Chile). Rev. Chilena Hist. Nat. 63:211-230.
Evans, Howard E.
1992. The nest and prey of *Cerceris lutzi* Scullen (Hymenoptera: Sphecidae). J. Kansas Ent. Soc. 65:91-92.
Fellenberg, Wolfgang and Heinrich Wolf
1992. Massensterben von Hautflügern unter Winterlinden im Sauerland 1989. Dortmunder Beitr. Landeskde 25:119-123.
Field, Jeremy
1992. Patterns of nest provisioning and parental investment in the solitary digger wasp *Ammophila sabulosa*. Ecol Ent. 17:43-51.
1992. Prey utilization by the solitary digger wasp *Ammophila sabulosa*. Ent. Gaz. 43:131-138.
Fricke, John M.
1992. Influence of tree species on frequency of trap-nest use by *Passaloecus* species (Hymenoptera: Sphecidae). Great Lakes Ent. 25:51-53.
Gadagkar, Raghavendra
1991. On testing the role of genetic asymmetries created by haplodiploidy in the evolution of eusociality in the Hymenoptera. J. Genetics 70:1-31.
1991. Demographic predisposition to the evolution of eusociality: A hierarch of models. Proc. Natl. Acad. Sci. USA 88:10993-10997.
Gadagkar, Raghavendra, Seetha Bhagavan, K. Chandrashekara and C. Vinutha
1991. The role of larval nutrition in pre-imaginal biasing of caste in the primitively eusocial wasp *Ropalidia marginata* (Hymenoptera: Vespidae). Ecol Ent. 16:435-440.
Gadagkar, Raghavendra, Seetha Bhagavan, Rashimi Malpe and C. Vinutha
1991. Seasonal variation in the onset of egg laying in a primitively eusocial wasp: implications for the evolution of sociality. Entomon 16:167-174.
Gadagkar, Raghavendra, K. Chandrashekara, S. Chandran and C. Vinutha
1991. Worker-brood genetic relatedness in a primitively eusocial wasp. Naturwissenschaften 78:523-526.
Gambino, Parker, Arthur C. Medeiros and Lloyd L. Loope
1990. Invasion and colonization of upper elevations on East Maui (Hawaii) by *Vespula pensylvanica* (Hymenoptera: Vespidae). Ann. Ent. Soc. Amer. 83:1088-1095.
Gayubo, S.F., J.D. Asis and J. Tormos
1992. A new species of *Palarus* Latreille from Spain with a comparative study on nesting behavior and larvae in the genus (Hymenoptera: Sphecidae). Ann. Ent. Soc. Amer. 85:26-33.
González, Jorge M., and John E. Lattke
1991. A paper wasp nest inside a plant of *Brocchinia hectioides* (Bromeliaceae). Florida Ent. 74:465.
Gray, Mike.
1991. Going, Going, Gone. Australian Nat. Hist. 23:758. (pompilid hunting behavior)
Guichard, K.M.
1991. Old world species of *Belomicrus* A. Costa, 1871. (Hymenoptera, Sphecidae). Entomofauna 12:353-372.
Gusenleitner, J.
1991. Über die *Microdynerus*-Arten Nordafrikas (Eumenidae, Vespidae, Hymenoptera). Linzer Biol. Beitr. 23:621-630.
1991. Über Vespoidea (Hymenoptera) aus der Mongolei und der Sovietunion. Linzer Biol. Beitr. 23:631-641.
1991. Neue und bemerkenswerte Grabwespenfunde für Österreich (Hymenoptera, Sphecidae). Linzer Biol. Beitr. 23:643-648.
Haeseler, Volker
1990. Ersatznester von *Dolichovespula saxonica* (Fabricius) und *Dolichovespula media* (Retzius) (Hymenoptera: Vespidae). Braunschw. Naturkdl. Schr. 3:747-756.
1991. Zum Auftreten der Grabwespe *Mimumesa atratina* (F. Morawitz 1891) am Stadtrand von Oldenburg i.O. (Hymenoptera: Sphecidae). Drosera '91:85-92.

Hallmen, Martin and Wilhelm Beier
1991. Ein Nistkasten für die Hornisse *Vespa crabro* L. zum Einsatz im Naturschutz und in der praktischen Naturerziehung (Hymenoptera: Vespidae). Mitt. Internat. Ent. Ver. 16:141-151.

Hamon, Jacques
1989. Comments on the proposed conservation of *Philanthus triangulum* (Fabricius, 1775) (Insecta, Hymenoptera) (Case 2608: see BZN 45:34-35). Bull. Zool. Nomen. 46:45.

Hamon, Jacques, Marc Russac and Robert Fonfria
1992. Les Ammophilini die France continentale et de Corse (Hymenoptera: Sphecidae). Espèces présentes et clés d'identification. Bull. Soc. Ent. Fr. 96:403-415. (keys to species)

Hansell, M.H. and S. Turillazzi
1991. A new stenogastrine nest from Papua New Guinea probably belonging to the genus *Stenogaster* Guerin 1831 (Hymenoptera Vespidae). Trop. Zool. 4:81-87.

Hebling, M.J.A., M.G.Cristofoletti-Hellmeister and V.L.L.Machado
1991. Respiratory metabolism of *Polybia (Myrapetra) paulista* Ihering, 1896 (Hymenoptera, Vespidae): influence of temperature and declining oxygen pressure. Revta Bras. Ent. 35:707-713.

Hook, Allan W.
1991. Book review: The social biology of wasps, edit. by Kenneth G. Ross and Robert W. Matthews, 1991. Amer. Ent. 37:247-248.

Kazenas, V.L.
1991. A new genus *Taukumia* (Hymenoptera, Sphecidae) from Kazakhstan. Zool. Zh. 70(5):156-158. (English translation in Ent. Rev. 70(6):21-23)
1991. Two new species of digger wasps of the genus *Belomicrus* (Hymenoptera, Sphecidae) from the southeastern Kazakhstan. Zool. Zh. 70(11):145-147. (in Russian with English summary)

Kifune, Teiji and Seiki Yamane
1991. A new record of stylopized *Vespula flaviceps flaciceps* from Primorskii Krai, the Far East USSR. Jpn. J. Ent. 59:104.

Krombein, Karl V.
1992. Host relationships, ethology and systematics of *Pseudomethoca* Ashmead (Hymenoptera: Mutillidae, Andrenidae, Halictidae and Anthophoridae). Proc. Ent. Soc. Wash. 94:91-106.
1992. Book review: Social insects – An evolutionary approach to castes and reproduction, edit. by W. Engels, 1990. Ann. Ent. Soc. Amer. 85:248-250.

Kuhlmann, Michael, Hans Retzlaff and Heinrich Wolf
1990. Zur Hautflüglerfaune (Hymenoptera) der Senne. I. Chrysididae, Tiphiidae, Mutillidae, Formicidae, Vespidae (Insektenfauna and Ökoligie der Binnendünen in der südlichen Senne. III. Teil). Mitt. ArdGem. Ostwestf.-lipp. Ent. 6:109-124.

Kurczewski, Frank E.
1991. Burrow construction from the ground surface in *Lyroda subita* (Hymenoptera: Sphecidae). Great Lakes Ent. 24:203-206.

Kurczewski, Frank E. and Richard C. Miller
1991. Range extensions for species of Sphecidae (Hymenoptera) in the northeastern United States. Great Lakes Ent. 24:253-254.
1992. Observations on the nesting of *Crabro tenuis* (Hymenoptera: Sphecidae). Great Lakes Ent. 25:33-39.

Kurczewski, Frank E. and Mark F. O'Brien
1991. *Auplopus carbonarius*, a Palearctic spider wasp, extends its range to Michigan (Hymenoptera: Pompilidae). Great Lakes Ent. 24:185-186.

Leclercq, Jean
1991. Crabroniens paléarctiques du genre *Odontocrabro* Tsuneki (Hymenoptera, Sphecidae). Bull. Annls. Soc. R. Belge Ent. 127:133-139.

Lelej, A.S.
1990. New and little known species of spider wasps (Hymenoptera, Pompilidae) from Soviet Far East, p. 71-78 *in*: News of insects systematics of Soviet Far East, Acad. Sci. USSR, Far East Branch, Vladivostok. (in Russian)

Low, Bobbi S. and William T. Wcislo
1992. Male foretibial plates and mating in *Crabro cribrellifer* (Packard) (Hymenoptera: Sphecidae), with a survey of expanded male forelegs in Apoidea. Ann. Ent. Soc. Amer. 85:219-223.

Lomholdt, Ole
1989. Comments on the proposed conservation of *Philanthus triangulum* (Fabricius, 1775) (Insecta, Hymenoptera) (Case 2608: see BZN 45:34-35). Bull. Zool. Nomen. 46:45.

Luig, Jaan
1991. On Estonian Scolioidea (Hymenoptera, Apocrita, Aculeata). Proc. Estonian Acad. Sci. Biol. 40:212-216.

Madl, Michael
1991. Zur Kenntnis der Embolemidae Österreichs (Hymenoptera, Bethyloidea, Embolemidae). Entomofauna 12:213-216.

Martin, S.J.
1992. Development of the embryo nest of *Vespa affinis* (Hymenoptera: Vespidae) in southern Japan. Ins. Soc. 39:45-57.
1992. Colony defence against ants in *Vespa*. Ins. Soc. 39:99-112.

Michener, Charles D.
1992. Sexual Dimorphism in the glossa of Colletidae (Hymenoptera, Apoidea). J. Kansas Ent. Soc. 65:1-9.

Móczár, L.
1990. Further data to the Chrysidoidea, Pompiloidea and Vespoidea fauna (Hymenoptera) of the Bátorliget Nature Reserves, p. 623-632 *in*: The Bátorliget Nature Reserves – after forty years, 1990.

Mueller, Ulrich G., Alan F. Warneke, T. Ulmar Grafe and Peter R. Ode
1992. Female size and nest defense in the digger wasp *Cerceris fumipennis* (Hymenoptera: Sphecidae: Philanthinae). J. Kansas Ent. Soc. 65:44-52.

Naumann, I.D.
1991. Chap. 42. Hymenoptera (Wasps, bees, ants, sawflies), p. 916-1000 *in*: The Insects of Australia, edit by I.D. Naumann. Melbourne Univ. Press, 1137 p. in two volumes.

Negrisolo, E.
1990. Hymenoptera Sphecidae e Scoliidae raccolte nel Friuli-Venezia Giulia e nel Veneto orientale. Gortania 12:313-328.

Nemkov, P.G.
1990. New and little known species of digger wasps (Hymenoptera, Sphecidae) of the East Siberian and Soviet

Far East, p. 79-85 *in*: News of insects systematics of Soviet Far East, Acad. Sci. USSR, Far East Branch, Vladivostok. (in Russian)

O'Donnell, S. and R.L. Jeanne
1992. The effects of colony characteristics on life span and foraging behavior of individual wasps (*Polybia occidentalis*, Hymenoptera: Vespidae). Ins. Soc. 39:73-80.

Osten, Till
1992. *Scolia rufibarbata*, eine neue Dolchwespen-Art aus Afghanistan (Hymenoptera, Aculeata).

Pekkarinen, Antti and Larry Huldén
1991. Distribution and phenology of the *Ancistrocerus* and *Symmorphus* species in eastern Fennoscandia (Hymenoptera, Eumenidae). Ent. Fennica 2:179-189.

Pratte, Michel and Jacques Gervet
1992. Effects of prior residence and previous cohabitation on the *Polistes dominulus* Christ dominance hierarchy. Ethology 90:72-80.

Pulawski, Wojciech J.
1991. A revision of the wasp genus *Kohliella* (Hymenoptera: Sphecidae). Proc. Calif. Acad. Sci. 47:289-302.
1992. World species of the wasp genus *Holotachysphex* de Beaumont (Hymenoptera: Sphecidae). Proc. Ent. Soc. Wash.94:223-242.

Queller, David C. and Joan E. Strassmann
1991. Book review: The social biology of wasps, edit. by Kenneth G. Ross and Robert W. Matthews, 1991. Science 254:736-737.

Reed, Hal C. and Peter J. Landolt
1991. Swarming of paper wasp (Hymenoptera: Vespidae) sexuals at towers in Florida. Ann. Ent. Soc. Amer. 84: 628-635.

Soika, A. Giordani and Razi Khan
1991. I *Rhynchium* del medio oriente e territori limitrofi (Hymenoptera, Vespidae). Boll. Mus Civ. St. Nat Venezia 40:99-106.

Sømme, Lauritz
1991. Astrid Løken 80 år. Insekt-Nytt (1):21-23.

Sorg, Martin and Heinrich Wolf
1991. Zur Hymenopterenfauna des NSG „Koppelstein" bei Niederlahnstein. III. Grab-, Weg- und Faltenwespen sowie andere Stechimmen (Hymenoptera, Aculeata: Dryinidae, Bethylidae, Chrysididae, Tiphiidae, Mutillidae, Sapygidae, Pompilidae, Eumenidae, Vespidae, Sphecidae). Beitr. Landespfl. Rheinland-Pfalz 14:167-200.

Strassmann, Joan E.
1991. Costs and benefits of colony aggregation in the social wasp, *Polistes annularis*. Behav. Ecol. 2:204-209.

Strassmann, Joan E., David C. Queller, Carlos R. Solis and Colin R. Hughes
1991. Relatedness and queen number in the Neotropical wasp, *Parachartergus colobopterus*. Anim. Behav. 42: 461-470.

Turillazzi, Stefano
1990. Socialità ed architettura del nido nelle vespe Stenogastrinae (Hymenoptera, Vespidae). Atti Acad. Naz. Ital. Ent. Rend. 38:1-24.
1990. Social biology of *Liostenogaster vechti* Turillazzi 1988 (Hymenoptera Stenogasterinae). Trop. Zool. 3:69-87.
1990. Notes on the biology, social behaviour and nest architecture of *Metischnogaster drewseni* (Saussure) (Hymenoptera, Stenogastrinae). Boll. Zool. 57:331-339.

Turillazzi, Stefano and M.H. Hansell
1991. Biology and social behaviour of three species of *Anischnogaster* (Vespidae, Stenogastrinae) in Papua New Guinea. Ins. Soc. 38:423-437.

von der Heide, Andreas
1991. Zum Auftreten von Stechimmen in stillgelegten Abtorfungsflächen eines Hochmoorrestes bei Oldenburg i.O. (Hymenoptera: Aculeata). Drosera '91:57-84. (survey of aculeate Hymenoptera in a raised peat bog)

von der Smissen, Jane
1991. Beitrag zur Bienen- und Wespenfauna des südöstlichen Schleswig-Holstein und des Wendlandes (Hymenoptera: Aculeata). Drosera '91:93-99.

Wahis, Raymond
1991. Sur 2 espèces d'*Anoplius* (s. str.): *A. tenuicornis* (Tournier, 1889) et *A. basalis* Dreisbach, 1950 (Hymenoptera: Pompilidae, Pompilinae). Bull. Annls Soc. R. Belge Ent. 127:113-117.

Wahis, Raymond and Edgard Gros
1991. Sur trois pompilides méditerranéens peu connus: *Poecilagenia rubicans* (Lepeletier, 1845), *Agenioideus fascinubecula* Wolf, 1986 and *Arachnospila conjungens* (Kohl, 1898) (Hym. Pompilidae). Bull. Soc. Ent. Fr. 96:55-67.

Wahis, Raymond and Frédéric Longo
1991. *Priocnemis mesobromeli* Wolf, pompilide nouveau pour la faune belge (Hymenoptera: Pompilidae, Pepsinae). Notes Fauniques de Gembloux no. 24, p. 27-32.

Wahl, David
1992. Obitury: Henry K. Townes, Jr. Proc. Ent. Soc. Wash. 94:289-292. (includes bibliography 1983-1992; see also **Sphecos** 21:2-3)

Wenzel, John
Les nids de guêpes sociales d'intérêt historique conservés au MNHN, á Paris [Hymenoptera, Vespidae]. Revue Fr. Ent., (N.S.) 14:1-11.
Extreme queen-worker dimorphism in *Ropilidia ignobilis*, a small-colony wasp (Hymenoptera: Vespidae). Ins. Soc. 39:31-43.

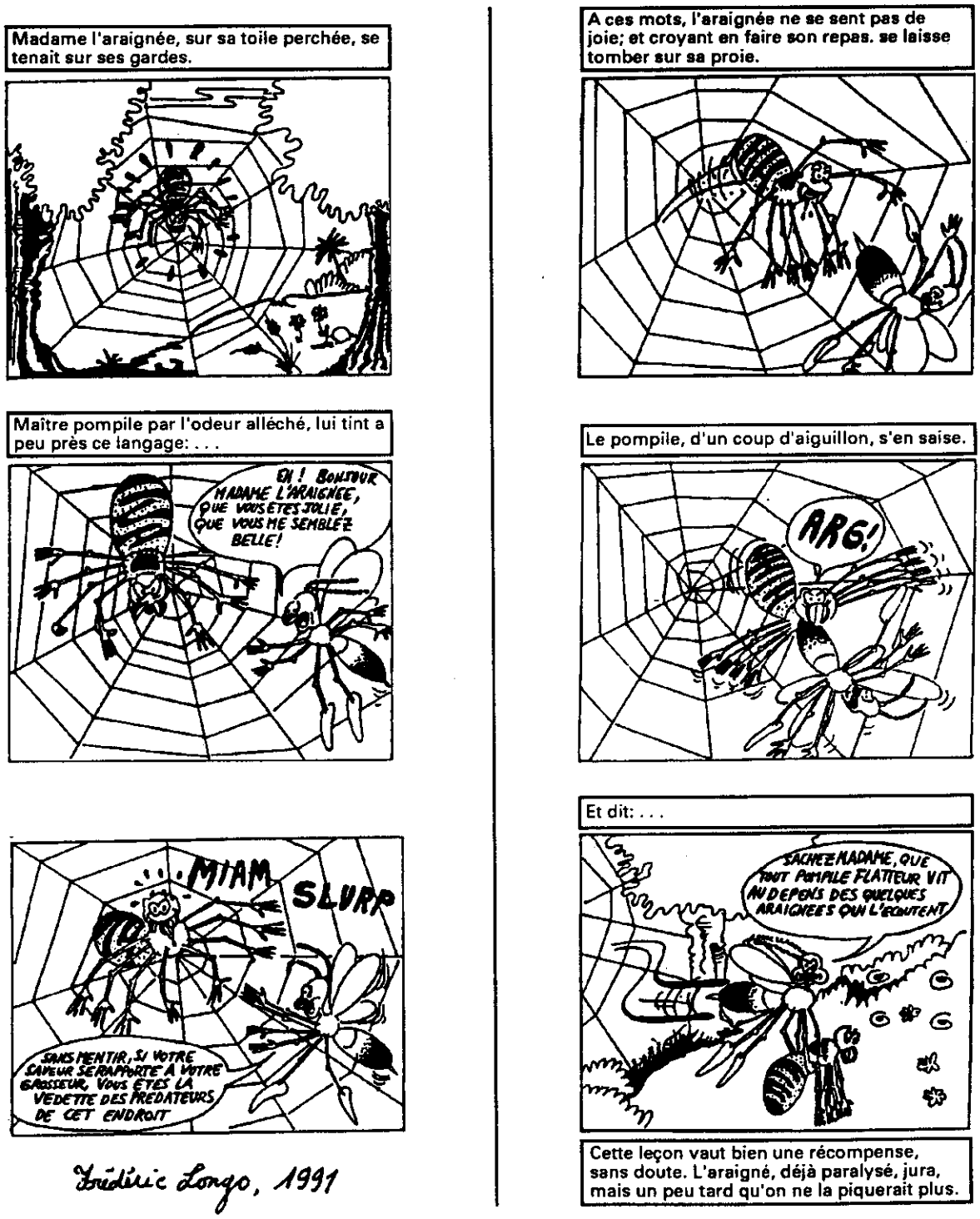
Whitehead, V.B. abd K.E. Steiner
1991. Males of *Podalonia canescens* (Sphecidae) pollinating the orchid *Disa atricapilla*, p. 120 *in*: Verrigtinge van die Agste Entomologiese Kongress gereël deur die Entomologiese Vereniging van Suidelike Afrika, Pretoria. 175 p.

Willink, Abraham
1991. Contribucion a la zoogeografia de insectos Argentinos. Bol. Acad. Nac. Cien., Cordoba 59:125-147.

Wolf, Heinrich
1991. Heimische Wespen. Der Sauerländische Naturbeobachter 22:2-9. (keys to Vespinae)
1991. Wegwespen (Hymenoptera: Pompilidae) aus der Mongolei. III. Ergebnisse der Mongolische-Deutschen Biologischen Expiditionen Seit 1962. NR. 214. Linzer Biol. Beitr. 23:371-373.
1991. Sommerzeit – Wespenzeit! Natur-Info Nr. 1. 3 p.
1991. Bewohner von Schilfgallen in Langen (Hessen). Hess. Faun. Briefe 11:31-33. (*Pemphredon lethifera* associated with chloropid galls.)
1992. Neuere Literatur über aculeate Hymenopteran. Mitt. Internat. Ent. Ver. 17:29-34.

Wu Yan-ru and Zhou Qin
1991. A study on Chinese Nyssonidae with description of a new species (Hymenoptera: Sphecoidea, Nyssonidae). Acta Ent. Sinica 34:364-366.

Yamane, Seiki
1991. Occurrence of *Ropalidia marginata* on the Volcano Islands, Japan. (Hymenoptera, Vespidae). Proc. Japan. Soc. Syst. Zool. (45):55-59.
Yamane, Seiki and Teiji Kifune
1991. Detailed data of the stylopized Eumenidae included in the paper of Sk. Yamane (1990). New Ent. 40:11-12.
Yamane, Seiki and Hideaki Matsuura
1991. Establishment of *Delta pyriforme* (Fabricius) in the Bonin Islands, Japan (Hymenoptera, Eumenidae). Tropics 1:155-162.
Zhang Shi-mei, Chao Yong-xiang and Hu Sheng-chang
1991. A discussion on the line of demarcation of the Palearctic and Oriental regions of Xizang Autonomous Region. Acta Ent. Sinica 34:103-107.

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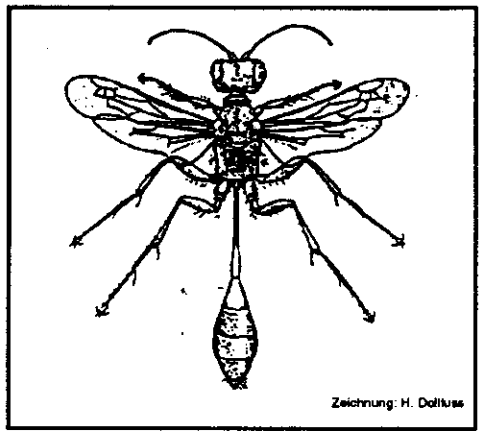


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