

Biosystematic Studies of Ceylonese
Wasps, XX: A Revision of *Tachysphex*
Kohl, 1883, with Notes on Other
Oriental Species (Hymenoptera:
Sphecidae: Larrinae)

KARL V. KROMBEIN
and
WOJCIECH J. PULAWSKI

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Biosystematic Studies of Ceylonese Wasps,
XX: A Revision of *Tachysphex* Kohl, 1883,
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*Karl V. Krombein,
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SMITHSONIAN INSTITUTION PRESS

Washington, D.C.

1994

A B S T R A C T

Krombein, Karl V., and Wojciech J. Pulawski. Biosystematic Studies of Ceylonese Wasps, XX: A Revision of *Tachysphex* Kohl, 1883, with Notes on Other Oriental Species (Hymenoptera: Sphecidae: Larrinae). *Smithsonian Contributions to Zoology*, number 552, 106 pages, 257 figures, 1994.—Twenty-three species of *Tachysphex* are recorded from Sri Lanka. Nine previously known species are redescribed, and the following new species are described: *anthracinus* Pulawski (Sri Lanka), *chiatotrichus* Pulawski (Sri Lanka), *crinitus* Pulawski (Sri Lanka), *diadelus* Pulawski (Sri Lanka), *drymobius* Pulawski (Sri Lanka), *eucharistus* Pulawski (Sri Lanka), *gryllivorus* Pulawski (Nepal, Sri Lanka), *haematopus* Pulawski (Sri Lanka), *indicus* Pulawski (southern India, Sri Lanka), *noar* Pulawski (Sri Lanka), *oxychelus* Pulawski (Sri Lanka), *sri* Pulawski (Sri Lanka), *sympleuron* Pulawski (India, Sri Lanka), and *xanthoptesimus* Pulawski (southern India, Sri Lanka). Other species known from lowland India, Burma, and Thailand, are redescribed in the Appendix, and two new species are described: *actites* Pulawski from Thailand and *rugicauda* Pulawski from India. A key for all of the species treated is provided. Newly synonymized names are: *Tachysphex consocius mookonis* Tsuneki, 1972, = *nitidissimus* de Beaumont, 1952; *Tachysphex grandii* de Beaumont, 1965, = *consocius* Kohl, 1892; *Tachysphex collaris* Kohl, 1898, and *lanatus* Arnold, 1947, = *mediterraneus* Kohl, 1883; *Tachysphex egregius* Arnold, 1924, = *plicosus* (A. Costa, 1867); *Tachytes flavogeniculatus* Taschenberg, 1880, = *Tachysphex erythropus* (Spinola, 1839); *Tachysphex lugubris* Arnold, 1924, *rugosus* Gussakovskij, 1952, and *quadrifurci* Pulawski, 1971, = *minutus* Nurse, 1909; *Tachysphex peculator* Nurse, 1909, = *albocinctus* (Lucas, 1849); *Tachysphex schmiedeknechti satanas* Pulawski, 1971, = *schmiedeknechti* Kohl, 1883; *Tachysphex tinctipennis* Cameron, 1904, = *morosus* (F. Smith, 1858); and *karooensis* Arnold, 1923, and *foucauldi* de Beaumont, 1952, = *vulneratus* R. Turner, 1917. The following taxa, previously regarded as subspecies of *Tachysphex panzeri* (Vander Linden, 1829), are newly synonymized with the latter: *Lyrops rufiventris* Spinola, 1839, *Tachytes oraniensis* Lepageletier, 1845, *Tachytes pulverosus* Radoszkowski, 1886, *Tachysphex panzeri fortunatus* de Beaumont, 1968, *Tachysphex panzeri cyprius* Pulawski, 1971, and *Tachysphex panzeri sareptanus* Pulawski, 1971. A neotype is designated for *Tachytes discolor* Frivaldszky, 1877 (a junior synonym of *Tachysphex panzeri* (Vander Linden, 1829)). The species group classification for the genus is abandoned because of intermediate species. *Tachysphex vulneratus* R. Turner, previously known from Africa, is first recorded from India and Thailand; *lagunaensis* Tsuneki, described from the Philippines, is recorded from Laos and Thailand; and *panzeri* (Vander Linden), known from the western Palearctic to the Indian subcontinent, is recorded from Thailand. Original behavioral data are presented for *consocius*, *drymobius*, *gryllivorus*, *indicus*, *morosus*, *panzeri*, and *sympleuron*.

OFFICIAL PUBLICATION DATE is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year*. SERIES COVER DESIGN: The coral *Montastrea cavernosa* (Linnaeus).

Library of Congress Cataloging-in-Publication Data (revised for vol. 20)
Krombein, Karl V.

Biosystematic studies of Ceylonese wasps.

(Smithsonian contributions to zoology ; no. 16, 20: Authors Karl V. Krombein and Wojciech J. Pulawski.)

Vol. 17: Authors: Karl V. Krombein and J. van der Vecht.

In vols. place of publication appears as: City of Washington.

Includes bibliographical references.

Contents: 2. Scolioidea (Hymenoptera: Scolioidea)—5. Ampulicidae (Hymenoptera: Sphecoidea)—20. A revision of *Tachysphex* Kohl, 1883, with notes on other Oriental species (Hymenoptera: Sphecidae: Larrinae)

Supt. of Docs. no.: SI 1.27:374

1. Wasps—Sri Lanka—Classification. I. Pulawski, Wojciech J. II. Vecht, J. van der (Jacobus). III. Title. IV. Series: Smithsonian contributions to zoology ; no. 283, etc.

QL1.S54 no. 283, etc. 591s 82-600154 [QL567.5.S72] 595.79'8

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Introduction

With 382 species recognized through 1993, *Tachysphex* is the second largest genus of Larrinae after *Trypoxylon*, which has 629 known species. With 23 species resident in Sri Lanka, it has a larger representation than any other sphecid genus except the allied larrine genus *Liris* Fabricius, which has at least 24 described and undescribed species.

Sri Lanka is a small country (65,610 km²), but it is a land of diverse habitats ranging from the more xeric areas of low altitude in the northwest and southeast to the large expanse of rain forest in the southwest. It is divided into several ecological zones (see "Climatic and Ecological Zones" below), and the species of *Tachysphex* exhibit several distributional patterns. Most species occur at low altitudes from near sea level to 100 m, but two species, *bengalensis* and *morosus*, are found altitudes of 900 and 1880 m, respectively. Thirteen species are restricted to more xeric areas where the average annual rainfall is in the 870–1725 mm range, but nine species occur both in these more xeric areas and in wetter localities where the average annual rainfall may be nearly 5000 mm. One species, *drymobioides*, has been collected only at several localities in the lowland rain forest where the average annual rainfall may be as

high as 3900 mm.

Bingham (1897:194) first reported *Tachysphex* occurring in Sri Lanka. He cited *auriceps* Cameron, originally described from Pune (= Poona), India, from "Bombay; Bangalore; Ceylon." We have seen no Sri Lankan examples of *auriceps* nor specimens determined by Bingham, but his material was most likely *panzeri*. (*panzeri* is common in Sri Lanka, and males run to *auriceps* in Bingham's key to the genus.) Kohl (1901:783) was the first author to describe a Sri Lankan species, *brevitarsis* (now recognized as a synonym of *bengalensis* Cameron), from Badureliya in Kalutara District. The only other mention of *Tachysphex* in Sri Lanka was the occurrence of *changii* Tsuneki, known previously only from Taiwan and the Ryukyu Islands (Krombein, 1981:123).

Several years ago we published a revisionary study of Sri Lankan species of the larrine genus *Gastrosericus* Spinola (Krombein and Pulawski, 1986). We have adopted the same procedure in preparing the present revision, with Krombein taking responsibility for the section on natural history and the computer generated maps, Pulawski preparing the section on systematics and other illustrations, and both of us collaborating on the introduction. We then exchanged drafts of the respective sections and, after making essential modifications, prepared the final draft presented here.

While working on Sri Lankan material, Pulawski examined all species of *Tachysphex* recorded from the Oriental Region. Some of them may be found subsequently in Sri Lanka. Most of these species have never been revised and their original descriptions were mostly poor and did not provide information on critical body structures. For this reason, all species recorded from Burma, India (excluding Himalaya), and Thailand are redescribed in an Appendix.

The preceding number in the series, "Biosystematic Studies

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Review Chairman: John M. Burns, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. Reviewers: Byron A. Alexander, University of Kansas, Lawrence, Kansas 66045-2106; James M. Carpenter, American Museum of Natural History, New York 10024-5192; Michael A. Prentice, University of California, Berkeley, California 94720.

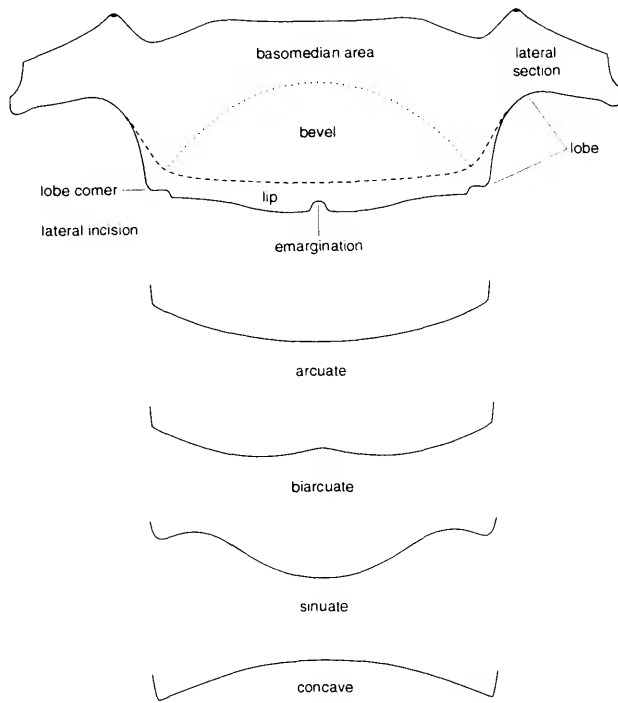


FIGURE 1.—Clypeus of *Tachysphex* (an idealized female).

of Ceylonese Wasps," is "XIX: Natural History Notes in Several Families (Hymenoptera: Eumenidae, Vespidae, Pompilidae, and Crabronidae)" *Smithsonian Contributions to Zoology*, 515, 41 pages, 59 figures, 1991, by Karl V. Krombein.

SOURCES OF MATERIAL.—The section on natural history is based on data obtained by K.V. Krombein during his dozen visits to Sri Lanka from 1969 through 1981 and/or by P.B. Karunaratne. The section on systematics is based primarily on specimens collected by various specialists and technicians during the Smithsonian "Ceylon Insect Project," supplemented by material from other collections as noted in the Acknowledgment subsection. Many extralimital specimens were collected by Pulawski, mostly in Thailand and India in 1989, in Namibia in 1990, and the Ivory Coast, Ghana, and Togo in 1991.

TECHNICAL TERMS AND SYMBOLS.—We essentially follow Bohart and Menke (1976) in their use of morphological terms, but those for the mandible are from Michener and Fraser (1978), and a few others are new. The terms anterior and posterior are proper spellings for the words anterad and posterad that are commonly used in literature on aculeate Hymenoptera. We prefer to follow the common usage. Less known or new terms are defined as follows:

Clypeus (Figure 1): has a median section and two lateral sections. The middle section usually has a densely punctate, setose basomedian area, a sparsely punctate, shiny bevel, and a marginal lip. The prominent, anterome-

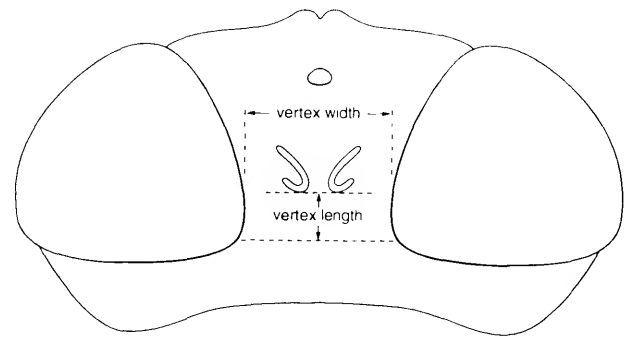


FIGURE 2.—Vertex of *Tachysphex*.

dian (or ventromedian) portion of the middle section is often referred to as the lobe. The free margin of the lobe can be straight, arcuate, biarcuate, sinuate, or concave; the lip can have a mesal emargination and/or lateral incisions on each side. The clypeal length is measured along the body's median axis.

Episternal sulcus complete (incomplete): reaching (not reaching) mesothoracic foremargin;

Female tarsi of *brullii* type (Figures 97-99): tarsomere IV on all legs about as wide as long, with straight apicoventral margin; tarsomeres V elongate, not angulate basally, with conspicuously convex apicoventral margin; claws elongate, equal in size;

Female tarsi of *obscuripennis* type (Figures 117-122): tarsomere IV on all legs wider than long, widely, obtusely emarginate, with apicoventral margin produced into a lobe; tarsomeres V not elongate, angulate basoventrally, with apicoventral margin produced into a lobe; claws not elongate, unequal in size (one claw of each pair being larger);

Female tarsi of *pompiliformis* type: tarsomere IV on all legs longer than wide, acutely emarginate, with apicoventral margin concave; tarsomeres V not elongate, not angulate basally, with apicoventral margin straight or slightly concave; claws not elongate, equal in size;

Hindwing crossvein cu-a inclined (reclined): posterior end further from (closer to) wing base than anterior end (Figures 234 and 18).

Mandibular condyle: mandibular articulation on the occipital side of the head capsule;

Mesothoracic venter: area between the fore- and midcoxae;

Sternum, tergum: abbreviated terms for gastral sternum, gastral tergum;

Trimmal carina: begins at some distance from the mandibular base and constitutes the inner mandibular margin except basally.

Vertex length (Figure 2): the distance between a hindcellus and an imaginary line connecting the eye hindcorners (i.e., the points where the inner and the posterior portions of the orbits meet).

Vertex width (Figure 2): the shortest interocular distance.

The terms *anteriad* and *posteriad* are proper spellings for the words *anterad* and *posterad* that are commonly used in literature on aculeate Hymenoptera. We prefer to follow the common usage.

BIBLIOGRAPHIC CITATIONS.—Pulawski (1971) provided a full bibliography for several species considered here, and most of these references are not repeated below. Subsequent references have been added, except for those faunal papers that deal with commonly collected species and refer to localities within the previously known ranges.

MATERIAL DEPOSITORIES.—Institutional or personal collections in which the material examined is deposited or where the type specimens are kept are abbreviated in the text as follows:

BMNH	British Museum (Natural History) [current nonstatutory name: The Natural History Museum], London, Great Britain
BISH	Bernice P. Bishop Museum, Honolulu, Hawaii
CAS	California Academy of Sciences, San Francisco, California
CNC	Canadian National Collection of Insects, Arachnids, and Nematodes, Biosystematic Research Institute, Ottawa, Ontario
FSAG	Faculté des Sciences Agronomiques de l'Etat, Gembloux, Belgium
GENOVA	Museo Civico di Storia Naturale, Genova, Italy
HALLE	Institut für Zoologie, Martin-Luther Universität, Halle-Wittenberg, Germany
ITZA	Instituut voor Taxonomische Zoölogie - Zoölogisch Museum, Amsterdam, the Netherlands
KRAKÓW	Zakład Zoologii Systematycznej Polskiej Akademii Nauk, Kraków, Poland
LAUSANNE	Musée Zoologique, Lausanne, Switzerland
LUND	Zoological Museum, Lund, Sweden
MNCN	Museo Nacional de Ciencias Naturales, Madrid, Spain
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MOSCOW	Zoological Museum, Moscow State University, Moscow, Russia
NAPOLI	Istituto e Museo di Zoologia dell'Università di Napoli, Napoli, Italy
NMC	National Museum, Colombo, Sri Lanka
NHMW	Naturhistorisches Museum, Wien, Austria
OSU	Entomology Museum, Oregon State University
OXFORD	Oxford University Museum, Hope Department of Entomology, Oxford, Great Britain
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands

SAM	South African Museum, Cape Town, South Africa
TMB	Természettudományi Múzeum, Budapest, Hungary
TMP	Transvaal Museum, Pretoria, South Africa
TORINO	Istituto e Museo di Zoologia dell'Università di Torino, Torino, Italy
UCD	Department of Entomology, University of California, Davis, California
USNM	United States National Museum of Natural History, Smithsonian Institution, Washington, D.C.
ZIN	Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
ZMK	Zoologisk Museum København, Denmark
ZSBS	Zoologische Sammlung der Bayerischen Staates, München, Germany

One or a pair of paratypes have been deposited in the National Museum, Colombo.

COLLECTOR NAMES.—Collectors of specimens in type series of new species are abbreviated as follows (names that occur once or twice are spelled in full):

DWB	D.W. Balasooriya
EGD	E.G. Dabrera
GR	G. Ratnavira
KVK	K.V. Krombein
LW	L. Weeratunge
MJ	M. Jayaweera
NK	N. Karunaratne
NVTAW	N.V.T.A. Weragoda
PBK	P.B. Karunaratne
[PBK]	Collector's name not indicated on the label, but the handwriting is that of P.B. Karunaratne
PF	P. Fernando
PL	P. Leanage
RS	R. Subasinhe
SK	S. Karunaratne
SS	S. Siriwardane
TG	T. Gunawardane
TW	T. Wijesinhe
VG	V. Gunawardane
VK	V. Kulasekera
WJP	W.J. Pulawski

GEOGRAPHIC NAMES.—We use the current official names for the countries, provinces, and localities, with two exceptions. Ceylon or Ceylonese is used in the title and occasionally in the Introduction. The term Transcaspiia is used to designate the republics of Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. The area was known as Russian Turkestan prior to 1920, and as Soviet Middle Asia until 1991.

SRI LANKAN LOCALITIES, CLIMATIC AND ECOLOGICAL ZONES.—Figure 3 shows the political division of the country

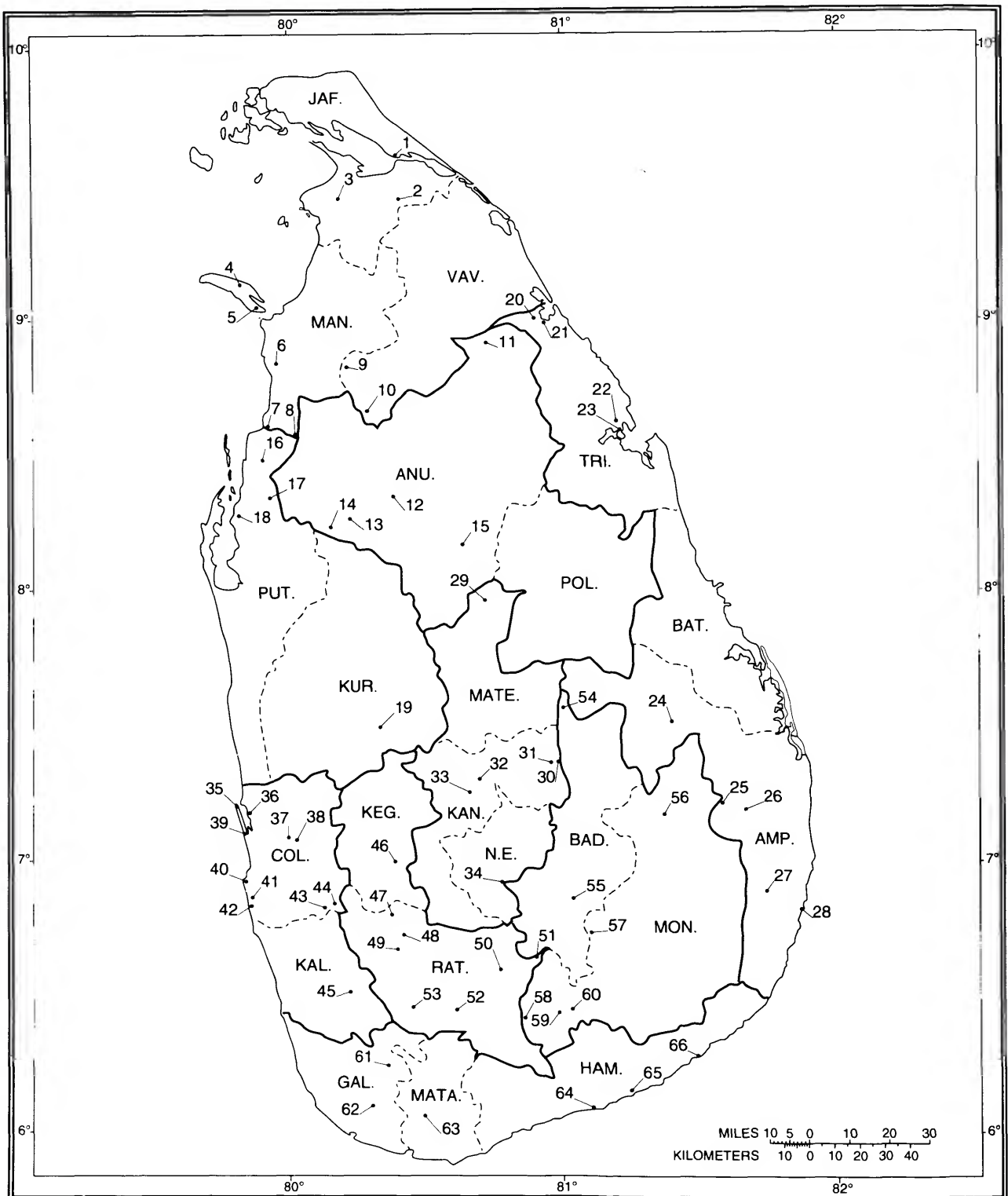


FIGURE 3.—Map of Sri Lanka showing division of country into Provinces (solid lines) and Districts (dashed lines), and the localities in numerical sequence at which specimens of *Tachysphex* have been collected.

into Provinces and Districts as of 1974. The abbreviations for Districts are those used on locality labels of specimens collected during the Smithsonian Ceylon Insect Project, 1969–1981. The Provinces are listed below in the sequence used in the Ceylon Gazetteer (USBGN, 1960:ii). The names of the Districts, and abbreviations as used on the map, are as follows: Jaffna (Jaf.), Mannar (Man.) and Vavuniya (Vav.) Districts in Northern Province; Anuradhapura (Anu.) and Polonnaruwa (Pol.) Districts in North Central Province; Puttalam (Put.) and Kurunegala (Kur.) Districts in North Western Province; Matale (Mate.), Kandy (Kan.) and Nuwara Eliya (N.E.) Districts in Central Province; Trincomalee (Tri.), Batticaloa (Bat.) and Amparai (Amp.) Districts in Eastern Province; Colombo (Col.) and Kalutara (Kal.) Districts in Western Province; Kegalla (Keg.) and Ratnapura (Rat.) Districts in Sabaragamuwa Province; Badulla (Bad.) and Monaragala (Mon.) Districts in Uva Province; and Galle (Gal.), Matara (Mata.) and Hambantota (Ham.) Districts in Southern Province. It should be noted that in 1975 the former Vavuniya District was divided into the Mullaitivu and Vavuniya Districts, and the former Colombo District into the Gampaha and Colombo Districts. We have not used these Districts on the map, because all of the Ceylon Insect Project specimens are labeled with the pre-1975 Districts. None of the *Tachysphex* localities is in the new Mullaitivu District, but the following are in the new Gampaha District: Gampaha Botanic Gardens, Henaratgoda, Katunayaka, Kurana, and Pamunugama.

Our collecting areas were most frequently in jungles, sanctuaries or protected areas, but occasionally along roadsides. The localities in numerical sequence as mapped in Figure 3 are listed below. A few unfamiliar words in the listing are as follows:

aru, ara–stream

damana–open sandy loam area in Dry Zone jungle with sparse tufts of grass and a few small shrubs

ganga–stream, river

oya–stream, river

tank–artificial impoundment of water behind an earthen embankment

villu–marsh, pond, tank, lake

Northern Province

Jaffna District

1. Elephant Pass, a narrow passage between two parts of Jaffna District
2. Kilinochchi
3. 10 mi (16 km) S of Pooneryn

Mannar District

4. Pesalai
5. Mannar
6. Ma Villu, a tank, including the villages of Silavatturai and Kondachchi

7. Marichchukkaddi
8. 0.5 mi (0.8 km) NE of Kokmotte Bungalow, Wilpattu National Park in Puttalam District, in thorn scrub jungle and on damanas

Vavuniya District

9. Parayanalankulam, including Irrigation Canal, 25 mi (40 km) NW of Medawachchiya
10. Cheddikulam

North Central Province

Anuradhapura District

11. Padaviya, including Archeological or Antiquities site
12. Anuradhapura
13. Nochchiyagama
14. Hunuwilagama
15. Ritigala Natural Reserve

North Western Province

Puttalam District

16. Kali Villu in Wilpattu National Park
17. Panikka Villu in Wilpattu National Park
18. Arukallu, Eluamkulam, 15 mi (24 km) N of Puttalam

Kurunegala District

19. Kurunegala, including Athugala and Badegamuwa Jungle

Eastern Province

Trincomalee District

20. Tennamaravadi
21. Amarivayal
22. Kanniyai, including 7 mi (11.2 km) W of Trincomalee
23. Trincomalee including China Bay and Ridge Bungalow

Amparai District

24. Maha Oya
25. Inginiyagala
26. Ekgal Aru, including Tank and Reservoir Jungle
27. Lahugala Sanctuary
28. Radella, including Panama

Central Province

Matale District

29. Kibissa, 0.5 mi (0.8 km) W of Sigiriya

Kandy District

30. Hasalaka, including 5 mi (8 km) NW of Mahiyangana in Badulla District
31. Thawalamtenne
32. Kandy, including Udawattakele Sanctuary, Peak View Bungalow and Reservoir Jungle
33. Peradeniya

Nuwara Eliya District

34. Hakgala, including Botanical Gardens and Natural Reserve

Western Province

Colombo District

- 35. Kurana
- 36. Katunayaka
- 37. Gampaha Botanical Garden
- 38. Henaratgoda
- 39. Pamunugama
- 40. Colombo, including Museum Garden
- 41. Nugegoda, including Kohuwala
- 42. Ratmalana, including Zoo Farm and Airport
- 43. Handapangoda
- 44. Labugama Reservoir

Kalutara District

- 45. Badureliya

Sabaragamuwa Province

Kegalla District

- 46. Kitulgala, including Bandarakele Jungle or Makande Mukalana

Ratnapura District

- 47. Deerwood, Kuruwita
- 48. Gilimale, including Induruwa Jungle
- 49. Ratnapura
- 50. Rajawaka
- 51. Uggalkaltota
- 52. Bulutota Pass
- 53. Weddagala, near Sinharaja Jungle

Uva Province

Badulla District

- 54. Ulhitiya Oya, 15 mi (24 km) NNE of Mahiyangana
- 55. Ella

Monaragala District

- 56. Nilgala
- 57. Wellawaya
- 58. Uda Walawe
- 59. Mau Aru or Ara, 10 mi (16 km) E of Uda Walawe
- 60. Angunakolapelessa, including 12 (19.2 km) and 13 mi (20.8 km) E of Uda Walawe

Southern Province

Galle District

- 61. Kanneliya Jungle, near Hiniduma
- 62. Kottawa Forest Reserve

Matara District

- 63. Paraduwa¹

Hambantota District

- 64. Hambantota

- 65. Bundala Sanctuary

- 66. Palatupana including Yala, Tank, and Wildlife and Nature Protection Society Bungalow (WLNPS).

Figure 4 shows the partition of Sri Lanka into areas based on average annual rainfall, and the division into ecological areas. For the sake of conciseness, explanation of zones and the distance scales are omitted from the distribution maps that accompany the treatments of individual species.

The delineation into areas of average annual rainfall is based on de Silva (1980, map II), which used averages for a period of 30 years, 1931–1960.

The ecological zones, indicated by the letters A through D, are those adopted by plant and mammal ecologists (Mueller-Dombois, 1969, and Crusz, 1986). The botanists characterize these zones as follows: A, the *Manilkara-Chloroxylon* series of plants, found in both northwestern and southeastern Sri Lanka; B, the *Chloroxylon-Berrya-Vitex-Schleicheria* series; C, the *Filicium-Euphoria-Artocarpus-Myristica* series; and D includes the three rain forest areas, lowland, mid and high altitude, each dominated by different plant series. The mammalogists use the following terms for these zones: A, monsoon scrub jungle; B, monsoon forest and grassland; C, intermonsoon forest; and D, rainforest and grassland, subdivided into areas below 914 m, between 914 and 1524 m, and above 1524 m.

Areas with rainfall of less than 2000 mm annually, A and most of B, are considered to be the Dry Zone, and areas above 2000 mm annually the Wet Zone. Zone C is commonly designated as the Intermediate Zone, where rainfall may be above 2000 mm in small circumscribed sections.

ACKNOWLEDGMENTS.—Field work by Krombein in Sri

¹ A specimen of *bengalensis* Cameron bears a handwritten label, "Paradua/Ceylon/W.Horn 99." The Ceylon Gazetteer does not list such a place, but it does list three Paraduwas. We assume that the spelling on the label is incorrect, and that one of these Paraduwas is where Horn collected. One Paraduwa is a village in Kalutara District at coordinates 06°38'N and 80°00'E on the Kalu Ganga, 8 km upstream from Kalutara on the west coast. The other two Paraduwas are a village and an estate, both at 06°04'N and 80°29'E on the Nilwala Ganga, 18 km upstream from Weligama on the south coast. The localities in both Districts are in the Wet Zone, and have an average annual rainfall of 2540–3175 mm.

We reviewed Horn's (1899) account of his collecting trip of three months in Ceylon. He mentioned a number of localities but his "Paradua" is not among them. He visited various places on his second trip of two weeks along the southwestern coast from Colombo at 06°56'N and 79°51'E, to Weligama at 05°58'N and 80°25'E. He did not always list dates with localities, but he mentioned leaving Colombo on 14 June by train for Weligama, a trip of 5½ hrs. He suffered a stroke at Weligama, probably a day or two later, and then spent a few days in the mountains. He says 10 days, but considering later dates mentioned, it probably was not more than 3–4 days. On his return trip to Colombo, he noted stopping for a day in Galle, spending three days in Bentota, arriving in Mt. Lavinia on 27 June, the next date mentioned after 14 June, and going on to Colombo the next day. So, it appears that he was in the Weligama area for about 8–9 days. Inasmuch as he did not list a stop at Kalutara, we have assumed that his "Paradua" must have been in Matara District on the road north from Weligama into the higher country.

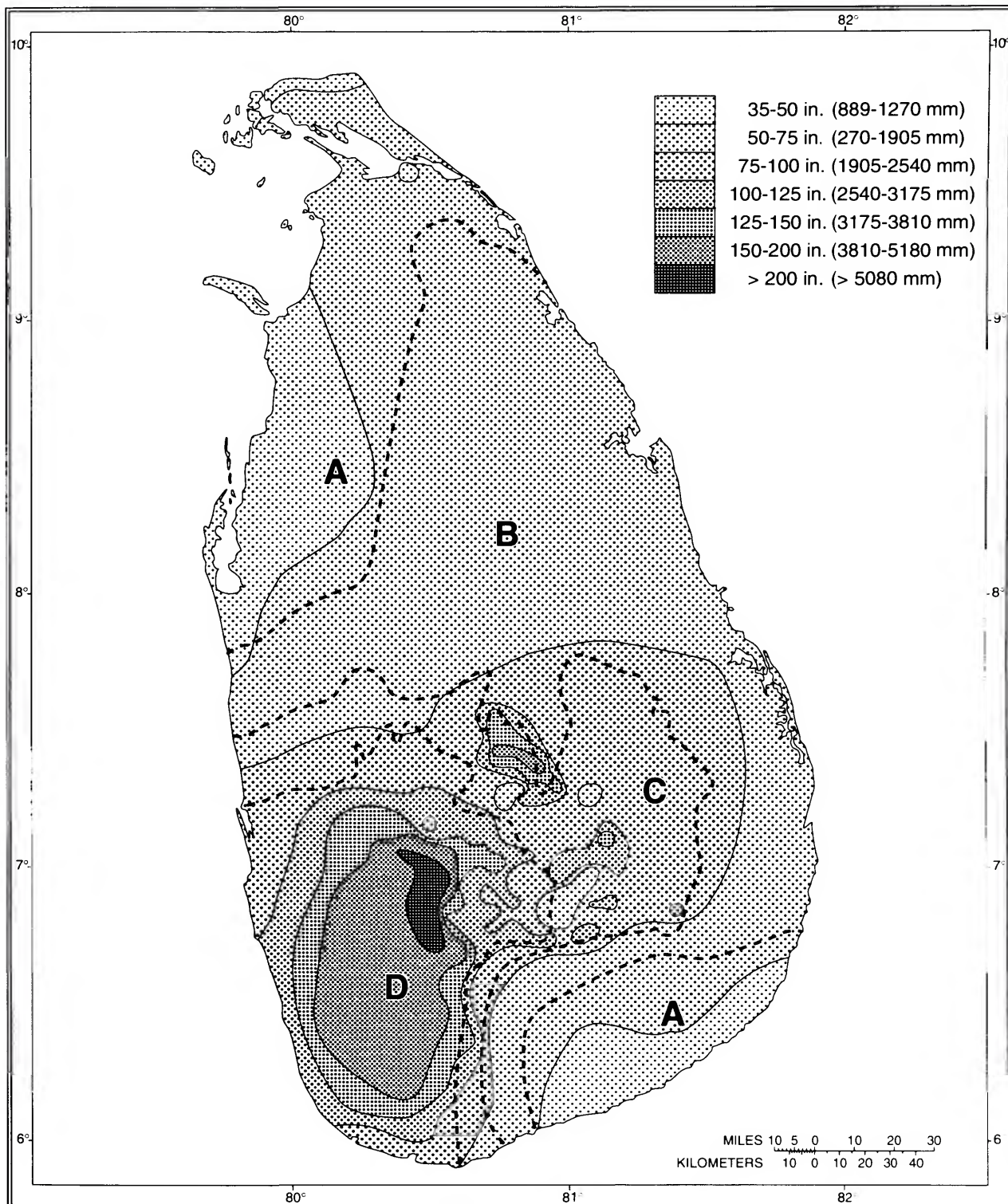


FIGURE 4.—Map of Sri Lanka showing average annual rainfall, 1931–1960, and ecological zones (A–D, dashed lines). (Adapted respectively from de Silva, 1980, and Mueller-Dombois, 1969).

Lanka was funded by Smithsonian Research Foundation Grant SFG-0-6955, and travel was provided in part by Fluid Research Funds from former Secretary S. Dillon Ripley. Within Sri Lanka Krombein is indebted to W. Thelma T.P. Gunawardane, currently Director, Department of National Museums, who planned itineraries and arranged accommodations for field parties. P.B. Karunaratne, former Curator of Insects at the Museum, accompanied many of the field parties and participated in making some of the behavioral observations as well as in collecting some of the specimens on which this study is based. Field work by Pulawski was supported by the National Science Foundation, Grant Number BSR-8722030.

We thank the persons who made material available for study: J.A. DiGiulio and George R. Ferguson (Oregon State University, Corvallis, Oregon), Margie A. Cochrane (South African Museum, Cape Town, South Africa), Gary A. Gibson (Biosystematic Research Institute, Ottawa, Ontario, Canada), Ole Lomholdt (Zoologisk Museum, Copenhagen, Denmark), Elvira Mingo (Museo Nacional de Ciencias Naturales, Madrid, Spain), Gordon M. Nishida (Bishop Museum, Honolulu, Hawaii), Christopher O'Toole (Hope Collections of Entomology, University Museum, Oxford, Great Britain), Jenő Papp (Természettudományi Múzeum Alattara, Budapest, Hungary), R.T. Simon Thomas (Instituut voor Taxonomische Zoölogie -Zoölogisch Museum, Amsterdam, the Netherlands), Colin R. Vardy (British Museum, Natural History, London, Great Britain).

We are grateful to the following specialists for identification of prey captured by the several species of *Tachysphex* discussed in the section on Natural History: Nicholas D. Jago, Centre for Overseas Pest Research, London (nymphs of Acrididae and Eumastacidae); and the late Ashley B. Gurney, Systematic Entomology Laboratory (SEL), U.S. Department of Agriculture, Washington (adult Acrididae, Gryllidae, and Blattidae).

We are indebted to Arnold S. Menke (Systematic Entomology Laboratory, United States Department of Agriculture, Washington, D.C.) and to Frank E. Kurczewski (College of Environmental Science and Forestry, State University of New York, Syracuse) for their pertinent and helpful remarks on the subfinal draft of the manuscript.

We thank Lisa A. Borok and Mary Ann Tenorio (CAS) who generated SEM micrographs (Mary Ann also produced the line drawings), and George L. Venable (USNM) who used computer graphic techniques to provide the distributional and ecological maps.

Natural History

In this section, original observations on Sri Lankan *Tachysphex* are reported and summaries of known information are given for two species discussed in the Appendix (*schmie-deknechti* and *alhocinctus*).

Most species of *Tachysphex* in Sri Lanka are found

principally within the Dry Zone in areas where the average annual rainfall ranges from 850 to 2000 mm. Two species of wide distribution in the Oriental Region or in the Indian subcontinent, *changi* Tsuneki and *bengalensis* Cameron, are found in both the Dry Zone and the Wet Zone. Other species that occur in both zones are uncommon in the more humid localities. However, *drymobius* Pulawski, new species, is known only from a short series collected at several localities in the Sinharaja rain forest, where rainfall in some years may exceed 5000 mm.

All *Tachysphex* are ground-nesting wasps, and most species prefer to nest in friable soils such as sand or sandy loam. The species are most abundant at low elevations, but *bengalensis*, one of the more widely distributed species within Sri Lanka, is found from near sea level to an elevation of about 915 m.

Ethological observations in Sri Lanka were made by K.V. Krombein and/or P.B. Karunaratne. Field notes and voucher specimens are in the National Insect Collection in the Smithsonian Institution, and bear the following code numbers (the species sequence is the same as in the section on systematics, see also there for rationale):

Tachysphex morosus F. Smith—61076D, 62176E; *Tachysphex consocius* Kohl—52376D; *Tachysphex gryllivorus* Pulawski, new species—101377B,C,F,G,H; *Tachysphex drymobius* Pulawski, new species—11575F; *Tachysphex sympleuron* Pulawski, new species—10977A; *Tachysphex panzeri* (Vander Linden)—2875A, 22775B, 61276A; *Tachysphex indicus* Pulawski, new species—21579A,B, 21679C.

Reference is made in the discussion of each of these species to two papers by Pulawski (1971, 1988) that include summaries, respectively, of previously published reports on behavior and ecology of the Palaearctic species and of behavioral components among the species of *Tachysphex*.

In this Natural History section, the pronoun we in the field notes refers to KVK and PBK, and in the discussions to KVK and WJP.

We did not observe the complete sequence of nesting behavior in any of the seven Ceylonese species for which we recorded data. The following generalized account of the normal sequence based on extralimital species may be useful to those who wish to make additional ethological observations in Sri Lanka.

Nest construction by the female precedes hunting and oviposition. Nests are made in the soil, usually in a flat or slightly sloping substrate, although several species nest in steeper slopes or banks, and a few species utilize burrows of other wasps in which they dig their own nests. The female begins a nest by scraping the soil surface with her mandibles, then uses the pecten of the foretarsi in unison to excavate a burrow, raking the soil beneath and behind her. The excavated soil accumulates in a tumulus or spoil heap behind the entrance. The spoil heap is leveled from time to time in some species, but is left to accumulate in others. Soil from the spoil heap may be used to make a temporary or final closure of the nest. After

making the burrow and terminal cell the wasp makes an orientation flight or walk around the immediate area before leaving the nest site.

The burrow usually penetrates the soil along a straight axis for a variable distance at an angle of 15° to 30°, although it may be almost horizontal when the nest is begun in a steeper slope or bank. The burrow is usually straight but a few species make a downward angle at about the midpoint. The burrow is occasionally vertical in the Ceylonese *gryllivorus* Pulawski, new species, and also in the North American *belfragei* (Cresson) in the single nest that was observed (Kurczewski, 1979:642). The burrow terminates in an ovoid cell that may be simply an enlargement at the end of the burrow, or placed at an angle to the burrow axis. Some species make unicellular nests, while others may construct from one to five additional cells at the end of lateral galleries from the main burrow.

The species of *Tachysphex* prey only upon Orthoptera and Blattodea, more frequently upon nymphs than adults, and both sexes are used. Previous prey records are for Acrididae, Tettigoniidae, Gryllidae, Blattidae, Mantidae, and one questionable record for Phasmatidae (Pulawski, 1988). We found one nymph of Eumastacidae among several acridid nymphs in a cell of the Ceylonese *morosus* F. Smith. Most *Tachysphex* prey upon members of only one family, although a single cell may contain prey of two or more species or genera. A few species store prey belonging to two families. The number of prey used in a single cell varies from one large specimen in some species to as many as 13 small specimens in many species.

Some species of *Tachysphex* transport their prey head forward, with either the venter or dorsum of the prey up. Some species carry the prey on the ground, while other species fly with the prey, either in a series of short flights or in one long flight from the site of prey capture to the nest. Many species, especially those that carry the prey on the ground, deposit the prey at the nest entrance, open the entrance if it has a temporary closure, enter the burrow, turn around, and then pull in the prey headfirst. Other species, especially those that fly with prey, do not drop the prey at an open entrance, but hurriedly enter the nest headfirst, carrying their prey with them. A few species that fly with prey may drop it at the entrance, remove the closure, and then carry the prey into the nest. The prey is usually placed in the cell venter up with the head at the inner end of the cell.

Most *Tachysphex* deposit the egg transversely across the thoracic venter, attaching one end behind a forecoxa. However, the species preying upon Mantidae place the egg suberect either in front of the forecoxae, or on the outer margin of a forecoxa. In some species storing multiple prey, the egg may be deposited on the first prey collected or on the largest or one of the larger specimens after the last prey is brought into the cell.

Tachysphex morosus (F. Smith)

Maindron (1879) was the first author to report the nesting habits of *morosus*, but his identification of the species is not certain.

NEST CONSTRUCTION.—We found this wasp, 9.2 mm long, nesting at 1515 on 10 June 1976, in Ekgal Aru Sanctuary Jungle, Amparai District, in the Dry Zone. The nest was in a flat, bare sandy spot along a jeep trail through the jungle. The wasp was closing the burrow entrance by kicking sand backward behind her. We disturbed the wasp, after which she flew around for a few seconds, and then alighted at the entrance, at which time we collected her.

We noted another female *morosus*, 9.4 mm long, excavating a nest in the rain forest at 1100 on 21 June 1976, near Weddagala, Sinharaja Jungle, Ratnapura District. The nest was located on a slight slope of a logging road made from a mixture of sand and fine gravel, a nesting medium that made it impossible to trace the exact nest architecture. The wasp was filling the burrow entrance when we returned to the nesting site at 1500, at which time we collected her and dug up the nest.

NEST STRUCTURE.—The burrow of the Ekgal Aru nest went downward into sandy loam at an angle of 20° for 3 cm, and ended in a horizontal cell, 12 mm long and 8 mm wide, containing four prey, the innermost bearing the wasp egg.

In Weddagala a grass stem probe penetrated the burrow at a slight angle for 6 cm. We found a completed cell 3 cm from the burrow axis; it contained three grasshoppers, one with an egg. A cell at the end of the burrow held three grasshoppers, one bearing the wasp egg. A third completed cell was on the other side of the burrow about 3 cm from the entrance; it contained four prey, one bearing a wasp egg. It is likely that this third cell was the oldest of these three, because the egg hatched that evening. A fourth cell was on the left side of the burrow, and about 3 cm from the entrance; it contained two prey, one with an egg, and a tiny dipterous maggot.

We continued digging and found three older cells that may have been made by this wasp. Considering the stage of larval development in each of these cells, it is probable that this was a separate nest. The first cell was 6 cm from the burrow entrance and about 8 cm from the burrow axis; it held two prey and a wasp larva half grown. A second cell was 17 cm from the end of the burrow and at the same depth; it contained four prey and a half grown wasp larva. The third cell was 5 cm from the second, and contained a nearly mature wasp larva and the remains of two prey.

PREY.—The grasshopper nymphs in the nest at Ekgal Aru consisted of two males and a female of *Stenocatantops splendens* (Thunberg) (Acrididae, Catantopinae), 8.5–9.5 mm long, and a female of a species of *Chorotypus* (Eumastacidae), 6.0 mm long.

The 21 nymphal prey in the Weddagala cells belonged to a single species of *Mesambria* (Acrididae, Catantopinae), and were 6–11 mm long. Both sexes were preyed upon, and a single cell contained one or more specimens of both sexes. Some of the prey had recovered partially from the wasp sting. They were able to get up on their legs, but could not walk.

IMMATURE STAGES.—Two eggs were 1.6–1.9 mm long and 0.4 mm wide. The egg was attached on the sternum of a prey

behind either the left or right forecoxa and extended transversely to the right or left, respectively. A newly hatched larva at Weddagala was feeding through the intersegmental membrane behind the left forecoxa.

NEST ASSOCIATES.—We saw no adult parasitic miltogrammine flies (Sarcophagidae) around the nesting site. The tiny maggot that we recovered from one cell was too small to have been that of a miltogrammine, and was probably that of a commensal species of Phoridae.

DISCUSSION.—This species is unlike related species, such as *pompiliformis*, *fulvitaris*, and *nitidus*, in several details of its behavior. The Weddagala nest was multicellular rather than unicellular. Although the nest at Ekgal Aru had only a single cell, the nest closure noted by Karunaratne may have been temporary. That wasp, if not captured, might have continued to make an additional cell or cells.

The egg at Ekgal Aru was on the innermost grasshopper, but that was one of the larger prey, so the egg might not have been deposited until the cell was fully stored.

The inclusion of a eumastacid nymph in the Ekgal Aru nest is unusual, for the other prey in that nest and in the nest at Weddagala were species of Acrididae.

Iwata (1964:369–370, and fig. 32 on 355), under the synonymic name *bengalensis*, reported details of several nests of *morosus* in Thailand. The wasps nested in a mound of sandy soil. Nest construction by two wasps required 31 and 45 minutes. The burrow was 3–4 mm wide, 6.5–20.0 cm long, and ended in an ellipsoidal cell 10 mm long and 7.5 mm in diameter. The burrow entrance was left open while the wasp departed to hunt prey after making an orientation flight. The wasps preyed upon nymphal and adult Catantopinae (Acrididae), and a completed cell usually held two prey. The wasp carried the prey in flight, venter up, clasping the base of the prey antennae in her mandibles. Iwata noted one wasp bringing in three prey after hunting for periods of 19, 5, and 23 minutes respectively. Three nests held only one cell, but one nest had two cells. The egg, 2.12 mm long and 0.49 mm in diameter, was placed on the sternum projecting to one side, between the fore- and midcoxae. Iwata's observations were similar to ours, except that the Ceylonese species usually stored 2–4 prey per cell, and nesting burrows were markedly shorter. This may reflect the difference in nesting medium: the sandy soil in which Iwata's wasps made nests might have been more friable than that of the Ceylonese wasps.

Tachysphex consocius Kohl

We obtained only one nesting and prey record of this grasshopper-hunter in Mannar District, 0.8 km northeast of Kokmotte Bungalow, Wilpattu National Park, on 23 May 1976. Karunaratne saw a female, 6 mm long, with a prey on the ground at the entrance to her nest on a damana, an open sandy area with sparse tufts of grass and a few small shrubs. The wasp entered the burrow headfirst, came to the entrance headfirst, reached out of the burrow and with some difficulty dragged in

the grasshopper nymph. The observer captured the wasp as she emerged from the burrow.

NEST STRUCTURE.—The burrow was 3 cm long, 4 mm wide and penetrated the ground at an angle of 30°. The soil was hard below the top layer of 2 cm of dense alluvial sand. The terminal cell was to the left of the burrow axis, and was slightly wider than the burrow diameter.

PREY.—The grasshopper, which did not bear a wasp egg, was a nymph, 7 mm long, of *Spathosternum prasiniferum* Walker (Acrididae, Hemiacridinae).

DISCUSSION.—Although *consocius* is widely distributed in the southern Palearctic and Ethiopian Regions, as well as in the Indian subcontinent, its nesting habits were studied only recently (Asís, Gayubo, and Tormos, 1989). Nesting areas are horizontal, with no vegetation. The nest is unicellular, 8–10 cm long, ending 3–4 cm below the surface. Prey consists of small acridid nymphs that are transported in flight. The nest entrance is left open during the entire provisioning period. One fully provisioned nest contained eight prey (small acridid nymphs); another incompletely provisioned nest held three prey. An egg was found on the ventrolateral part of prey immediately behind the forelegs. Both males and females spend the night in short galleries in the ground that they dig shortly before sunset.

Tachysphex gryllivorus Pulawski, new species

We found several females, 8.5–9.5 mm long, nesting in flat, damp sandy loam in two different areas of the Padaviya Antiquities Site, Anuradhapura District, on 13 October 1977 between 0930 and 1340.

NEST CONSTRUCTION.—During burrow excavation this species removed the grains of soil and spread them in a spoil heap that went around half of the entrance. The heap was about 65 mm wide and extended 30 mm beyond the entrance. One nest was begun shortly after 1030; at 1330 the wasp was making a temporary closure by coming to the burrow entrance headfirst, emerging, and then dragging some of the soil backward into the burrow. However, burrow excavation was usually more rapid. Another female was digging her burrow by 0925, completed it between 1000 and 1025, and brought in her first prey at 1028. Another began her burrow at 0950, completed it at 1052, left without making a temporary closure, and returned with her first prey at 1057.

HUNTING AND PROVISIONING.—Prey was brought in rapidly and the entrance was not filled once provisioning began. One female brought in eight prey between 1057 and 1130, their capture requiring from 30 seconds to 9 minutes (mean 4.0 minutes). This wasp remained in the nest between provisioning flights for periods ranging from 30 seconds to 4 minutes (mean 1.1 minute).

Another wasp made two provisioning flights of three and four minutes each, and remained in the nest for periods of from one to three minutes between flights.

NEST STRUCTURE.—In three nests the burrow went downward at an angle of 30° for about 30 mm, and the burrow was

vertical in the two other nests to depths of 32 and 40 mm. The burrow diameter at the entrance varied from 4 to 7 mm. The number of cells in completed nests ranged from one to three. The cells varied from almost spherical (5–6 mm) to rather elongate, 8–10 mm long and 5 mm wide.

We captured two wasps while they were closing nests in which the initial section of the burrow went downward at an angle of 30°. The section was 30 mm long in one nest and the burrow then continued at a lesser angle to a depth of 40 mm and 60 mm from the entrance. The single cell at the end contained 13 crickets, the largest with a wasp egg. The first cell found in the second nest was at a depth of 25 mm and was 25 mm from the end of the burrow. The cell contained three crickets, one with an egg. A second cell, probably the last one constructed, was at a depth of 30 mm and directly beneath the entrance. Because it contained only two crickets but no egg, this cell may not have been completely provisioned. A third cell, 35 mm deep (probably the first cell completed), was 50 mm from the burrow entrance, and contained three crickets and an egg.

A completed vertical nest had a seal of compacted soil 5 mm thick at the entrance. An older vertical cell at the bottom of the burrow at 40 mm depth was 10 mm high and contained 13 crickets but no egg. A soil partition, 2–3 mm thick, was above this cell and then an unsealed vertical cell, 8 mm high, containing nine crickets and no egg.

PREY.—The wasps preyed only upon nymphal crickets (Gryllidae, Gryllinae) identified as probably a species of *Teleogryllus* and a species of *Gymnogryllus* or genus near it. The majority were 4.5 to 6.0 mm long, but one was 4.0 mm long and another 8.0 mm long.

Apparently the paralysis resulting from the wasp sting is transitory. Most of the crickets began hopping for distances as great as 25–50 mm after the cells were opened with a trowel. It is quite possible that a lightly attached wasp egg might have been dislodged before we captured the crickets, thus accounting for the absence of eggs in some of the cells. The relatively few inactive crickets probably were those paralyzed most recently.

IMMATURE STAGES.—Three slightly curved eggs were 2.2–2.5 mm long and 0.4–0.6 mm wide. Two were attached between the left fore- and midcoxae; one extended across the thorax and protruded laterad of the fore- and midcoxae, and the other protruded beyond the right forecoxa. The third egg was attached between the forecoxae near the base of the right, extending across the sternum and protruding between the fore- and midfemora on the left side.

DISCUSSION.—This new species is unique among several closely related species, such as *brullii* (Smith), *obscuripennis* (Schenck), and *blattivorus* Gussakovskij, as summarized by Pulawski (1971). It preys upon small cricket nymphs rather than on tettigoniid nymphs as does *brullii*, or cockroach nymphs and adults as do *obscuripennis* and *blattivorus*. Two more remotely related species, *mediterraneus* Kohl and *plicosus* A. Costa, prey upon tree crickets (Oecanthinae).

Tachysphex gryllivorus is also unusual because in two of five

nests the burrows penetrated the soil vertically, rather than at a low angle of about 30° as in the other three nests. Nests of all other species of *Tachysphex* are inclined except *helfragei* (nest vertical) and the few species that make an almost horizontal burrow on sloping ground or in cliffs.

A final unique characteristic in the genus, insofar as known, is that paralysis caused by the wasp sting is of such brief duration that many crickets could leap substantial distances when released from the cells. Some cockroach prey of *Tachysphex obscuripennis* (Schenck) were reported to recover partially from paralysis, but were incapable of locomotion and could move only their antennae and palpi in a lively manner.

Tachysphex mediterraneus Kohl

LIFE HISTORY.—Krombein did not observe nesting behavior of this species, but available data were summarized by Pulawski (1971). The nest is closed during the provisioning period except when the female is inside. The female opens the entrance and enters the nest without dropping the prey. Prey consists of tree crickets of the genus *Oecanthus*, mainly immature but also adult, both males and females.

Tachysphex plicosus (A. Costa)

LIFE HISTORY.—Krombein did not observe nesting behavior of this species, but Pulawski (1974b) summarized the available data. Nests of *Tachysphex plicosus* are established in pre-existing cavities in the soil, such as abandoned nests of other aculeate Hymenoptera. The prey consists mainly of nymphal tree crickets, *Oecanthus*, but also nymphal tettigoniids, *Phaneroptera nana* Fieber.

Tachysphex drymobius Pulawski, new species

PREY.—Karunaratne collected a female, 9.5 mm long, flying with her adult male cockroach prey, 14 mm long, at noon on 15 January 1975. The wasp was flying along an abandoned logging road made from fill of gravelly soil and sand in the Kanneliya section of the Sinharaja rain forest, Galle District. The prey belonged to a species of *Lupparia* or a related genus.

DISCUSSION.—As noted in the preceding discussion of *gryllivorus*, two closely related Palearctic species, *obscuripennis* and *blattivorus*, are known to prey upon cockroach nymphs and adults.

Tachysphex sympleuron Pulawski, new species

NEST CONSTRUCTION AND PROVISIONING.—We observed nesting by one female, 7 mm long, near the China Bay Ridge Bungalow, Trincomalee, in the Dry Zone on 9 October 1977. Karunaratne saw this female hunting on the ground in a small level bare area. She began digging a burrow at 1140 and continued to dig for 10 minutes. Then she left the entrance open, flew off, returned in five minutes, and began to close the burrow entrance. She then walked around the area, and began to dig a second burrow a meter from the first one. She spent 15

minutes digging, emerged from the nest, leaving the entrance open, and began to walk in a zigzag fashion in the immediate area. She came to a clump of grass, went beneath it, and emerged immediately with a paralyzed grasshopper nymph. She carried the prey toward the burrow, venter up, grasping the grasshopper's mouthparts. When she reached the burrow entrance, she set down the prey, entered the burrow headfirst, and reappeared within the entrance headfirst a few seconds later. She reached out, grasped the antennae of the prey, and backed into the burrow with it. The observer captured the wasp two minutes later when she emerged. The paralyzed grasshopper was kept in a rearing container. At 2130 that evening, the grasshopper was quite lively, although it could not jump.

The construction of the first burrow, its careful closure and subsequent abandonment, is puzzling. No such behavior has been published for other species of *Tachysphex*, although Kurczewski (1989) saw the North American *acutus* (Patton) abandon a burrow after digging in it for 20 minutes and making a partial closure before departing. Regrettably, the observer in Sri Lanka did not dig up this anomalous burrow to ascertain a possible reason for deserting it.

NEST STRUCTURE.—The burrow was 4 mm in diameter, penetrated the ground at an angle of 25°, and ended 3 cm below the surface. There was no special cell, the single prey lying on its back at the bottom of the burrow.

PREY.—The slant-faced grasshopper was a third instar female, 20 mm long, of *Tristria pulvinata* Uvarov (Acrididae, Acridinae).

IMMATURE STAGES.—The egg was quite curved, 1.4 mm long and 0.4 mm wide. It was attached so loosely on the thoracic sternum that it came off when the prey was placed in a vial of alcohol.

DISCUSSION.—It is presumed that *sympleuron* stores only one prey per cell inasmuch as the single prey in this nest was large and bore the wasp egg, which in all other *Tachysphex* whose oviposition behavior is known is not laid until the cell is completely stored.

Pulawski (1974b) captured in Bulgaria a female of the closely related *minutus* Nurse (which he called *rugosus* Gussakovskij), 7.5 mm long, carrying a paralyzed acridid grasshopper, *Omocestus petraeus* (Brisout), 13.5 mm long.

Tachysphex panzeri (Vander Linden)

NEST CONSTRUCTION.—I noted a female of *panzeri*, 9 mm long, digging at her burrow entrance on a level path of compacted sand and gravel in the Museum Garden, Colombo, on 8 February 1975. She entered the burrow for a few seconds, came out and began to close the entrance, at which time I captured her.

I found a second female, 11.5 mm long, on 12 June 1976, nesting in alluvial sand along a road through a damana in Ekgal Aru Sanctuary Jungle, Amparai District. At 1230 she emerged headfirst from the burrow, throwing sand in behind her, then turned around and entered the burrow headfirst to compact the sand. She appeared to be making a final closure.

NEST STRUCTURE.—The burrow in Colombo was 4 mm in diameter, and penetrated the soil at an angle of 30° for 5 cm. A cell had not yet been constructed. At Ekgal Aru the soil was very dry, and the burrow entrance had a diameter of 13 mm. The burrow penetrated the ground at an angle of 20°–30° for 4.2 cm. There was a cell 3 cm from the end of the burrow at the same depth. It contained a grasshopper but I did not find the wasp egg. It may have become detached in the dry soil.

PREY.—The grasshopper at Ekgal Aru was an adult female, 19 mm long, of *Aulacobothrus luteipes* Walker (Acrididae, Acridinae).

Karunaratne collected a female of *panzeri*, 9 mm long, while she was transporting her grasshopper on foot, venter up and headfirst, on the lawn in the Museum Garden, Colombo, at 1320 on 27 February 1975. She was straddling the prey, and moving in swift, short runs. The prey was an adult female, 20 mm long, of *Trilophidia annulata* (Thunberg) (Acrididae).

DISCUSSION.—Our limited observations agree with those made on European specimens of *panzeri* (Pulawski, 1971: 268–269; Gayubo, 1986:999) except that burrows of the Ceylonese population were slightly shorter. European specimens were reported to store one or two prey per cell. Inasmuch as the single prey in the Ekgal Aru nest did not bear a wasp egg, it seems probable that the wasp would have brought a second prey. The European *panzeri* were reported to carry the prey by holding the antennae.

Tachysphex indicus Pulawski, new species

NEST EXCAVATION AND HUNTING BEHAVIOR.—I found several females nesting 15–16 February 1979, near Kokmotte Bungalow in the damana described under *consocius*. The sand had a crusty flat surface where two females were excavating their burrows on either side of a small shallow depression at 0945 on the 15th. The excavated sand was accumulating in the depression slightly below each burrow. Neither wasp dispersed the excavated soil farther from their burrows. I returned an hour later to find the entrances of both nests closed and neither wasp in the area. At 1110 I revisited the site and disturbed a female that flew off; she returned without prey in five minutes. She perched on the sand at the burrow entrance for a minute, then flew off and returned preyless twice in the next four minutes. This behavior continued several times between 1130 and noon. The second wasp returned to her nest without prey at 1142. She also made the same kind of brief trips during the next 20 minutes, returning preyless each time. The burrows were still closed and no wasps were at the site when I returned at 1400. I revisited the site occasionally during the next two hours and saw no activity until the first wasp reappeared without prey at 1601. She flew off, and was again at the closed nest without prey 20 minutes later.

I returned to the nesting site at 0850 on the 16th and found the nest entrances closed and no wasps. The situation was unchanged during several visits to the site during the next 35 minutes. The first wasp finally returned without prey at 0928,

flew to a clump of grass 1.2 m distant, and disappeared. She returned to the nest preyless in a minute and a half, then flew off and returned twice in the next minute. She stayed at the nest entrance for six minutes and left again. I returned several times during the next few hours but found both burrows closed, and no wasps at the site. The first wasp returned preyless at 1552, and the second one, 10 mm long, flew to her nest with a prey at 1554. She scratched open the entrance and dragged in the prey hurriedly. I captured her when she emerged headfirst, scratching sand behind her to close the burrow.

I saw a third female beginning a nest about a meter distant from the nesting site of the first and second wasps at 0926 on the 16th. She was still digging when I left the area 15 minutes later. Her burrow was closed and the wasp gone at 1044. The nest was closed and the wasp gone during my subsequent visits until she returned to her nest without prey at 1600. I captured her at this time while I was excavating the nest of the second wasp.

NEST STRUCTURE.—The burrow of the second wasp was 5–6 mm in diameter, penetrated the sand at an angle of 30° for 14 cm. The last 33 mm was enlarged to form an elongate cell 9 mm in diameter. The earth was quite dry at that depth. I did not have time to excavate the burrows of the first and third wasps.

PREY.—The single cell contained two slender mantids, placed headfirst in the cell, a male nymph, 27 mm long, and an adult male, 35 mm long, of *Parathespis humberiana* (Sausure). Neither mantid bore a wasp egg, so it is probable that the cell had not been completely provisioned.

It is possible that these slender mantids may frequent clumps of grass such as the one into which I saw the first wasp disappear for a minute and a half.

Tachysphex schmiedeknechti Kohl

Krombein did not find this species in Sri Lanka, but Myartseva (1976) observed the nesting habits of *schmiedeknechti* on sandy banks of the Tedzhen River in Turkmenistan. The galleries, 11–21 cm long, ended in a single cell 5–8 cm below the soil surface. As in other species of the genus, nest construction precedes hunting, with forelegs used for digging. The nest entrance is closed when the wasp is away for hunting. Prey are mantids, either adults of small species, or second and third instars of large species, and flown to the nest. One to three prey are stored per cell. Both sexes dig temporary galleries in which they stay overnight, but females also use unfinished nests. De Beaumont (1955) found a female carrying a prey, a paralyzed nymph of *Mantis religiosa* Linnaeus, in Morocco.

Myartseva (1972) reared *Chrysis decora* Mocsáry (as *mesasiatica* Semenov) from a nest of *schmiedeknechti*.

Tachysphex albocinctus (Lucas)

This species was not found in Sri Lanka. Nesting behavior was observed by Ferton (1912) in Algeria (as *mantiraptor*), by Bristowe (1925) in Somalia (as *syriacus*), by Gess (1981) in South Africa, and by Asís, Gayubo, and Tormos (1989) in Spain.

Nesting takes place in sandy areas. Nest construction lasts 35–50 minutes. After some sand accumulates in a spoil heap behind the entrance, the female moves it back 6–8 cm from the entrance. While returning toward the nest she throws the sand backward with her forelegs, projecting it behind her. The entrance is temporarily closed during the provisioning period except when the wasp is inside. The nest contains one to three cells; the burrows are 7–15 cm long, straight or angulate about at the midpoint. When provisioning is completed, the female fills the burrow with soil and, unlike other Sphecidae, builds a characteristic mound over it.

After completion of the nest, the female performs orientation flights and goes hunting. Prey are mantids, 13–41 mm long, both males and females and usually nymphal, such as *Calidomantis* Rehn, *Tarachodes* Burmeister (Somalia), and *Mantis religiosa* Linnaeus (Spain). The female malaxates the mantid after stinging it and drinks the fluids that pour from the prey's mouth. The prey is then flown to the nest while kept headfirst. The female lands at the nest entrance, opens it without dropping the prey, and enters headfirst. One to seven prey are deposited per cell. They are placed either on their venter, side, or dorsum, with their heads toward the cell's apex. Since the prey length is greater than cell's length, their legs and occasionally abdomens extend into the burrow beyond the cell. The egg is deposited on a prey's throat next to one of its legs.

The main difference in nesting behavior between this species and *indicus* is that in *indicus* the excavated sand is not leveled (females were nesting at the edge of a slight depression, so the spoil heaps just accumulated below the entrance). Also, the cell of *albocinctus* is apparently shorter, so that prey extend partly into the burrow.

Asís, Tormos, and Gayubo (1987) described the larva of *albocinctus*.

Systematics

GENERIC DESCRIPTION.—*Tachysphex* Kohl is a member of Larrini as defined by Bohart and Menke (1976) because of the hindocellus modified to a flattened, elongate scar; a part of each scar is bordered by a narrow, translucent band, the only remnant of a lens (the band is broadly interrupted on the scar's outer, posterolateral, or lateral side, depending on its orientation). It is most closely related to *Holotachysphex*, *Kohliella*, and *Parapiagetia*, as demonstrated by the presence of an oblong, glabrous swelling above each antennal socket. Another significant character shared by these four genera, but also found in *Gastrosericus*, many *Tachytes*, and *Larropsis chilopsidis* Cockerell and W. Fox (southwestern North America), is the absence of basal oblique carinae on tergum I (a pair of such carinae is present in the other Larrinae and other nonpetiolate Sphecidae). *Tachysphex* appears to lack unique diagnostic structures and can only be recognized by the absence of specializations found in other genera (Pulawski, 1988). It is thus difficult to characterize concisely. Important features that distinguish *Tachysphex* from other Larrini, other than those

mentioned above, are the following (alternative character state follows in parentheses):

1. Head top evenly convex (integument concave around midocellus in *Larra*, *Liris*, *Dalara*, and *Paraliris*).

2. Frons not swollen along orbits (swollen in *Larra*, *Liris*, *Dalara*, *Dicranorhina*, *Paraliris*, and to a lesser degree in *Ancistromma* and *Larropsis*).

3. Upper frons evenly convex (with conspicuous V-shaped swelling in *Kohliella*).

4. Hindocellar scars elongate, their long axes forming an angle of 80° to 130° (only slightly elongate, with long axes perpendicular to body's long axis or nearly so, in *Larrina*); scar shorter than distance that separates it from midocellus (opposite in *Tachytes*).

5. Occipital carina joining hypostomal carina (separate in *Tachytella* and many *Gastrosericus*).

6. Thorax without additional sclerites between metasternal apex and propodeum (a pair of elongate sclerites present in *Parapiagetia*).

7. Episternal sulcus separated from postspiracular carina (next to postspiracular carina in *Larrini*).

8. Propodeum not elongate, spiracle separated from metanotum by less than its own length (by more than its own length in *Larrina* and also *Tachytes dichrous* F. Smith).

9. Propodeal dorsum setose throughout except glabrous in *sinaiticus* Pulawski (Sinai Peninsula), many *tenuis* R. Turner (Australia), and largely glabrous in many *walkeri* R. Turner, also an Australian species; in neither is the glabrous area well defined (propodeal dorsum medially with a well-defined, aetose area in *Ancistromma*, *Larropsis*, *Prosopigastra*, and representatives of several other genera, e.g., *Tachytes distinctus* F. Smith and *pygmaeus* Kohl); also, propodeal dorsum glabrous posteriorly in some *Parapiagetia*.

10. Forewing with three nonpetiolate submarginal cells (cell III posteriorly petiolate in *Kohliella*, absent in *Gastrosericus*).

11. Jugal lobe of hindwing longer than anal cell, jugal and anal excisions next to each other (jugal lobe shorter than anal cell in *Tachytella* and some *Gastrosericus* such as *pulchellus* Arnold, jugal and anal excisions widely separated).

12. Hindtibial dorsum with one to several suberect spines (with one or two, inconspicuous, nearly appressed bristles in *Holotachysphex*).

13. Forebasitarsal rake present at least in the female, in which the basitarsus has five or more spines (rake absent in *Holotachysphex* and *Paraliris*).

14. Claws not dentate (female claws with subbasal tooth on ventral surface in *Kohliella* and some *Liris* such as *odontophorus* (Kohl) and *croesus* (F. Smith)).

15. Gaster short, length of tergum I about equal to apical width (elongate in *Dicranorhina* and many *Parapiagetia*, length of tergum I markedly exceeding apical width).

16. Tergum I without short, oblique carinae at the base (carinae also absent in *Gastrosericus*, *Holotachysphex*, *Kohliella*, *Parapiagetia*, some *Tachytes*, and *Larropsis chilop-*

sidis (Cockerell and W. Fox), but one carina extends from each lateral corner in other genera).

17. Lateral carina of tergum I entire (evanescent behind spiracle and totally reduced posteriorly in *Kohliella*).

18. Tergum II not carinate laterally in most species but a weak longitudinal carina present in some large Australian species, especially in females, e.g., *hypoleius* (F. Smith), *persistans* R. Turner, *pugnator* R. Turner, and *stimulator* R. Turner (lateral carina present in *Holotachysphex* and most *Prosopigastra*, rudimentary or absent in *Prosopigastra creon* (Nurse) and *nubigera* Gussakovskij, absent in other genera).

19. Female tergum VI not flattened, the angle between its lateral margin and the pygidial plate in side view about 30°–40° (tergum VI flattened in *Prosopigastra*, where the same angle is about 10°–20°).

20. Female tergum VI, in most species, with a well-defined pygidial plate; plate evanescent in *erythropus* Spinola (Mediterranean Basin to India) and the Argentinean *mendozaanus* Brèthes, absent in the Australian *nefarius* Pulawski (pygidial plate absent in *Holotachysphex*, indicated only apically by two vestigial structures, a slight inflection and a row of setigerous punctures).

21. Sting including sheaths circular in cross section (also circular in *Holotachysphex*, but flattened dorsoventrally in the other genera, although the difference is weak in *Gastrosericus* and *Tachytella*).

22. Male tergum VII not depressed apically (in *Prosopigastra*, it has a translucent, impunctate depression that is delimited anteriorly by a row of punctures; punctures evanescent in *ahrensiana* Pulawski and *menelaus* (Nurse)).

23. Male sterna without densely setose, round patches (which are found in *Holotachysphex* and some *Gastrosericus*).

24. Male sternum VIII bidentate (= emarginate) or tridentate apically (varying from rounded to emarginate except in the small genera such as *Kohliella*, where it is rounded, and also *Paraliris* and *Tachytella*, where it is truncate).

Other noteworthy characters are: trimmal carina (= cutting edge) of mandible dentate except in the Egyptian species *ramses* Pulawski and the Australian *nefarius*; posterior mandibular margin emarginate, weakly stepped in *nefarius*; inner orbits converging above; marginal cell of forewing long, narrowly truncate (foremargin 2.7–4.2 × apical width, distance between posteroapical corner and wing foremargin 0.2–0.6 × maximum width); hindcoxal apex without process except process present in females of *bohartorum* Pulawski and *hopi* Pulawski (both western North America); male forefemur notched basally (e.g., Figures 12, 21, 50, 89, 90) in most species, but notch absent in *antillarum* Pulawski (Cuba, Puerto Rico), *dominicanus* Pulawski (Eastern Cuba, Hispaniola), *maculipennis* Pulawski (Australia), some *psilocerus* Kohl (Mexico to Wyoming), *quisqueyus* Pulawski (Hispaniola), *sericeus flavofimbriatus* Arnold (Madagascar), *tenuis* R. Turner (Australia), *vitiensis* F. Williams (Fiji), and the *geniculatus* species group (North Africa including Sudan, Arabian Peninsula north to Syria); basal tarsomeres long;

hindtarsomere II 0.5–0.7 × length of hindtarsomere I (including female of *gryllivorus* in which hindtarsomere II is unusually short).

PROBLEMS RELATED TO SPECIES GROUP CLASSIFICATION.— De Beaumont (1936a) was the first to subdivide *Tachysphex*, and he used species groups rather than subgenera. I subsequently reanalyzed his system, rejected some unreliable characters and added new ones (Pulawski, 1971, 1974a, 1977, 1988). As a result, I combined some of de Beaumont's groups and established new ones (see Pulawski, 1988:8, for a review of groups recognized at that time). One severe drawback of using species groups is that the large *pompiliformis* group cannot be defined by any apomorphic characters, being essentially a heterogeneous assemblage of unassigned species. Similarly, the *plicosus* group can be defined only on the basis of biological features. In spite of these imperfections, the species group system was useful for identification, description, and establishing relationships among species. However, it largely collapses now with the study of Sri Lankan species. The problems encountered during this study are discussed below.

1. The *plicosus* group is probably an assemblage of unrelated species using the same prey. The two included species, *mediterraneus* and *plicosus*, share no synapomorphy, although each has various autapomorphies. The only feature that grouped them together was the gryllid prey, believed to be unique within the genus (but sometimes used by the Nearctic *mundus* W. Fox). A third gryllid hunter, *Tachysphex gryllivorus*, described in this paper, shares no unique derived structures with either *plicosus* or *mediterraneus*. Including this new species in the *plicosus* group would only make the group more heterogeneous.

2. The *brullii* group cannot be clearly separated from the *pompiliformis* group. The group was defined by various apomorphies of the apical female tarsomeres, such as apicoventral margin convex or produced into a lobe (Pulawski, 1971, 1988), and tarsomere IV as long as wide or wider. No group character was known for the males. For practical purposes I

recognized two subgroups, in spite of intermediate species found in Australia (see Pulawski, 1977:219, and 1988:168 for details).

The *brullii* subgroup was characterized essentially by elongate apical tarsomeres and claws, and the *obscuripennis* subgroup by tarsomere IV wider than long, tarsomeres V angulate basally, and the foretibia without spines on the outer surface. However, I assigned the South American *acutemarginatus* Strand to the *brullii* group following different criteria (Pulawski, 1974a). In that species, the apicoventral margin of the apical tarsomere is straight, but the body sculpture is fine and the propodeal dorsum is covered with erect setae, slightly inclined posterad, two characters found in all Neotropical members of the *brullii* group. There are several similarly confusing cases among the Sri Lankan species. For example, *eucharistus* is a typical member of the *brullii* subgroup, but *haematopus* is less characteristic: the claws are only slightly elongate and the apicoventral margin is weakly convex. In *gryllivorus*, the claws are not elongate and the apicoventral margin is straight. Based on the tarsal characters, *gryllivorus* must be excluded from the *brullii* group, yet it appears to be closely related to *haematopus* and *eucharistus*. All three species have characters that I regard as probable synapomorphies, such as a finely sculptured thorax, propodeal setae inclined posterad, laterally incised female clypeal lip, and a relatively narrow vertex. As a result, I find it impossible to separate the *brullii* group from the *pompiliformis* group based on tarsal characters. Other structures (e.g., propodeal setae oriented posterad, tibial outer surface without spines), whether used alone or in various combinations, are also unreliable.

In conclusion, the *pompiliformis*, *brullii*, and *plicosus* groups cannot be easily defined in Sri Lanka. Because members of these three groups constitute the majority of species treated here (24 of the 42 species), the species groups have not been used. The species, however, are arranged in the behavioral and systematic sections mainly in the sequence in which they would appear in Pulawski (1971, 1988).

Key to *Tachysphex* of Sri Lanka, Lowland India, Burma, and Thailand

This key is provisional, as many undescribed species are not included. Also unknown and not included are the males of *auriceps*, *bituberculatus*, *rugicauda*, *crinitus*, and *instructus*. Identifications should therefore be carefully checked with species diagnoses and descriptions in order to avoid errors.

- 1. Episternal suture absent [Figure 198]; vestiture not concealing integument . . . 2
- Episternal suture present, in some species concealed by vestiture 4
- 2. Frons punctatorugose; punctures of tergum II separated by linear interspaces; female flagellomeres I-III all or partly red 33. *fulvicornis* R. Turner
- Frons punctate; many interspaces of tergum II as large as punctures; female flagellum black 3
- 3. Mesopleuron dull, punctatorugose or punctate beneath scrobe; female gena thick in dorsal view [Figure 142]; male forefemoral notch setose [Figure 145]
- 18. *sympleuron* Pulawski, new species
- Mesopleuron punctate, interspaces in most specimens shiny; female gena thin in dorsal view in Indian specimens; male forefemoral notch glabrous
- 32. *minutus* Nurse

4. Labrum convex, protruding beyond clypeal free margin [Figures 149–151]; mouthparts elongate [Figures 147, 148], length of galea more than basal width, equal to at least 0.8 of scape. Female: pygidial plate red 5
 Labrum flat, not or barely protruding beyond clypeal free margin; mouthparts not elongate, length of galea less than basal width and less than 0.8 of scape. Female: pygidial plate black 8
5. Female: middle clypeal lobe partly yellow. Male: dorsal volsellar process low, almost not differentiated [Figure 152] 19. *panzeri* (Vander Linden)
 Female: middle clypeal section all black or partly reddish. Male: dorsal volsellar process well defined [Figures 154, 158, 197] 6
6. Female: clypeal lip incised laterally [Figure 156]; propodeal side ridged behind spiracle. Male: volsella as in Figure 158 21. *diadelus* Pulawski, new species
 Female: clypeal lip sinuous laterally [Figure 149] or evenly arcuate; propodeal side not ridged (females of the two species included are identical externally and can be separated only by distribution). Male: volsella as in Figure 154 or 197 7
7. Sri Lanka. Male: dorsal volsellar process low, broad [Figure 154] 20. *noar* Pulawski, new species
 India: Gujarat and Rajasthan. Male: dorsal volsellar process high, slenderer [Figure 197] 31. *conclusus* Nurse
8. Scutum reticulate [Figure 225]; inner hindtibial spur with widely spaced rays [Figure 228]; forewing with dark transverse band [Figure 222], all dark in some specimens [Figure 223] 37. *schmiedeknechti* Kohl
 Scutum punctate; inner hindtibial spur with densely spaced rays; forewing hyaline, yellowish, or moderately infumate, without dark, transverse band 9
9. Hindwing crossvein cu-a conspicuously inclined [as in Figure 234] and sternum I without longitudinal carina; foretarsomere I somewhat expanded apicolaterally in females and most males [Figures 255, 256]. Female: pygidial plate conspicuously, uniformly microsculptured [Figure 257]. Male: sterna IV–VI largely glabrous 10
 Hindwing crossvein cu-a reclined [Figure 18] to inclined (if inclined, then sternum I with longitudinal carina and male sterna setose); foretarsomere I not expanded. Female: pygidial plate (except *testaceipes*) without conspicuous microsculpture or microsculptured only posteriorly 11
10. Setae of tergum I straight, appressed, less than one midocellar diameter long; subcostal vein of forewing light brown, not contrasting in color with other veins 23. *indicus* Pulawski, new species
 Setae of tergum I (except posteriorly and laterally) sinuous, suberect, equal to about 0.5 × basal mandibular width; subcostal vein of forewing almost black, markedly darker than other veins 40. *albocinctus* (Lucas)
11. Female: pygidial plate longitudinally ridged in apical half [Figure 202] 34. *rugicauda* Pulawski, new species
 Female: pygidial plate not ridged 12
12. Tibiae all or partly red 13
 Tibiae all black 21
13. Hindwing vein cu-a inclined [Figure 234], only weakly so in some *selectus*; sternum I posteriorly with well-defined longitudinal carina [Figure 236]; male sterna III–V with conspicuous, long setae which are either erect or appressed [Figures 241, 242] 14
 Hindwing vein cu-a reclined [Figure 18] to minimally inclined; if inclined, then sternum I noncarinate or with obtuse longitudinal carina; setae of male sterna III–V short, long, or absent 16
14. Setae sinuous along hypostomal carina, on mesopleuron anteriorly, and on propodeum 22. *selectus* Nurse
 Setae straight 15

15. Female: gaster black; pygidial plate nonmargined laterally [Figures 237, 238]; mesopleural setae not concealing integument; length 9–14 mm. Male: most setae of male sternum III–V not agglutinated [Figures 241, 242] 38. *erythropus* (Spinola)
 Female: gaster red basally; pygidial plate well defined; mesopleural setae totally concealing integument; length 14–18 mm. Male: setae of male sternum III–V dense, as if agglutinated 39. *grandissimus* Gussakovskij
16. Gaster all red (black apically in some specimens) 17
 Gaster all black (red apically in some specimens) 19
17. Genal and thoracic setae straight, not obscuring mesopleural integument. Female: pygidial plate coarsely, irregularly sculptured [Figure 190]; apical tarsomeres: venter with central cluster of minute spines, apicoventral margin produced into lobe 29. *auriceps* Cameron
 Genal and thoracic setae sinuous or curved, largely or totally obscuring mesopleural integument [Figure 174]. Female: pygidial plate finely sculptured; apical tarsomeres: venter without spines, apicoventral margin straight 18
18. Anterior (oblique) portion of mesothoracic venter shorter than posterior (horizontal) part; dorsal length of flagellomere I 2.2–2.7 × apical width in female, 1.5–2.1 in male. Female: clypeal lip with varying number of teeth but at least with a pair of admedian teeth [Figure 5] 1. *gujaraticus* Nurse
 Anterior (oblique) portion of mesothoracic venter longer than posterior (horizontal) part [Figure 174]; dorsal length of flagellomere I 1.4–2.1 × apical width in female, 1.0–1.2 in male. Female: clypeal lip not dentate [Figure 171] 24. *erythrophorus* Dalla Torre
19. Female: pygidial plate shiny except apical, sharply delimited portion contrastingly dull, characteristically microsculptured [Figures 205, 209]. Male: foretarsus with conspicuous rake; sternum III–V largely glabrous 35. *vulneratus* R. Turner
 Female: pygidial plate all shiny, uniformly sculptured. Male: foretarsus without rake; sternum III–V setose 20
20. Femora red; sternum I not carinate. Male: clypeal lip conspicuously sinuate, with markedly prominent corner [Figure 54], trimmal carina deeply emarginate and with large subbasal tooth [Figure 57] 7. *haematopus* Pulawski, new species
 Femora all or largely black; sternum I with median carina, at least apically. Male: clypeal lip arcuate or weakly sinuate, with nonprominent corner [Figure 43], mandible of usual shape (trimmal carina with moderate size tooth and small cleft) 6. *gryllivorus* Pulawski, new species
21. Hindcoxal dorsum with inner margin conspicuously angulate basally [Figure 79] 22
 Hindcoxal dorsum with inner margin not angulate or with low, obtuse angle 23
22. Mesopleuron rugose; propodeum not carinate between dorsum and side, side ridged; trimmal carina of mandible with usual moderate tooth and small cleft. Female: clypeal lip with obtuse, median point and three teeth on each side [Figures 72, 74], forebasitarsus with straight outer margin, its rake spines not divided into two groups. Male: forefemoral notch not expanded dorsad, its bottom not compressed into crest 9. *mediterraneus* Kohl
 Mesopleuron punctate; propodeum carinate between dorsum and side, side punctate; trimmal carina of mandible with big subbasal tooth but no cleft [Figures 81, 82]. Female: clypeal lip markedly sinuate, with roundly prominent corner [Figure 81], forebasitarsus with concave outer margin, its rake spines divided into two groups, one basal and one apical [Figure 85]. Male: forefemoral notch markedly expanded dorsad on anterior femoral face, its bottom compressed into longitudinal crest [Figures 89–91] 10. *plicosus* (A. Costa)

23. Females 24
 Males 42
24. Pygidial plate unusually broad, uniformly, conspicuously microsculptured [Figure 216] 36. *testaceipes* Bingham
 Pygidial plate narrow, without conspicuous, uniform microsculpture 25
25. Foretarsal rake short [Figure 188]: apical spines of basitarsus 1.0–1.2 × apical width of basitarsus, shorter than tarsomere II 28. *actites* Pulawski, new species
 Foretarsal rake long: apical spines of basitarsus at least 1.6 × width of basitarsus, at least as long as tarsomere II 26
26. Setae of propodeal dorsum straight, inclined anterad or anterolaterad along midline; mesopleuron punctate 27
 Setae of propodeal dorsum erect or inclined posterad, sinuous in some species (basomedian setae inclined anterad in some species); mesopleuron variously sculptured 32
27. Clypeal lip incised laterally [Figure 25] 4. *consocius* Kohl
 Clypeal lip not incised 28
28. Mesopleural setae slightly sinuous 26. *bituberculatus* Cameron
 Mesopleural setae straight 29
29. Clypeal lobe narrower: distance between corners about 1.2 × distance between corner and orbit [Figures 182, 183]; propodeal dorsum with longitudinal, parallel ridges [Figure 184] 27. *instructus* Nurse
 Clypeal lobe broader: distance between corners 1.5–1.8 × distance between corner and orbit [Figures 9, 14, 16, 175] 30
30. Vertex setae 2.0–2.5 midocellar diameters long; vertex markedly wider than long (width 1.5–1.6 × length) 3. *morosus* (F. Smith)
 Vertex setae slightly longer to slightly shorter than one midocellar diameter; vertex about as wide as long (width 1.1–1.3 × length) 31
31. Clypeal lobe with well-defined bevel [Figure 175] 25. *puncticeps* Cameron
 Clypeal lobe without bevel or bevel evanescent [Figure 9] 2. *sri* Pulawski, new species
32. Hindtarsomere IV as wide as long, conspicuously emarginate, with shallowly concave apicoventral margin [Figures 38, 39, 48, 67, 100]; hindtarsomere V not angulate basoventrally in lateral view [Figure 98] 33
 Hindtarsomere IV wider than long, shallowly emarginate, with roundly prominent apicoventral margin [Figures 120, 121]; hindtarsomere V angulate basoventrally in lateral view [Figure 118] 38
33. Mesopleuron with well defined, conspicuous punctures; setae sinuous on scutum, mesopleuron, propodeum, and along hypostomal carina 12. *crinitus* Pulawski, new species
 Mesopleuron with minute or ill-defined punctures; setae straight 34
34. Scutum longitudinally crenulate along hindmargin; mesopleural punctures minute, several diameters apart, interspaces unsculptured, shiny 30. *lagunaensis* Tsuneki
 Scutum not crenulate along hindmargin; mesopleuron microsculptured between punctures 35
35. Pygidial plate emarginate apically [Figure 44]; forebasitarsus without ventral spines; length of midtarsomere II 1.5–1.6 × apical width 6. *gryllivorus* Pulawski, new species
 Pygidial plate not emarginate; forebasitarsus with one or more ventral spines (between rake spines and those on inner margin); length of midtarsomere II more than twice apical width 36
36. Propodeal dorsum evenly microareolate, side evenly microsculptured; dorsal emargination of hindtarsomere IV obtusely angulate [Figure 100]; hindtarsomere

- V elongate, without ventral spines [Figures 99, 101]; claws longer [Figure 98] 11. *eucharistus* Pulawski, new species
 Propodeal dorsum irregularly ridged longitudinally, side ridged; dorsal emargination of hindtarsomere IV narrower [Figure 38, 67]; hindtarsomere V not elongate, with ventral spines [Figures 40, 68]; claws shorter 37
37. Interocellar area with well defined punctures, interspaces shiny; vertex width 0.9–1.1 × length; claws somewhat gibbose near midlength (Fig. 70); foretarsal rake pale brown 8. *oxychelus* Pulawski, new species
 Interocellar area dull, without well-defined punctures; vertex width 1.4–1.6 × length; claws evenly arcuate; foretarsal rake black 5. *anthracinus* Pulawski, new species
38. Midfemoral venter with fringe of setae about 0.2 × femoral width [Figure 116]; hindfemoral venter basally with similar fringe 39
 Midfemoral venter with fringe of setae about 0.1 × femoral width; hindfemoral venter without such fringe 41
39. Erect setae of head and thorax sinuous 17. *bengalensis* Cameron
 These setae straight (two closely related species that cannot be distinguished with certainty in female sex) 40
40. Southwestern Sri Lanka; mesopleural punctures averaging less than one diameter apart; tergum IV nonfasciate 16. *drymobius* Pulawski, new species
 Sri Lanka to Ryukyu Islands; in many specimens mesopleural punctures averaging more than one diameter apart and/or tergum IV silvery fasciate 15. *changi* Tsuneki
41. Midscutal setae nearly erect, diverging posterolaterad on each side of midline [Figure 109] 14. *chiastotrichus* Pulawski, new species
 Midscutal setae nearly appressed, oriented posterad 13. *xanthoptesimus* Pulawski, new species
42. Foretarsus with well-developed rake: apical spine of tarsomere II longer than III + IV combined; tergum VII densely punctate mesally and sparsely punctate laterally [Figure 219]; genitalia as in Figures 213, 214, 217 36. *testaceipes* Bingham
 Foretarsal rake absent or shorter: apical spine of tarsomere II shorter than III + IV combined; tergum VII uniformly sculptured; genitalia different 43
43. Setae of propodeal dorsum straight, inclined anterad or anterolaterad along midline; mesopleuron punctate 44
 Setae of propodeal dorsum erect or inclined posterad, sinuous in some species; mesopleuron variously sculptured 48
44. Flagellomeres III–XI with longitudinal line that delimits two variously sculptured and setose areas [Figures 30, 31]; hindmargin of sternum VIII tridentate [Figure 27] 4. *consocius* Kohl
 Flagellomeres simple; hindmargin of sternum VIII emarginate 45
45. Vertex setae 2.0–2.5 midocellar diameters long; forebasitarsus in vast majority of specimens with rake [Figure 23] 3. *morosus* (F. Smith)
 Vertex setae at most slightly longer than one midocellar diameter; forebasitarsus without rake 46
46. Vertex setae markedly shorter than one midocellar diameter; midscutal setae diverging posterolaterad on each side of midline [as in Figure 109]; clypeal lip markedly sinuate [Figure 186] 28. *actites* Pulawski, new species
 Vertex setae about as long as one midocellar diameter; midscutal setae oriented uniformly posterad; clypeal lip arcuate to slightly sinuate [Figures 10, 176] 47
47. Forefemoral notch glabrous 25. *puncticeps* Cameron
 Forefemoral notch setose [Figure 12] 2. *sri* Pulawski, new species
48. Scutum longitudinally crenulate along hindmargin; mesopleuron with minute but well-defined punctures which are several diameters apart, interspaces shiny 30. *lagunaensis* Tsuneki

- Scutum not crenulate; mesopleuron differently sculptured (see next couplet for details), with well-defined microsculpture 49
49. Mesopleuron impunctate or with ill-defined punctures; sterna II-V finely, evenly punctate (punctures one diameter apart or less), with appressed setae (only bristles at base of apical depressions are erect) 50
- Mesopleuron with well-defined punctures; sterna II-V mesally with large punctures, some of which are several diameters apart; sternal setae erect or nearly so 52
50. Propodeal dorsum evenly microareolate, side evenly microsculptured; dorsal length of flagellomere I $1.8 \times$ apical width; vertex width $0.8 \times$ length 11. *eucharistus* Pulawski, new species
- Propodeal dorsum irregularly ridged or rugose; side ridged but ridges evanescent in small specimens; dorsal length of flagellomere I $1.2-1.4 \times$ apical width; vertex width $1.1-1.3 \times$ length 51
51. Intercellular area with well-defined punctures; sternum VIII apically tridentate or with rounded median lobe [Figure 64]; apical tarsomeres with cluster of spines [Figure 68] 8. *oxychelus* Pulawski, new species
- Intercellular area without well-defined punctures; sternum VIII emarginate apically; apical tarsomeres without ventral spines 5. *anthracinus* Pulawski, new species
52. Midfemoral venter with inconspicuous, short setae 53
- Midfemoral venter with conspicuous fringe of setae about $0.2 \times$ femoral width [as in Figure 116] 54
53. Midscutal setae nearly erect, diverging posterolaterad on each side of midline [Figure 109] 14. *chiastotrichus* Pulawski, new species
- Midscutal setae nearly appressed, oriented posterad 13. *xanthoptesimus* Pulawski, new species
54. Erect setae of head and thorax sinuous 17. *bengalensis* Cameron
- These setae straight 55
55. Apical tarsomeres with numerous apicoventral spines and with a group of spines on each lateral margin [Figures 123, 124] 15. *changi* Tsuneki
- Apical tarsomeres with only a few apicoventral spines, without spines on lateral margins 16. *drymobius* Pulawski, new species

Descriptions of Species

Many characters have been omitted from the descriptions because they are identical in all or most of the species treated here. Unless indicated otherwise, the following states apply: labrum flat, not protruding or barely protruding beyond clypeal free margin; galea wider than long; axilla simple, not carinate or unusually convex; episternal sulcus present; mesothoracic venter densely punctate (punctures averaging about one diameter apart); metapleural flange not expanded; propodeum with no carina between dorsum and side, hindface ridged; hindwing (Figure 18): crossvein cu-a vertical or reclined, jugal lobe relatively small, jugal excision present to absent; claws not elongate, evenly curved, inner and outer claws of each pair equal in size; sternum I without longitudinal carina; female: scutum and scutellum not flattened, pygidial plate margined by well-defined carina, forefemoral venter minutely, closely punctate, foretibia densely, uniformly punctate throughout (or at most punctures insignificantly sparser on the outer surface), length of tarsomeres IV more than width, pygidial plate sharply

margined; male: length of flagellomere I equal to $0.8-1.0$ of II; tergum VII with punctures less than one diameter apart, and sternum VIII evenly emarginate apically; penis valve of usual shape: with straight ventral margin, finely dentate apicoventrally.

Unless indicated otherwise, the accounts on "Collecting Periods" and "Habitat" refer to Sri Lanka only.

1. *Tachysphex gujaraticus* Nurse

FIGURES 5-8

Tachysphex gujaraticus Nurse, 1909:516, ♀, ♂. [Lectotype: ♀, India: Gujarat: Deesa (BMNH), designated by Pulawski, 1975:310, examined.]—Bohart and Menke, 1976:274 [listed].

Tachysphex No. 18.—de Beaumont, 1940:178 [Egypt; part, other specimens = *Tachysphex erythrophorus*, corrected to *Tachysphex laniger* by Pulawski, 1971:129].

Tachysphex laniger Pulawski, 1964:105, ♀, ♂. [Holotype: ♀, Egypt: Abu Rawash NW Cairo (CAS), examined. Synonymized with *Tachysphex gujaraticus* by Pulawski, 1975:310.]; 1971:129 [revision].—de Beaumont, Bytinski-Salz, and Pulawski, 1973:8 [Israel].

DIAGNOSIS.—*Tachysphex gujaraticus* has sinuous or curved setae that largely conceal the integument on the mesopleuron and scutal forecorners (as in Figure 174), and that are oriented posterad on the propodeal dorsum; the labrum is flat, not protruding or slightly protruding beyond the clypeal margin; hindwing crossvein cu-a vertical or reclined (Figure 18); the female pygidial plate is shiny, almost unsculptured (with a few, ill-defined punctures); the male sterna are densely, evenly setose, and the gaster and legs are all or largely red in the female and most males. *Tachysphex erythrophorus* Dalla Torre (West Africa to India) is similar, but in *gujaraticus* the mesothoracic venter is the usual shape: the anterior (oblique) portion of the mesothoracic venter is shorter than the posterior, horizontal one; flagellomere I is shorter (dorsal length 1.4–2.1 × apical width in female and 1.0–1.2 in male); the female clypeus is denticulate (Figure 5); and in many males the forefemoral notch is acutely angulate basally. In *erythrophorus*, the anterior portion of the mesothoracic venter is longer than the posterior portion (Figure 174); flagellomere I is longer (dorsal length 2.2–2.7 × apical width in female and 1.5–2.1 in male); the female clypeus is not denticulate (Figure 171); and the male forefemoral notch is obtusely angulate basally.

DESCRIPTION.—Scutal punctures about one diameter apart except discal punctures two to many diameters apart in most females and some males. Mesopleuron dull, granulose. Episternal sulcus incomplete. Propodeum dull; dorsum irregularly rugose, partly ridged in some specimens; side ridged or ridges evanescent. Hindcoxal dorsum: inner margin not carinate, not expanded basally. Apical tarsomeres without spines on venter or lateral margins.

Setae (figures in parentheses refer to setal length expressed as fractions of basal mandibular width): appressed on vertex,

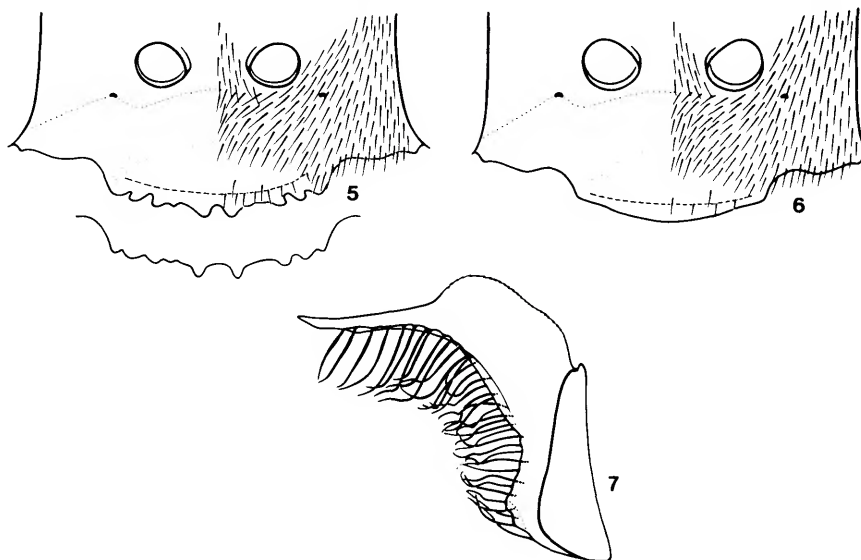
erect adjacent to hypostomal carina (0.4–0.5); sinuous or curved on gena, scutum anteriorly (0.5–0.6), mesopleuron, and propodeum; on scutal disk curved semicircularly, with their tips nearly reaching integument; oriented posterad on propodeal dorsum (0.4–0.6); appressed on midfemoral venter.

♀.—Clypeus (Figure 5): bevel shorter than basomedian area; lip arcuate, its free margin with a pair of admedian teeth and with three pairs of lateral teeth that are separated by two incisions; lateral teeth irregularly shaped in many specimens, confluent in some. Vertex width 1.0–1.3 × length. Dorsal length of flagellomere I 1.4–2.1 × apical width. Outer surface of foretibia with one to three spines, its punctures sparser than on remaining surface. Pygidial plate smooth, shiny, with fine, scattered punctures. Tarsi of *pompiliformis* type. Length 6–9 mm.

Head and thorax largely black, but the following are reddish yellow: mandible (except apical third), clypeal bevel and lip, and in most specimens also scapal venter; pronotal lobe yellow apically and mesothoracic venter reddish between midcoxae. Wings hyaline. Legs red except fore- and midcoxae black in some specimens and forefemur largely black in Sri Lankan females. Gaster red or with black spots (see “Geographic Variation” below).

♂.—Clypeus (Figure 6): bevel shorter than basomedian area; lip arcuate, with obtuse, somewhat ill-defined corners that are closer to orbits than to each other. Vertex width 1.4–1.7 × length. Dorsal length of flagellomere I 1.0–1.2 × apical width. Forefemoral notch with asetose bottom. Foretarsus with rake: outer margin of forebasitarsus with three preapical spines, apical spine of tarsomere II longer than tarsomere III. Sterna densely, evenly setose. Length 5–7 mm. Volsella: Figure 7.

Head and thorax largely black, but the following are reddish



FIGURES 5–7.—*Tachysphex gujaraticus* Nurse: 5, female clypeus, with outline showing individual variation; 6, male clypeus; 7, volsella.

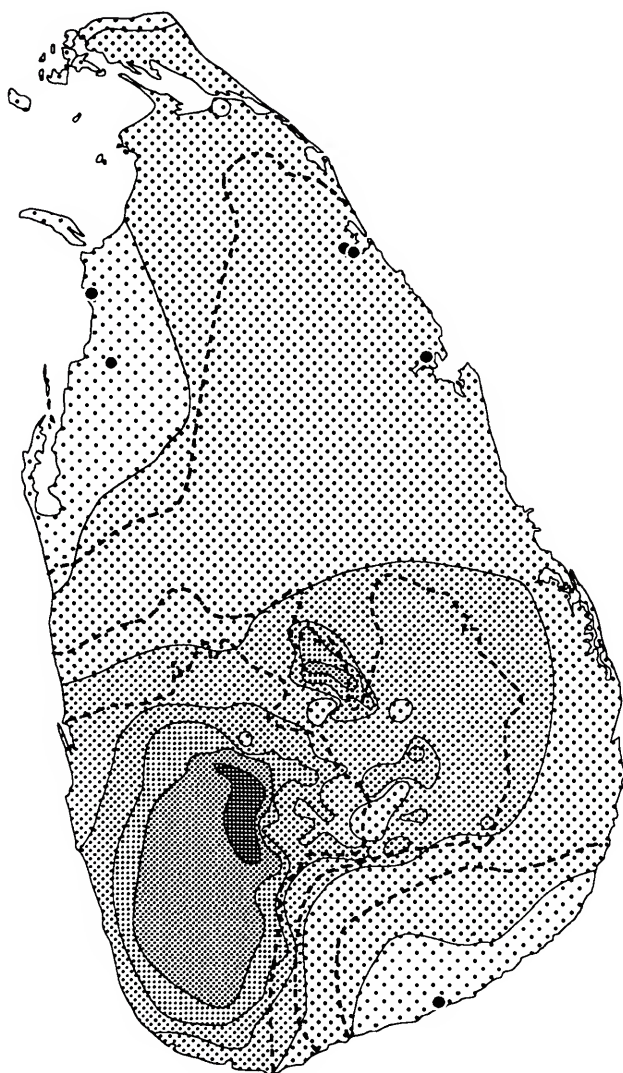


FIGURE 8.—Collecting localities of *Tachysphex gujaraticus* Nurse in Sri Lanka.

yellow: mandible (except apical third), clypeal bevel and lip in many specimens and scapal venter in some; pronotal lobe black or (most specimens) yellow apically. Wings hyaline. Femora, tibiae and tarsi red or femora black (hindfemur less frequently black than fore- and midfemora); tibiae partly black in specimens from Tajikistan. Gaster red with brown apical segments or all dark brown (with apical depressions of segments translucent). Frontal setae silvery.

CORRECTION TO EARLIER DESCRIPTION.—Pulawski (1971:131, fig. 60) incorrectly described the male clypeus as having the lip rounded laterally. A reexamination of voucher specimens from Egypt using better optics revealed that the lip is angulate laterally, as it is in Sri Lankan specimens (Figure 6).

GEOGRAPHIC VARIATION.—In the male, the forefemoral notch bottom is flat in specimens from Sri Lanka, and its proximal margin is not prominent. In males from Egypt, the bottom is somewhat compressed to an obtuse, longitudinal crest, and the proximal margin of the notch is sharply prominent.

The gaster is all red in females from Egypt, Israel, Saudi Arabia, Turkmenistan, and Tajikistan, but terga II and III or II-IV are largely black in those from Sri Lanka.

RELATIONSHIPS.—*Tachysphex gujaraticus* was previously placed in the *pompiliformis* group (Pulawski, 1971). The dense, sinuous setae and impunctate mesopleuron suggest that *gujaraticus* is closely related to *erythrophorus*. The impunctate mesopleuron, however, may actually be a plesiomorphic feature, and sinuous setae have evolved in other species from arid areas that are clearly unrelated to *gujaraticus*, e.g., *micans* (Radoszkowski).

COLLECTING PERIOD.—11 April through 19 September.

HABITAT.—Within Sri Lanka, *gujaraticus* is known from the Dry Zone from near sea level to an altitude of 30 m and an average annual rainfall of about 1075–1725 mm (Figure 8).

GEOGRAPHIC DISTRIBUTION.—Morocco, Mali, Sudan, Egypt, Israel, Saudi Arabia, Tajikistan and Turkmenistan, India (Gujarat), and Sri Lanka.

RECORDS (localities listed in Pulawski, 1971, are not repeated here).—INDIA: Gujarat: Deesa (1♀ lectotype of *gujaraticus*, 2♂, BMNH).

MALI: Ansongo (1♀, 1♂, BMNH).

MOROCCO: Tarcudant, Oued Souss (1♀, BMNH).

SRI LANKA: HAMBANTOTA DISTRICT: Bundala Sanctuary (1♂, USNM). MANNAR DISTRICT: Kokmotte Bungalow, 0.5 mi (0.8 km) NE Wilpattu National Park (2♂, USNM), Ma Villu (3♀, CAS; 8♀, 1♂, USNM); Ma Villu, Kondachchi (1♂, CAS; 2♂, USNM). TRINCOMALEE DISTRICT: Amarivayal (1♀, USNM), China Bay Ridge Bungalow (1♀, CAS; 11♀, 1♂, USNM), Tennamaravadi (1♂, USNM).

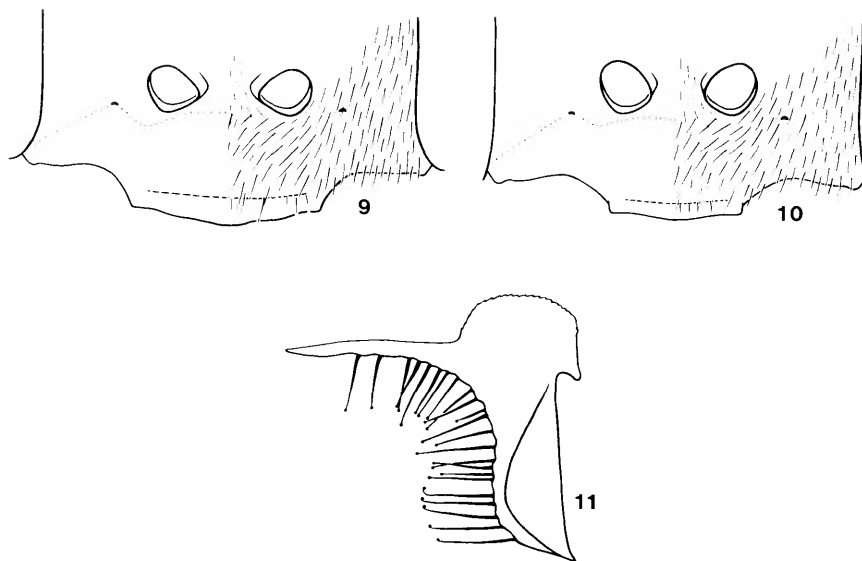
SUDAN: Ed Damer: Hudejba (1♀, ZSBS).

2. *Tachysphex sri* Pulawski, new species

FIGURES 9–13

NAME DERIVATION.—*Sri* is a Sanskrit word meaning fortunate, glorious, holy, reverend; with reference to the country where the species has been found.

DIAGNOSIS.—*Tachysphex sri* shares the following with many other species: mesopleuron shiny, with well-defined punctures; setae erect on vertex, nearly erect on scutum and midfemoral venter (see Figures 32, 33), inclined obliquely anterad on propodeal dorsum; gaster, femora, and tibiae black; and female tarsi of the *pompiliformis* type. Within this category, the female is unique in having a flat middle clypeal section (bevel absent or rudimentary, Figure 9) combined with short vertex setae (setal length about one midocellar diameter or $0.2 \times$ basal mandibular width). In the male, the clypeal lobe



FIGURES 9-11.—*Tachysphex sri* Pulawski, new species: 9, female clypeus; 10, male clypeus; 11, volsella.

has a well-defined corner and the bevel is absent or rudimentary (Figure 10), the foretarsal rake is absent, and the forefemoral notch is setose (Figure 12). The male of the Palearctic *tarsinus* (Lepeletier) is similar, but its clypeal lobe has a bevel that is convex to concave anteriorly.

DESCRIPTION.—Punctures well defined on scutum, mesopleuron, and mesothoracic venter, at most a few punctures more than one diameter apart. Episternal sulcus effaced anteroventrally. Propodeal dorsum rugose, side ridged. Hind-coxal dorsum: inner margin carinate basally, carina practically

not expanded. Apical tarsomeres V with no spines on venter or lateral margins.

Setae (figures in parentheses refer to setal length expressed as fractions of basal mandibular width): erect on vertex (0.2–0.3), nearly erect between mandibular base and occipital carina (0.3–0.4) and on midfemoral venter, as in Figures 32, 33 (about 0.2), semierect on scutum (about 0.2 anterolaterally); inclined obliquely anterad on propodeal dorsum.

Body black, mandible mesally and tarsal apex brownish red; wings yellowish, veins light brown.

♀.—Clypeus (Figure 9): middle section almost flat, with no transverse inflection; bevel absent or reduced to minute, anteromedian area; lip arcuate. Vertex width $1.2 \times$ length. Dorsal length of flagellomere I $2.3\text{--}2.5 \times$ apical width. Outer surface of foretibia with one spine or spine missing on one or both legs. Tarsi of *pompiliformis* type, forebasitarsus with six rake spines. Pygidial plate all unsculptured or alutaceous anteriorly, with a few minute, sparse punctures. Length 6.2–8.0 mm.

♂.—Inner mandibular margin with tooth. Clypeus (Figure 10): bevel absent or rudimentary; lip straight or weakly sinuate; corner prominent; distance between corners $1.0\text{--}1.2 \times$ distance between orbit and corner. Vertex width $1.5\text{--}1.7 \times$ length. Dorsal length of flagellomere I $1.2\text{--}1.4 \times$ apical width. Forefemoral notch moderately large, setose (Figure 12). Forebasitarsus without preapical spines on outer margin. Punctures of tergum VII evanescent mesally. Sterna densely, evenly punctate and setose. Length 5.2–6.5 mm. Volsella: Figure 11.

COLLECTING PERIOD.—21 January through 19 September.

HABITAT.—The species occurs only in the Dry Zone in

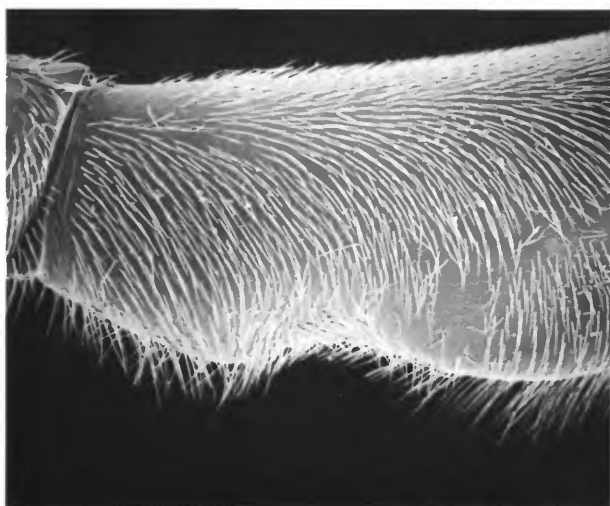


FIGURE 12.—*Tachysphex sri* Pulawski, new species: forefemoral notch of male.



FIGURE 13.—Collecting localities of *Tachysphex sri* Pulawski, new species, in Sri Lanka.

localities from near sea level to an altitude of about 100 m and average annual rainfall of 1200–1725 mm (Figure 13).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

RECORDS.—*Holotype*: ♂, Sri Lanka: Anuradhapura District: Padaviya Tank, 13–20 Mar 1976, PBK, SK, DB (USNM).

Paratypes: SRI LANKA: AMPARAI DISTRICT: Ekgal Aru, 12 June 1976, KVK, PBK, SK (1♀, CAS). ANURADHAPURA DISTRICT: Padaviya Tank, 13–20 Mar 1976, PBK, SK, DB (2♂, CAS; 2♂, USNM); Ritigala Natural Reserve, 24–25 Feb 1976, KVK, TW, SS, LJ, TG (1♀, USNM), 19 Sep 1980, KVK, PBK, TW, LJ, VG (2♂, CAS, USNM). BADULLA DISTRICT: Ulhitiya Oya, 15 mi (24 km) NNE Mahiyangana, 5–6 Sep 1980, KVK, PBK, TW, LJ, VG (1♀, USNM). MANNAR

DISTRICT: Ma Villu, 16–19 Sep 1980, KVK, PBK, TW, LJ, VG (1♂, USNM). MONARAGALA DISTRICT: Angunakolapelessa, 21–23 Jan 1979, KVK, PBK, TW, SS, TG (1♂, USNM), Nilgala, 14 Jul 1968, PBK (1♀, CNC). TRINCOMALEE DISTRICT: Trincomalee, China Bay Ridge Bungalow, 26 Feb 1979, KVK, TW, SS, LJ, TG (1♀, USNM); same locality, 24–25 Jul 1978, KVK, TW, VK, LJ (2♀, CAS).

3. *Tachysphex morosus* (F. Smith)

FIGURES 14–24

Tachytes morosus F. Smith, 1858:18, ♀. [Holotype: Indonesia: Sulawesi: no specific locality (OXFORD), examined. Transferred to *Tachysphex* by Bohart and Menke, 1976:275].—Maindron, 1879:179 [nesting habits].

Tachysphex bengalensis.—Bingham, 1897:193 [revision; specimens from Burma, corrected by R. Turner, 1917b:198].—Williams, 1928:92 [Philippines, corrected to *Tachysphex tinctipennis* by Pulawski, 1975:311] [also authors who followed Williams's interpretation: Krombein, 1949:382 (in key), 393 (Mariana and Caroline Islands); Tsuneki, 1963:7 (Thailand; redescription); 1967:49 (Taiwan; regarded *japonicus* as a junior synonym of *bengalensis*); 1976:54 (Philippines; as *bengalensis bengalensis*); Iwata, 1964:369 (life history); Haneda, 1971:30 (Taiwan)].

Tachysphex tinctipennis Cameron, 1904:301, ♀. [Holotype: ♀, India: Assam: Khasia Hills (OXFORD), examined. New synonym.].—Pulawski, 1975:311 [interpretation of the species].—Bohart and Menke, 1976:277 [listed].—Tsuneki, 1977b:269 [Taiwan; as *Tachysphex nigricolor tinctipennis*, new status]; 1983:64 [Philippines; redescription; as full species], 68 [in key].

Tachysphex bituberculatus.—Weber, 1948:203 [Hawaii, corrected to *Tachysphex bengalensis* by Krombein, 1949:393].—Yoshimoto, 1960:331 [listed]. *Tachysphex lihyuetanus* Tsuneki, 1971:15, ♂. [Holotype: ♂, Taiwan: Nantou Prefecture: Lihyuetan (originally K. Tsuneki coll., now USNM), not examined. Synonymized with *Tachysphex tinctipennis* by Tsuneki, 1983:64.]

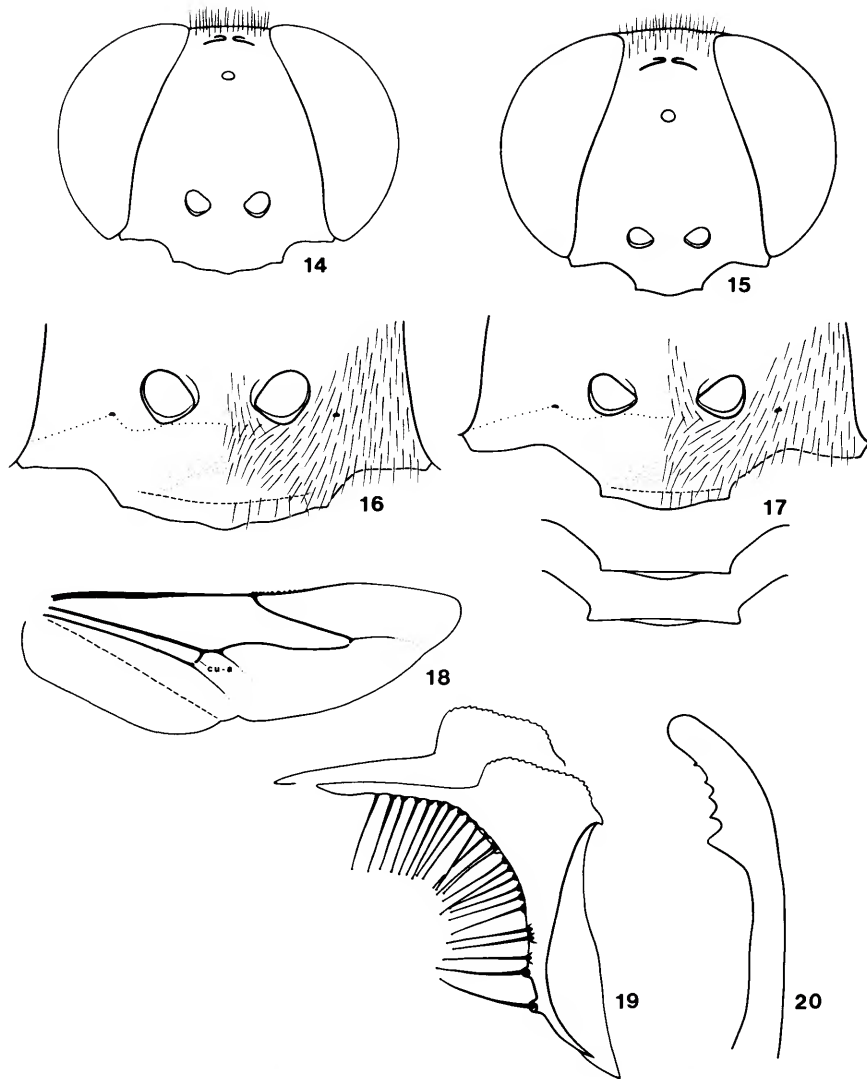
Tachysphex morosus.—Bohart and Menke, 1976:275 [listed].

Tachysphex tinctipennis tiidzimaensis Tsuneki, 1984:4, ♂, ♀. [Holotype: ♂, Japan: Ogasawara (= Bonin) Islands: Chichidzima: Mount Chuoh (K. Tsuneki personal collection, Mishima), not examined. Valid subspecies.]

DIAGNOSIS.—*Tachysphex morosus* is one of the many species in which the mesopleuron is shiny, with well-defined punctures; the setae are erect on the vertex and nearly so on the scutum and midfemoral venter (as in Figures 32, 33), inclined obliquely anterad on the propodeal dorsum; the gaster as well as legs are black; and the female tarsi are of the *pompiliformis* type. Species of this complex are difficult to distinguish, but *morosus* differs as follows:

1. From most species with the above characteristics, by an almost flat middle clypeal section in the female (bevel shorter than basomedian area) and the presence of a well-defined foretarsal rake in almost all males.

2. From *nigricolor* Dalla Torre (which occurs in China: Beijing; Korea, Japan, Ryukyu Islands, Taiwan), in having relatively long scutal setae, a distinctive male clypeus (Figures 15, 17), and a foretarsal rake present in almost all males; the all black or mesally dark reddish mandible helps in identification. Specifically, the setal length, anterolaterally on scutum, is about 0.3–0.4 × basal mandibular width; in the male, the apical portion of the clypeal lobe (including lip) is situated basically in the same plane as the remaining clypeus; the male



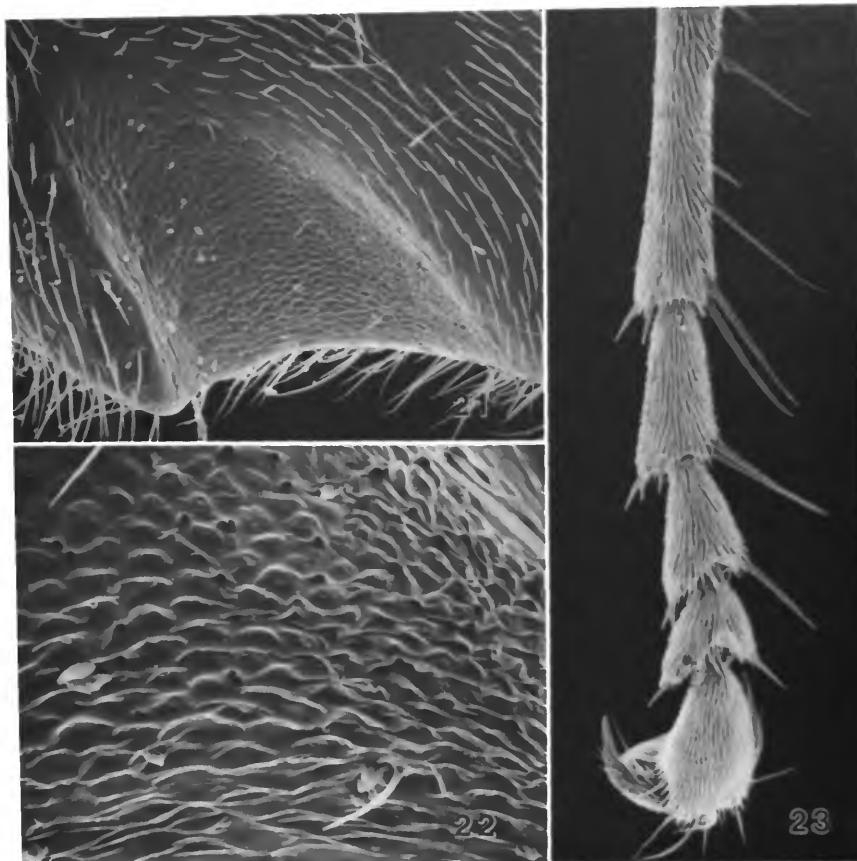
FIGURES 14–20.—*Tachysphex morosus* (F. Smith): 14, female head frontally; 15, male head frontally; 16, female clypeus; 17, male clypeus, with outlines showing individual variation; 18, female hindwing; 19, volsella, with outline showing individual variation; 20, penis valve (inner side).

forebasitarsus has two to five rake spines, of which at least one is longer than basitarsal width; and the apicoexternal spine of foretarsomere II is as long as foretarsomere III or longer. In *nigricolor*, the setal length, anterolaterally on scutum, is about $0.2 \times$ basal mandibular width, an obvious difference when specimens are compared; in the male, the apical portion of the clypeal lobe (including lip) is bent toward the back of the head and separated from the remaining surface by an inflection; the male foretarsomere has no rake spines or at most one minute spine near base; and the apicoexternal spine of foretarsomere II is shorter than tarsomere III. The two species are largely allopatric, but occur together in Taiwan. According to Tsuneki

(1983), the mandible is “usually wholly black” in *morosus* while “always medianly broadly reddish” in *nigricolor*, but in fact this difference is not very reliable. For example, the mandible is as dark in two paratypes of *nigricolor yaeyamanus* Tsuneki (CAS) as it is in most *morosus*. Two other characters mentioned by Tsuneki are also variable (microsculpture of mesopleural interspaces and propodeal ridges).

3. From the female of *sri* (an endemic of Sri Lanka), by the long vertex setae (setal length about two midocellar diameters in *morosus*, one diameter in *sri*).

4. From *formosanus* Tsuneki (which is known from



FIGURES 21-23.—*Tachysphex morosus* (F. Smith): 21, male forefemoral notch; 22, sculpture of male forefemoral notch $\times 1065$; 23, male foretarsus.

Taiwan and Ryukyu Islands), by subtle characters that probably intergrade. In *morosus*, the scutal setae are as described under 2 above and the mandible is black or dark reddish mesally. In *formosanus*, the scutal setae are insignificantly shorter (equal to 0.2–0.3 of basal mandibular width) and slightly more inclined posterad, and the mandible is yellowish red mesally (particularly on the anterior face). There are other differences according to Tsuneki (1983), but I have observed full intergradation: the tarsal apex (black or dark brown in *morosus*, reddish brown in *formosanus*), color and configuration of the female rake spines, and male forefemoral notch. The species overlap in Taiwan.

5. From *fugax* (Radoszkowski), which occurs in Africa, southern Europe, east to Tajikistan, in having a shorter female flagellum. For example, flagellomere IV is 3.5–3.6 as wide as long in *morosus* and 4.0–5.0 in *fugax*. There are no constant differences between males, although the flagellum averages longer in *fugax*. Males of *fugax* from southeastern Europe, however, are distinctive: length of flagellomere III is about 0.6–0.7 of IV and the apicoexternal spine of tarsomere II is markedly shorter than tarsomere III. In *morosus* and most

fugax, length of flagellomere III is 0.9 of IV, and apicoexternal spine of foretarsomere II is as long as tarsomere IV or longer.

6. From *helveticus* Kohl (which occurs in the western Palearctic to Mongolia), by a combination of characters: scutal setae as under 2 above, mandible black or dark reddish mesally, mesopleural interspaces shiny, apical silvery fascia on terga I–III (I–IV in occasional specimens). In *helveticus*, scutal setae are shorter in the female of the nominotypical subspecies (0.2 \times basal mandibular width) and longer in the male of *helveticus aegyptiacus* Morice (0.5 \times), the mandible is yellowish red in *helveticus aegyptiacus* (Egypt), the mesopleural interspaces are microsculptured in the female and many males of *helveticus helveticus* and *helveticus quadrifasciatus* Pulawski, and the apical fascia is present on terga I–IV in *helveticus quadrifasciatus* Pulawski (Cyprus, Jordan, Tajikistan).

7. From *angustatus* Pulawski (which is known from Greece, Turkey, Iran, Transcaspia, and Mongolia), by the broad clypeal lobe of male and finely punctate sterna in both sexes. In the male, the distance between the orbit and corner of the clypeal lobe is more than the clypeal midline in *morosus*, but

less than that in *angustatus*. Sternal punctures are markedly larger in *angustatus* than in *morosus*, a feature that is easily seen but difficult to describe or to quantify.

DESCRIPTION.—Scutal punctures well defined, about one diameter apart on disk, less than that near margins. Mesopleural punctures well defined, averaging about two to three diameters apart beneath scrobe (more than that in some specimens); interspaces shiny, also posteriorly. Episternal sulcus complete, but evanescent anteroventrally in many specimens. Propodeal dorsum rugose or irregularly ridged; side ridged. Hindcoxal dorsum: inner margin carinate basally, carina practically not expanded. Apical tarsomeres without spines on venter or lateral margins.

Setae (figures in parentheses refer to setal length expressed as fraction of basal mandibular width): erect on vertex (0.4–0.5) and between mandibular base and occipital carina (0.4), slightly inclined posterad on scutum mesally (0.3–0.4 anteriorly), suberect and inclined posterad on mesopleuron (0.4); inclined obliquely anterad on propodeal dorsum.

Body black, tarsal apex dark brown. Frontal vestiture silvery. Gastral segments I–III silvery fasciate apically (I–IV in a male from Kokmotte area, Sri Lanka). Wings moderately infumate.

♀.—Clypeus (Figures 14, 16): middle section almost flat, with no inflection between basomedian area and bevel; the latter shorter than basomedian area, not extending laterad to lobe corner; free margin of lobe arcuate to obtusely pointed mesally. Vertex width 1.5–1.6 × length. Dorsal length of flagellomere I 2.0–2.3 × apical width. Outer surface of foretibia with one or two spines. Tarsi of *pompiliformis* type, forebasitarsus with five to seven rake spines. Pygidial plate shiny, with punctures that concentrate mainly along margins. Length 8.5–10.5 mm.

♂.—Innermandibular margin with tooth. Clypeus (Figures 15, 17): bevel absent; lip of equal length mesally and laterally, its free margin straight, arcuate, sinuate, or insignificantly concave; distance between lip corners 0.7–0.9 × distance between corner and orbit; corners prominent. Vertex width 1.6–1.8 × length. Dorsal length of flagellomere I 1.1–1.4 × apical width. Forefemoral notch with microsculptured, asetose bottom (Figures 21, 22). Foretarsus with rake in vast majority of specimens (Figure 23): outer margin of forebasitarsus with three to five preapical spines, apical spine of tarsomere II as long as tarsomere III or longer (one male from Chiang Mai has two preapical spines on left basitarsus, but only one minuscule spine on right one; one male from Phoenix Islands has no preapical spines). Tergum VII with minute punctures that are several diameters apart basomedially. Sterna densely, evenly punctate and setose. Volsella: Figure 19. Penis valve: Figure 20. Length 5.5–8.5 mm.

COLLECTING PERIOD.—All months except April and December.

HABITAT.—The species occurs in all three ecological zones in Sri Lanka at altitudes ranging from near sea level to an



FIGURE 24.—Collecting localities of *Tachysphex morosus* (F. Smith), in Sri Lanka.

elevation of 1880 m, in localities with an average annual rainfall ranging from 970 to 4900 mm (Figure 24).

GEOGRAPHIC DISTRIBUTION.—Widely distributed in the Oriental Region and in Oceania, ranging from Sri Lanka, Sumatra, and New Guinea in the south to Nepal, China (Sichuan), and Taiwan in the north, and to Micronesia, Fiji, and Hawaii in the east. Quite possibly it was introduced into the last three areas by commerce.

RECORDS.—BHUTAN: Wangdu (1♀, CAS).

CHINA: SICHUAN: Hanyuan [as Fulin] (1♀, USNM).

FIJI: VITI LEVU: Korotogo, 8 km E Sigatoka (13♀, 20♂, CAS).

HONG KONG: Hong Kong Island: Potfulan (1♀, CAS).

INDIA: ASSAM: Khasia Hills (1♀, OXFORD, holotype of *tinctipennis*). BIHAR: Tirhut [as Tirhoot] (Bingham, 1897). KARNATAKA: Mudigere area (2♀, ♂, 1 CAS; 5♀, 2♂, ZMK). KERALA: Walayar forests (1♀, USNM). TAMILNADU: Anamalai Hills, Cinchona (1♀, 1♂, CAS; 2♀, 1♂, FSAG; 3♀, 1♂, OSU); Nilgiri Hills, Naduvatam (1♂, OSU); Nilgiri Hills, Cherangode (1♀, USNM); Shevaroy Hills, Yercano (2♀, OSU).

INDONESIA: IRIAN JAYA: Kebar, W Manokwari in Vogelkop (1♀, BISH). MALUKU: Ambon Island: no specific locality (2♀, CAS). SULAWESI: Senkang (1♀, 3♂, CAS; 5♀, 12♂, RMNH), no specific locality (1♀, OXFORD, holotype of *morosus*). WEST SUMATRA: Padang (1♀, 1♂, RMNH).

LAOS: VIENTIANE PROVINCE: Ban Van Eu (2♀, BISH), Gi Sion Vill., de Tha Ngon (1♀, BISH; 1♀, CAS), Phou Khao Khouai (1♀, BISH). SAVANNAHET PROVINCE: Savannahket (2♀, BISH).

MALAYSIA: Kuala Lumpur (1♀, BISH).

MYANMAR (Burma): Tenasserim (Bingham, 1897).

NEPAL: Arun Valley, Sabhaya River below Tumlingtar (2♀, BMNH; 1♀, CAS), Sysbrubens, 35 km N Trisuli (1♂, BISH).

PACIFIC OCEAN ISLANDS: CAROLINE ISLANDS: Peleliu Island: Palau (Krombein, 1949). HAWAIIAN ISLANDS: Oahu: Hickam Field (1♀, CAS), Honolulu (Weber, 1948). MARIANA ISLANDS: Saipan, Susupe (2♀, 2♂, BISH). PHOENIX ISLANDS: Canton Atoll (1♀, CAS; 3♀, 1♂, USNM).

PAPUA NEW GUINEA: MADANG: Nagada Harbor, 8 km N Madang (3♀, CAS), Sapi Forest Reserve, 30 km W Madang, 5°12'S, 145°30' (1♀, CAS). MOROBE: Wau (2♂, USNM).

PHILIPPINES (Tsuneki, 1983, if not indicated otherwise): CEBU: Argao. LUZON: Albay Province: Tabaco. Camarinesur Province: Baao and Bato. Laguna Province: Alaminos, Los Baños (1♀, RMNH; 1♂, BISH), Mount Makiling (1♀, USNM), Pagsanjan. La Union Province: Baguio, Naguilian, St. Fernando. Manila Province: Manila (1♀, USNM). Mountain Province: Bontoc. MINDANAO: Bukidnon, Davao, Zamboanga. NEGROS: Kalaukalau (8♀, BISH), Mambucal, Taytay beach. PALAWAN: Uring Uring: Brookes Point, 8°47', 117°50'E (3♀, ZMK).

SINGAPORE: Singapore (1♀, 2♂, CAS).

SRI LANKA: AMPARAI DISTRICT: Ekgal Aru Reservoir Jungle (1♀, USNM, Biological Note 61076D; 5♀, 2♂, USNM), Ekgal Aru tank (1♂, USNM). ANURADHAPURA DISTRICT: Padaviya (1♂, USNM), Ritigala Natural Reserve (2♀, 1♂, USNM), Wildlife Sanctuary Bungalow, Hunuwilagama in Wilpattu National Park (1♂, USNM). BADULLA DISTRICT: Ella (2♀, USNM). COLOMBO DISTRICT: Gampaha Botanical Garden (2♀, USNM); Colombo, Museum Gardens (1♂, USNM), Labugama Reservoir Jungle (1♀, USNM). GALLE DISTRICT: Kanneliya Jungle (1♀, USNM). HAMBANTOTA DISTRICT: Palatupana (1♀, USNM). KANDY DISTRICT: Hasalaka Circuit Bungalow (1♀, USNM); Kandy (5♀, 3♂, USNM); Kandy, Peak View Motel (1♂, CAS); Kandy, Udawattakele Sanctuary

(1♀, CAS; 5♀, USNM); Peradeniya, Botanical Gardens (1♂, USNM), Thawalamtenne (3♀, USNM). KEGALLA DISTRICT: Kitulgala in Bandarakele Jungle (1♀, USNM); Kitulgala, Makande Mukalana (1♀, USNM). KURUNEGALA DISTRICT: Kurunegala, Athugala (Elephant Rock) (1♂, USNM), Kurunegala, Badegamuwa Jungle (1♀, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park (2♀, 1♂, USNM); Marichchukkaddi (1♂, COLOMBO); Silavaturai, Kondachchi (1♂, COLOMBO; 1♂, USNM). MONARAGALA DISTRICT: Angunakolapelessa (2♂, USNM), 13 mi (20.8 km) E Uda Walawe (1♂, USNM). NUWARA ELIYA DISTRICT: Hakgala Botanical Gardens (3♀, 1♂, USNM), Hakgala Natural Reserve (8♀, 16♂, USNM). RATNAPURA DISTRICT: Rajawaka (1♀, USNM); Weddagala in Sinharaja Forest (1♀, USNM, Biological Note 62176); Sinharaja Forest, 2 mi (3.2 km) S Weddagala (2♀, 3♂, USNM); Sinharaja Forest, 3 mi (4.8 km) S Weddagala (1♀, USNM). TRINCOMALEE DISTRICT: Trincomalee, China Bay (1♀, 1♂, USNM); Trincomalee, China Bay Ridge Bungalow (1♀, CAS; 4♀, 1♂, USNM).

TAIWAN (Tsuneki, 1967, if not indicated otherwise): CHIAYI PREFECTURE: Chuchi. HUALIEN PREFECTURE: Liyuchih. ILAN PREFECTURE: Tsukeng. NANTOU PREFECTURE: Lihyuetan, Penpuchi. PINGTUNG PREFECTURE: Hengchun, Kentin, Suchungchi. TAIPEI PREFECTURE: Yangmingshan. TAITUNG PREFECTURE: Chulu, Taitung, Taoyeh. TAOYUAN PREFECTURE: Taoyuan (Haneda, 1971). Also (Tsuneki, 1977b): Takao and Taihorinsho.

THAILAND: BANGKOK: Bangkok (1♂, OSU). CHIANG MAI: Chiang Mai (2♀, 16♂, CAS), Huai Tung Tao, 10 km N Chiang Mai (1♀, CAS). KANCHANABURI: Kanchanaburi (1♀, 3♂, CAS), Lam Ta Pen River bank, 5 km NW Lat Ya (7♂, CAS). LOEI: Loei (6♀, 2♂, CAS). RAYONG: Ko Samet Island (1♀, 2♂, CAS).

4. *Tachysphex consocius* Kohl

FIGURES 25-34

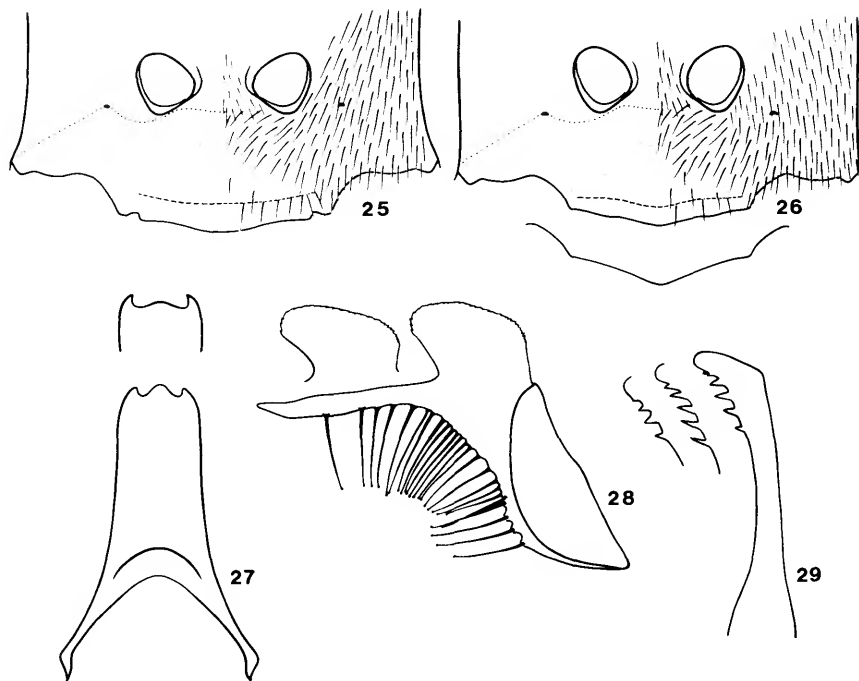
Tachysphex consocius Kohl, 1892:217, ♀. [Holotype: ♀, Azerbaijan: Helenendorf, now Khanlar (NHMW), examined].—Pulawski, 1971:185 [revision; full bibliography].—Bohart and Menke, 1976:273 [listed].

Tachysphex Cabrerae Mercet, 1909:196, ♂, ♀ [Incorrect original capitalization. Syntypes: Spain: Madrid (MNCN), examined. Synonymized with *Tachysphex consocius* by Pulawski, 1971:185.]

Tachysphex minutulus Arnold, 1923:160, ♀, ♂. [Holotype: sex not indicated, Zimbabwe: Bulawayo (SAM), examined (one female and one male on the same card labeled as types). Synonymized with *Tachysphex consocius* by Pulawski in Bohart and Menke, 1976:273].—Arnold, 1924:57 [additional description].

Tachysphex grandii de Beaumont, 1965:51, ♀, ♂. [Holotype: ♂, Italy: Bologna: Gaibola (Bologna Univ.), examined. New synonymy].—Pulawski, 1971:182 [revision].—Bohart and Menke, 1976:274 [listed].

DIAGNOSIS.—Like *morosus* and many other species, *consocius* is characterized by a shiny mesopleuron with well-defined punctures; the setae are erect on the vertex, nearly erect on the scutum and midfemoral venter (Figures 32, 33), and inclined obliquely anterad on the propodeal dorsum; the gaster, femora,



FIGURES 25-29.—*Tachysphex consocius* Kohl: 25, female clypeus; 26, male clypeus, with outline showing individual variation; 27, male sternum VIII, with outline showing individual variation; 28, volsella, with outline showing individual variation; 29, penis valve (inner side), with outlines showing individual variation.

and tibiae are black; and the female tarsi are of the *pompiliformis* type. The female of *consocius* differs in having a sinuate, laterally incised clypeal lip (Figure 25). Unlike all other *Tachysphex*, the male has a longitudinal line on flagellomeres III-XI that delimits two differently sculptured and setose areas (Figures 30, 31); the tridentate apical margin of sternum VIII (Figure 27) is shared with *oxychelus*.

STATUS OF *Tachysphex grandii*.—Following de Beaumont (1965), Pulawski (1971) regarded *grandii* as a separate species similar to *consocius*, with the same basic recognition characters as in the diagnosis above. I distinguished them as follows. In *consocius*: setal length $1.0-1.5 \times$ midocellar diameter on vertex and $0.7-1.5$ on midfemoral venter (Figure 32); frons all irregularly punctatorugose or with well-defined punctures above antennal socket; male flagellomeres III and IV markedly thicker than flagellomere I apically; and mesopleural punctures several diameters apart posteriorly. In *grandii*: setal length $0.5-0.6 \times$ midocellar diameter on vertex and $0.3-0.4$ on midfemoral venter (Figure 33); entire frons with well-defined punctures; male flagellomeres III and IV insignificantly thicker than flagellomere I apically; and mesopleural punctures of some specimens one diameter apart or so near metapleuron. A reanalysis of these characters shows that they do intergrade and are not correlated with each other. A few examples are given below:

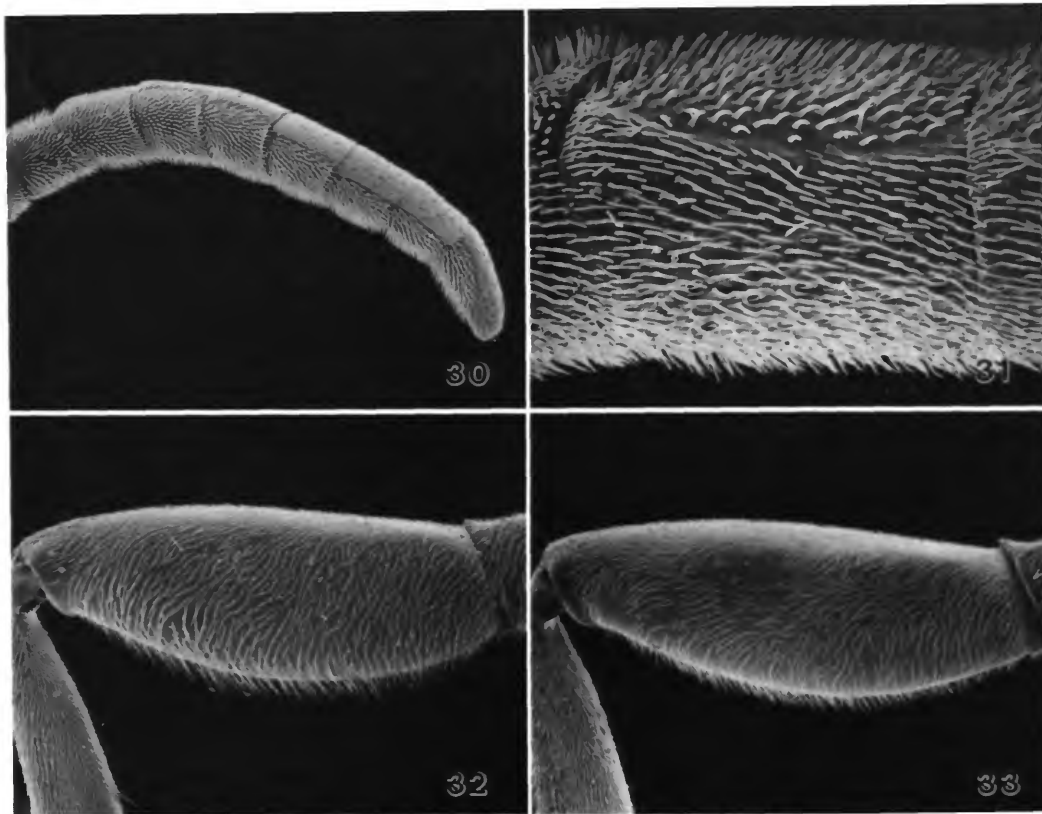
1. In three females from Sozopol, Bulgaria (CAS), the frontal punctures are well defined, but the setae of the midfemoral venter are $0.5 \times$ midocellar diameter in one and about 0.75 in the other two.

2. Several males from Yermasoyia River, Cyprus (CAS), have flagellomeres III and IV as thick as I and the setae of the midfemoral venter $0.7 \times$ midocellar diameter. In most of them, the frons is punctatorugose, but it is punctate in one.

3. In three males from Ashkhabad, Turkmenistan (CAS), collected in the same nesting site on the same day, the frons is markedly punctatorugose in one, somewhat rugose in another, and punctate in the third. The setae of the midfemoral venter are about $0.5 \times$ midocellar diameter in the first two specimens and 0.3 in the third.

At this time, I cannot see any discrete morphological gap between *consocius* and *grandii* and I do not think they are reproductively isolated. Consequently, I regard these two names as synonyms.

STATUS OF *Tachysphex consocius mookonis*.—Tsuneki (1972:392) described a *Tachysphex consocius mookonis*, based on a single female from the Somon Bulgan area, Mongolia (TMB). I have examined the specimen and found that the clypeal lip is not emarginate laterally, the vertex width is equal in length, and the pygidial plate is all black. These three characteristics exclude *consocius*. Other features demonstrate



FIGURES 30-33.—*Tachysphex consocius* Kohl: 30, male flagellum; 31, male flagellomere VIII; 32, female midfemur (Spain); 33, same (Bulgaria).

that the female in question is *nitidissimus* de Beaumont, 1952: a narrow vertex, vertex setae about equal in length to midocellar diameter, well-defined clypeal bevel, punctures of scutal disk averaging several diameters apart, silvery setal fasciae present on terga I-III only. Consequently, I regard *mookonis* as a junior synonym of *nitidissimus*. The previously known range includes North Africa, southeastern Europe, east to Uzbekistan, Turkmenistan, and Tajikistan. One new record is: Kazakhstan: Kaskelenka River, 50 km N Alma-Ata (2♂, CAS).

DESCRIPTION.—Frons of most specimens with well-defined punctures above antennal socket and punctatorugose, with ill-defined punctures, near midocellus; but entire frons punctatorugose in many specimens and with well-defined punctures in some. Scutal punctures well defined, averaging one diameter apart or nearly so, but discal punctures many diameters apart in many Egyptian specimens. Episternal sulcus effaced anteroventrally. Mesopleural punctures posteriorly minute (markedly smaller than those on scutum), several diameters apart; all mesopleural punctures minute in most specimens from southwestern Europe. Punctures of mesothoracic venter averaging one diameter apart or nearly so, but up to two or three diameters

apart in specimens from southwestern Europe. Propodeal dorsum ridged (ridges evanescent posteriorly in some specimens); side ridged. Hindcoxal dorsum: inner margin carinate but carina not expanded basally. Apical tarsomeres without spines on venter or lateral margins.

Setae erect on vertex, suberect on scutum and midfemoral venter (Figures 32, 33), inclined anterad on propodeal dorsum, varying in length both geographically and individually. Maximum setal length on vertex, scutum anterolaterally, and midfemoral venter, expressed as a fraction of midocellar diameter, is 1.5-1.0, 1.2-1.0, and 1.5-0.3, respectively. The shortest setae are found in some individuals from the Mediterranean basin to Turkmenistan and Tajikistan. In Sri Lankan specimens, the setal length is 1.0, 1.0, and 1.0, respectively.

Body black except mandible reddish mesally; apical tarsomeres reddish in many specimens and pygidial plate reddish apically in most Palearctic females. Frontal vestiture silvery. Terga I-III or I-IV in female, and I-IV or I-V in male, silvery fasciate apically. Wings almost hyaline with brown veins in most populations, but slightly yellowish, with yellowish veins, in Sri Lankan specimens.

♀.—Clypeus (Figure 25): bevel longer than basomedian area; lip sinuate, incised laterally. Dorsal length of flagellomere I 1.5–2.2 × apical width. Vertex width 1.5–1.7 × length. Outer surface of foretibia with one thin spine or without spines. Tarsi of *pompiliformis* type, forebasitarsus with six or seven rake spines. Pygidial plate shiny, sparsely punctate. Length 6.0–8.0 mm.

♂.—Inner mandibular margin with tooth. Clypeus (Figure 26): bevel shorter than basomedian area in most specimens, longer than bevel in some; lip arcuate, not pointed to prominently pointed mesally (slightly pointed in most specimens), with well-defined corner; distance between corners 1.3–1.4 × distance between corner and orbit. Dorsal length of flagellomere I 1.5–2.1 × apical width; flagellomeres III–XI with longitudinal line that delimits two differently sculptured and setose areas (Figures 30, 31). Vertex width 1.9–2.2 × length. Forefemoral notch glabrous, its bottom compressed but not crest-like. Forebasitarsus without preapical spines on outer margin. Tergum VII densely, minutely punctate. Sterna evenly, finely punctate, sternum VIII tridentate apically (Figure 27). Volsella: Figure 28. Penis valve: Figure 29. Length 4.5–6.0 mm.

COLLECTING PERIOD.—15–16 February, 12–17 and 21–26 May, 21–22 June, 28 October–3 November.

HABITAT.—This species occurs only in the Dry Zone at altitudes from sea level to 100 m and average annual rainfall of 920–1725 mm (Figure 34).

GEOGRAPHIC DISTRIBUTION.—Africa south to Cape Province, Arabian Peninsula, Europe north to southern France and Slovakia, Syria, Turkey, southern Russia (north to Volgograd area), Kazakhstan (north to Uralsk), Uzbekistan (north to Tashkent), Turkmenistan, Tajikistan, Mongolia, Iran, Afghanistan, India, Sri Lanka.

RECORDS (localities given in Pulawski, 1971, are not repeated).—INDIA: KARNATAKA: Bangalore (1♀, 1♂, ITZA; 2♂, ZMK). TAMIL NADU: Thanjavur (= Tanjore; 1♂, USNM).

IRAN: MAZANDERAN: coastal plain between Chalus and Shahsavar (1♀, CAS).

KENYA: Naro Moru, 00°09'S, 37°01'E (1♂, CAS; 1♀, ZMK), Tiwi Beaches, 04°14'S, 39°36'E (1♂, CAS).

NAMIBIA: GOBABIS DISTRICT: 40 km N Witvlei (1♀, CAS). KARIBIB DISTRICT: 43 km E Karibib (1♂, CAS). REHOBOTH DISTRICT: 9 km S Rehoboth (1♀, CAS). TSUMEB DISTRICT: 30 km E Namautoni (1♀, CAS). WINDHOEK DISTRICT: 2 km S Aris (1♂, CAS).

OMAN: Al Khuwayr, 23°36'N, 58°26'E (2♀, 2♂, CAS).

SOUTH AFRICA: CAPE PROVINCE: Cedarberg (1♀, RMNH), Plettenberg Bay (1♂, CAS), Wellington: Rooshoek (5♀, 4♂, CAS; 20♀, 16♂, RMNH). TRANSVAAL: Discovery (1♀, 1♂, CAS), Pretoria (1♂, CAS), Swartuggens (1♀, CAS).

SRI LANKA: ANURADHAPURA DISTRICT: Hunuwilagama near Wilpattu National Park (1♀, 1♂, USNM). HAMBANTOTA DISTRICT: Palatupana Tank (1♂, USNM). MANNAR DISTRICT: Kokmotte Bungalow, 0.5 mi (0.8 km) NE Wilpattu National



FIGURE 34.—Collecting localities of *Tachysphex consocius* Kohl in Sri Lanka.

Park (3♀, 1♂, USNM). TRINCOMALEE DISTRICT: Trincomalee, China Bay Ridge Bungalow (2♀, CAS; 4♀, USNM).

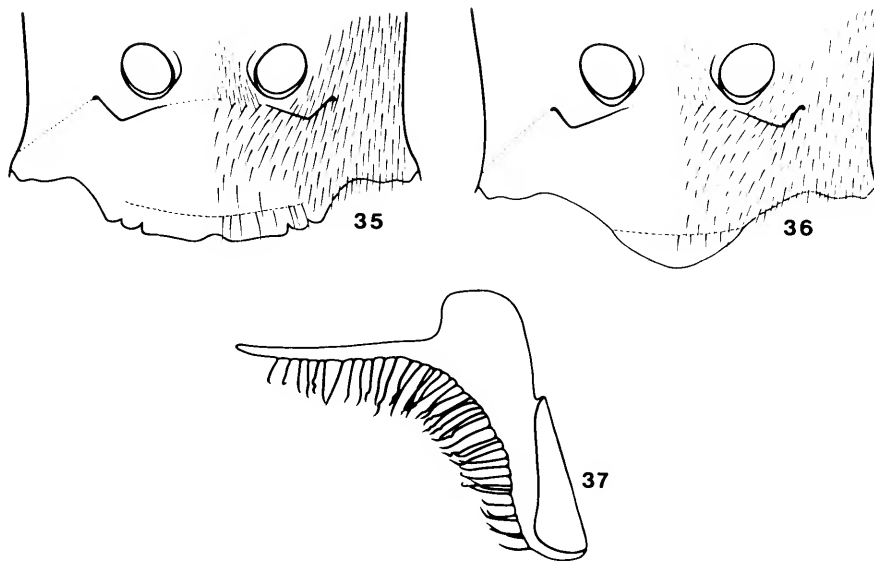
TANZANIA: Usambara Mountains: Amani (1♂, CAS; 2♀, 1♂, ZMK), Monga N Amani (1♀, 1♂, CAS; 2♀, ZMK).

ZIMBABWE (Arnold, 1923): Bulawayo, Matapos.

5. *Tachysphex anthracinus* Pulawski, new species

FIGURES 35–41

NAME DERIVATION.—*Anthracinus* is derived from the Greek adjective *anthrakinos*, pertaining to coal, coal-black; with reference to the black body, including the foretarsal rake of the female.



FIGURES 35-37.—*Tachysphex anthracinus* Pulawski, new species: 35, female clypeus; 36, male clypeus; 37, volsella.

DIAGNOSIS.—*Tachysphex anthracinus* has the setae erect on the vertex and along the hypostomal carina, nearly erect on the mesopleuron, and inclined posterad on the propodeal dorsum. Unlike other species with these characters, *anthracinus* has a dull, conspicuously microsculptured, practically impunctate mesopleuron, upper frons, and interocellar area. In the female, a black foretarsal rake is also distinctive, and subsidiary recognition features are: tarsomeres IV as long as wide (Figure 38), tarsomeres V with spines on venter and lateral margins (Figure 40), and vertex width about $1.5 \times$ length. The foretarsal rake is largely black in the western Australian *circulans* Pulawski (in which the setae are appressed on the head and mesopleuron), and silvery, red, or brown in the other species in which the propodeal setae are inclined posterad. Subsidiary recognition features of the male *anthracinus* are: clypeal lip obtusely pointed, distance between lip corners smaller than distance between corner and orbit (Figure 36).

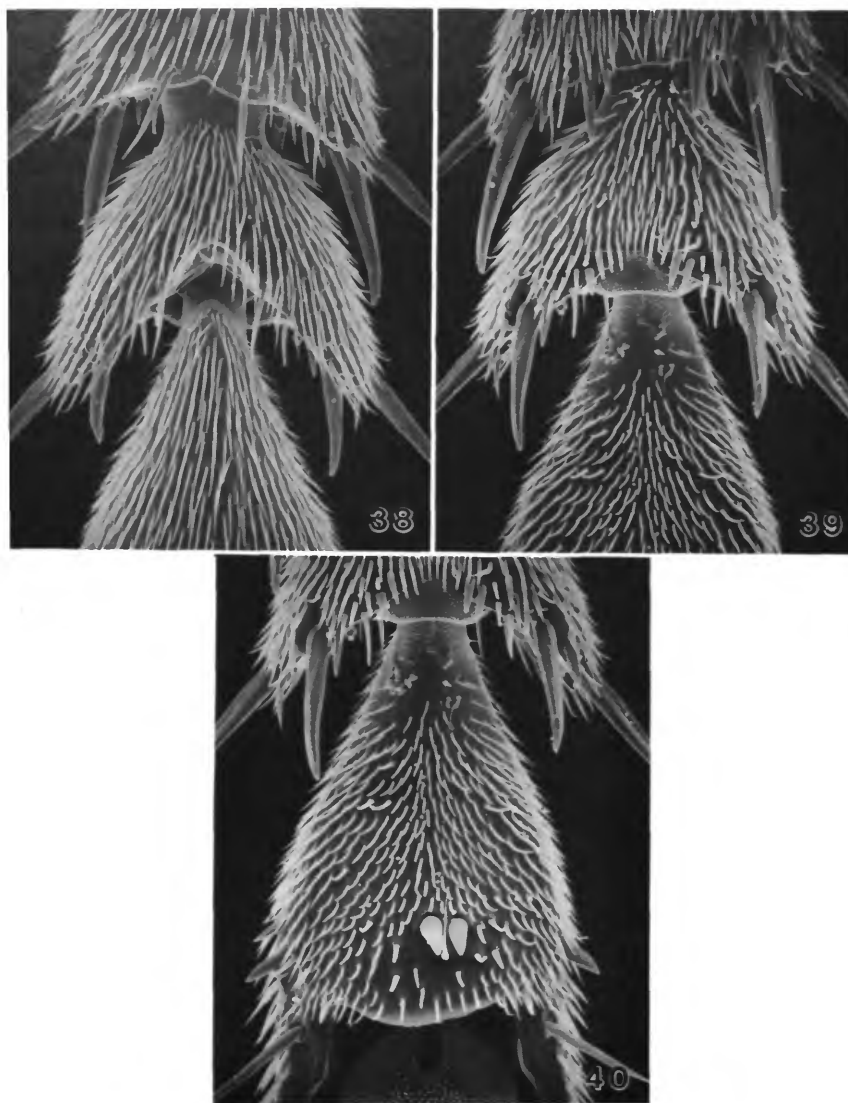
DESCRIPTION.—Frons, interocellar area, and mesopleuron dull, conspicuously microsculptured; frons and interocellar area at most with minute, inconspicuous punctures; mesopleuron with shallow, inconspicuous punctures that are about one diameter apart. Scutal punctures in most specimens well defined, averaging less than one diameter apart, but ill defined, almost contiguous, in smallest male. Propodeal dorsum irregularly rugose (irregularly longitudinally ridged near base); side ridged in females but ridges evanescent in males. Hindcoxal dorsum: inner margin weakly angulate basally. Sternum I with shallow apicomedian depression that, in some specimens, is bisected by obtuse, longitudinal carina.

Setae: on vertex erect, about one midocellar diameter long; along hypostomal carina erect, about $0.3 \times$ basal mandibular width; on scutum appressed, uniformly oriented posterad; on propodeal dorsum inclined posterad.

Head, thorax, gaster and legs (including tarsi and foretarsal rake) black. Tegula and humeral plate yellow brown, wings yellowish. Terga I-III silvery fasciate apically.

♀.—Labrum broadly, shallowly emarginate. Clypeus (Figure 35): bevel as long as basomedian area or slightly longer; lip emarginate mesally in most specimens but entire in some, with two lateral incisions on each side. Vertex width $1.4-1.6 \times$ length. Dorsal length of flagellomere I $1.5-1.6 \times$ apical width. Forefemoral venter smooth or microsculptured, with minute punctures that are many diameters apart. Outer surface of foretibia with few thin, erect bristles but without spines. Forebasitarsus with 10 or 11 rake spines. Hindtarsomere IV: length equal to apical width, emargination weakly acute, almost rectangular (Figure 38); apicoventral margin shallowly concave (Figure 39). Hindtarsomere V: apicoventral margin weakly convex; lateral margins with one or two small preapical spines; venter with a few small spines distally (Figure 40). Pygidial plate shiny, sparsely punctate. Length 7.5–8.0 mm.

♂.—Clypeus (Figure 36): bevel ill defined; lip broadened mesally, free margin obtusely angulate, not angulate laterally; distance between lip corners about $0.8 \times$ distance between corner and orbit. Vertex width $1.3-1.5 \times$ length. Dorsal length of flagellomere I $1.3 \times$ apical width. Bottom of forefemoral notch finely setose. Outer margin of forebasitarsus without preapical spines. Apical tarsomeres without spines on venter or



FIGURES 38–40.—*Tachysphex anthracinus* Pulawski, new species: 38, female hindtarsomere IV dorsally; 39, same, ventrally; 40, female hindtarsomere V ventrally.

lateral margins. Punctures of tergum VII less than one diameter apart, sternal punctures minute, dense, uniform. Volsella: Figure 37. Length 5.0–6.0 mm.

COLLECTING PERIOD.—22–28 January, 26 February, 10–28 March, and 10 June.

HABITAT.—This species occurs only in the Dry Zone in areas from near sea level to 100 m and an annual average rainfall of 1000–1700 mm (Figure 41).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka, Mannar District,

Kondachchi, 22–28 Jan 1978, PBK, TW, MJ, GR (USNM).

Paratypes: SRI LANKA: AMPARAI DISTRICT: Ekgal Aru, KVK, PBS, SK (1♀, USNM). ANURADHAPURA DISTRICT: Wildlife Society Bungalow, Hunuwilagama in Wilpattu National Park, D. Davies and W. Rowe (1♀, CAS), Padaviya, PBK, SK, DWB (1♀, USNM). JAFFNA DISTRICT: Kilinochchi, KVK, PF, DWB, VG (1♀, USNM). MANNAR DISTRICT: Silavathurai, Kondachchi, PBK, TW, MJ, GR (2♀, CAS, USNM), [PBK] (1♀, NMC); Kondachchi, PBK, TW, MJ, GR (1♀, CAS; 1 headless ♀, USNM); Kondachchi, Ma Villu,

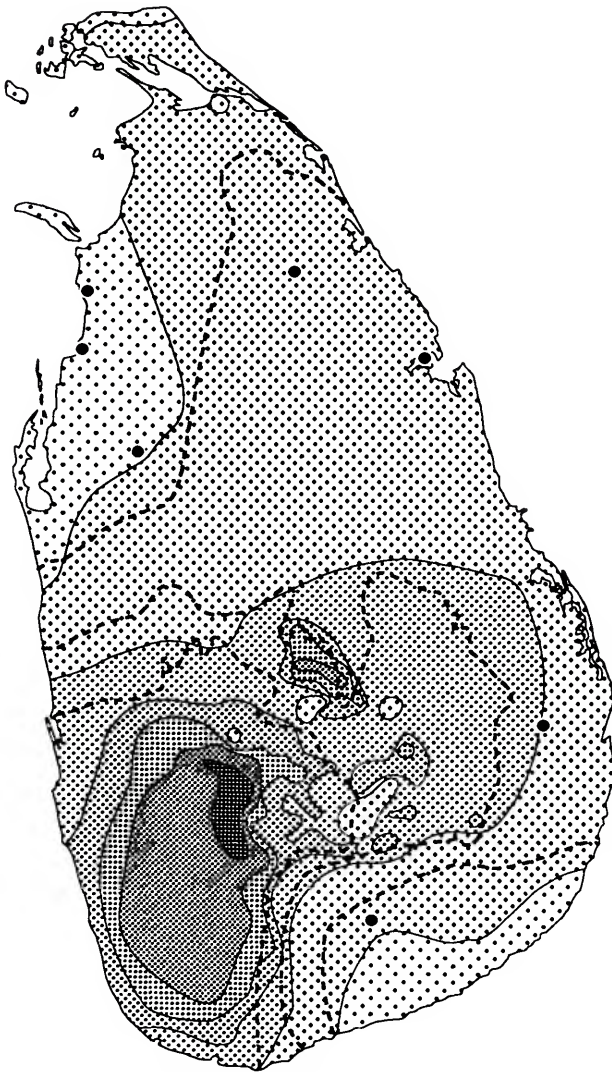


FIGURE 41.—Collecting localities of *Tachysphex anthracinus* Pulawski, new species, in Sri Lanka.

[PBK] (1♀, NMC); Marichchukkaddi, [PBK] (1♂, NMC). MONARAGALA DISTRICT: Angunakolapelessa, KVK, TW, LW (1♂, USNM). TRINCOMALEE DISTRICT: Trincomalee, China Bay Ridge Bungalow, KVK, TW, SS, LJ, TG (1♀, USNM).

6. *Tachysphex gryllivorus* Pulawski, new species

FIGURES 42–52

NAME DERIVATION.—The name *gryllivorus* derives from the Latin words *gryllus*, a cricket, and *vorare*, to devour; with reference to prey of this species.

DIAGNOSIS.—The propodeal dorsum of *gryllivorus* is microareolate or partly rugose or ridged, with setae inclined posterad (at least laterally), the propodeal side is finely punctate

or at most with rudimentary ridges along the margins, and the forebasitarsus has no ventral spines. The female has an unusually short midtarsomere II (Figure 47), with length 1.5–1.6 × apical width (while more than twice in other *Tachysphex*), the pygidial plate is emarginate apically (Figure 44), and subsidiary recognition features are: punctures of the pygidial plate relatively dense (Figure 44), apical tarsomeres with no spines on venter or lateral margins (Figure 49).

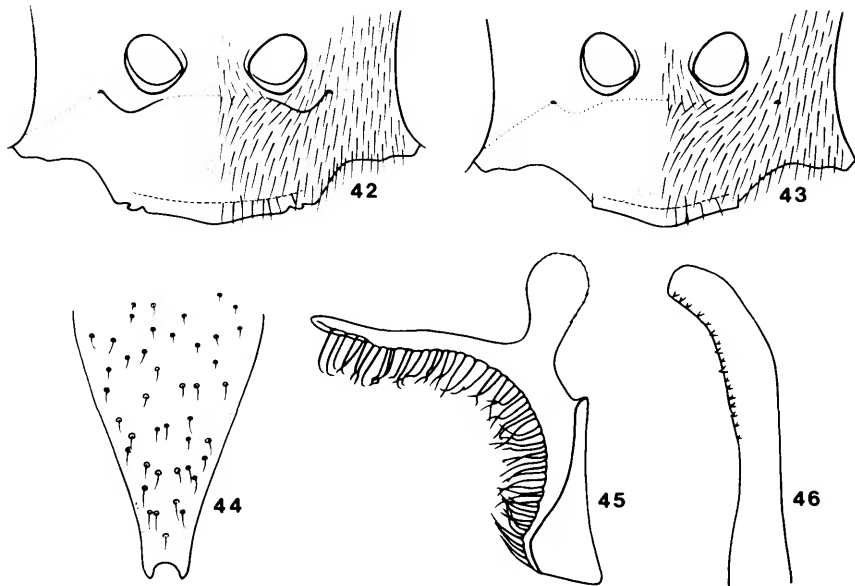
In the male, the propodeal characters are the same as in the female, the black gaster and largely black femora are combined with the red tibiae, and the foretarsus has no rake. The male of *haematopus* is similar, but unlike *gryllivorus* the femora are largely red. In addition, the clypeal lip corner is not prominent in *gryllivorus* (prominent in *haematopus*), the trimmal cleft is small (unusually large in *haematopus*, Figure 57), and flagellomere I is markedly shorter than II (about 0.6 of the latter instead of 0.8). Some extralimital species resemble *gryllivorus* as well. Males of *mundus* W. Fox (Nearctic), *spinulosus* Pulawski (Neotropical), and some *galeatus* Pulawski (Australian) have the same coloration and body sculpture, and they lack a foretarsal rake. In *gryllivorus*, however, the forefemoral notch is deep and has a longitudinal swelling (Figures 50, 51), the setae of sterna III–V are erect or inclined posterad (sternal setae appressed in the other three).

DESCRIPTION.—Mesopleural punctures fine, averaging more than one diameter apart; interspaces microsculptured but somewhat shiny. Propodeal dorsum uniformly microareolate or partly rugose or ridged; side in most specimens finely punctate, ridged anteriorly and posteriorly, but all microsculptured or all ridged in some males. Hindwing vein cu-a vertical in most specimens, but slightly inclined in some (vein anterior end closer to wing base than posterior end). Hindcoxal dorsum: inner margin practically not expanded basally. Forebasitarsus without ventral spines. Sternum I in most specimens with median, longitudinal carina, prominent apicomediaally, but carina absent and prominence vestigial in smallest males.

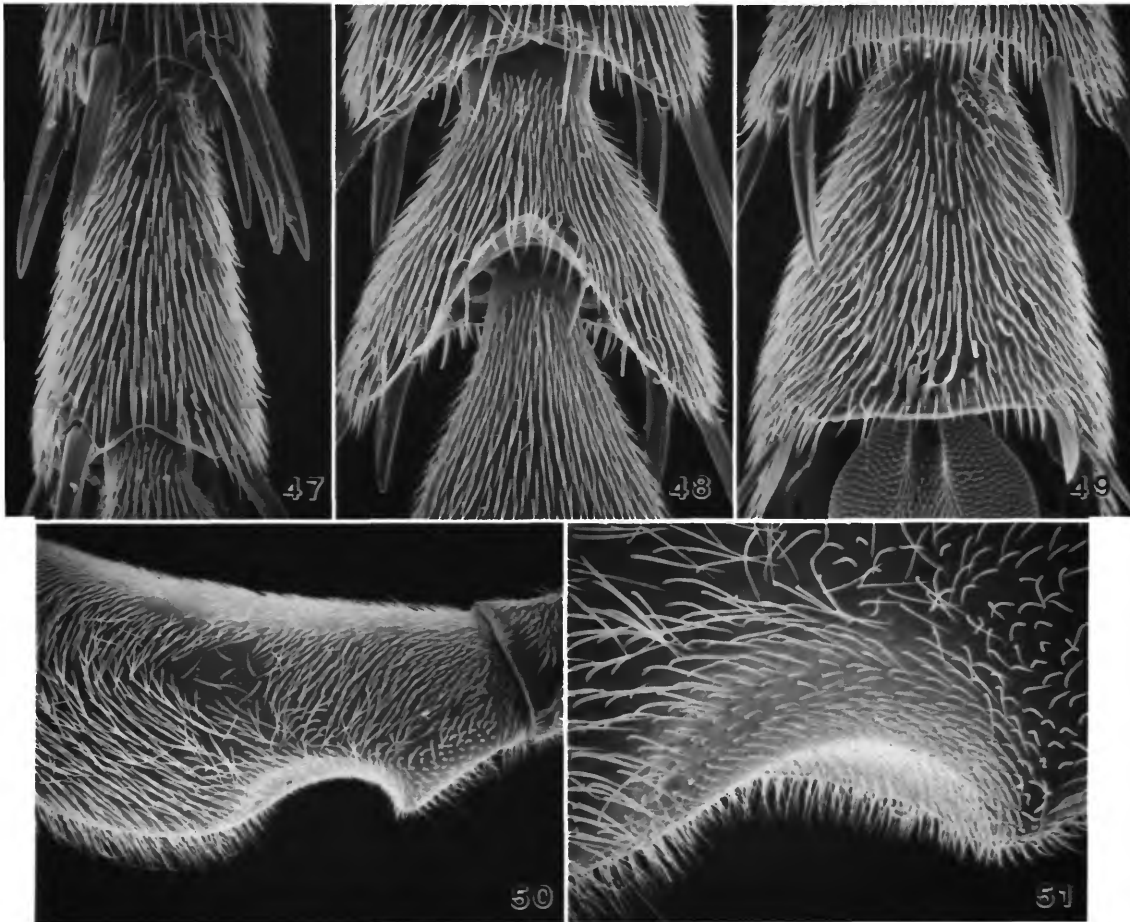
Setae erect, as long as midocellar diameter on vertex; on scutal disk uniformly inclined posterad, shorter than midocellar diameter; along hypostomal carina erect or nearly so, about 0.3 × basal mandibular width; on propodeal dorsum in most specimens inclined posterad except inclined anterad on basomedian, triangular area (apex of triangle not reaching dorsal hindmargin); all setae inclined posterad in one male examined.

Head, thorax, and gaster black; mandible dark reddish mesally in female, yellowish red in male; scape all yellowish red in some males except black basodorsally. Tegula and humeral plate light brown. Wings yellowish (weakly so in some males), veins light brown. Legs black in female, in male femoral apex, tibiae, and tarsi ferruginous. Terga I–IV silvery fasciate apically. Frontal and clypeal vestiture golden in male.

♀.—Labrum with shallow, rudimentary notch. Clypeus (Figure 42): bevel markedly shorter than basomedian area; lip weakly arcuate, not emarginate, with two lateral incisions on each side. Vertex width 1.0–1.1 × length. Dorsal length of flagellomere I 1.3–1.4 × apical width, equal to 0.7 of II.



FIGURES 42-46.—*Tachysphex gryllivorus* Pulawski, new species: 42, female clypeus; 43, male clypeus; 44, female pygidial plate; 45, volsella; 46, penis valve (inner side).



FIGURES 47-51.—*Tachysphex gryllivorus* Pulawski, new species: 47, female midtarsomere II; 48, female hindtarsomere IV dorsally; 49, female hindtarsomere V ventrally; 50, base of male forefemur in profile; 51, forefemoral notch obliquely.

Punctures of scutal disk fine, averaging two to three diameters apart. Forefemoral venter shiny, with minute punctures that are about two to three diameters apart, and also with a few large, sparse punctures. Outer surface of foretibia with a few thin, erect bristles, but without spines. Forebasitarsus with 8–10 rake spines. Midtarsomere II unusually short (Figure 47): length $1.5\text{--}1.6 \times$ apical width. Tarsomeres IV as long as wide, dorsal emargination weakly acute (Figure 48); apicoventral margin weakly concave. Tarsomeres V stout; venter with one long, erect preapical seta; apicoventral margin barely convex (Figure 49). Pygidial plate narrow, emarginate apically, sparsely setose (Figure 44), punctate; large punctures intermixed with small ones; many punctures less than one diameter apart. Length 9.0–10.0 mm.

♂.—Clypeus (Figure 43): bevel ill defined; lip arcuate or weakly sinuate, with well-defined corner; distance between corners $1.1\text{--}1.2 \times$ distance between corner and orbit. Vertex width $0.7\text{--}1.1 \times$ length. Dorsal length of flagellomere I $1.1\text{--}1.2 \times$ apical width, equal to 0.6 of II. Scutal punctures less than one diameter apart in most specimens, but slightly more than one diameter in some. Forefemoral notch large (Figure 50), finely punctate, setose, with longitudinal swelling (Figure 51). Outer margin of forebasitarsus without preapical spines. Apical tarsomeres without ventral spines. Punctures fine on sternum II but becoming gradually larger on following sterna. Volsella: Figure 45. Penis valve: Figure 46. Length 7.0–9.5 mm.

Setae dense and erect or inclined posterad on sterna II–IV, $0.5\text{--}1.0 \times$ midocellar diameter long on III, about $1.0 \times$ midocellar diameter long on IV.

COLLECTING PERIOD.—January through March, 21–25 May, 14 July, 25–26 August (Nepal), 8–14 October.

HABITAT.—Within Sri Lanka, *gryllivorus* is widespread in the Dry Zone at low elevations with average annual rainfall not more than 1700 mm, and it occurs sparingly in the Intermediate Zone; one specimen was collected at Gilimale in the Wet Zone with an average annual rainfall of nearly 4000 mm (Figure 52).

GEOGRAPHIC DISTRIBUTION.—Nepal to Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka, Anuradhapura District, Padaviya, 13 Oct 1977, PBK (USNM).

Paratypes: INDIA: KERALA: Walayar Forests, P. Susai Nathan (2♀, OSU, RMNH). Also: Bombay Presidency [now Gujarat and Maharashtra States]: Sigiri, E. Comber (2♀, 1♂, BMNH) [a locality not found on available maps and gazetteers; most likely the specimens came from one of the following Sri Lankan localities in Matale District and were subsequently mislabeled: Sigiriya, $7^{\circ}57'N$, $80^{\circ}45'E$; Sigiri Wewa, $7^{\circ}55'N$, $80^{\circ}45'E$; or Sigiri Oya, $8^{\circ}00'N$, $80^{\circ}44'E$].

NEPAL: Adhabhar near Simra, 600 ft., Canadian Nepal Expedition (1♀, CNC).

SRI LANKA: ANURADHAPURA DISTRICT: Padaviya, KVK (3♀, USNM); Padaviya, archaeological site, PBK, PF, TW, MJ (1♀, CAS); Wildlife Society Bungalow, Hunuwilagama in Wilpattu National Park, D. Davis and W. Rowe (1♂, USNM). KANDY DISTRICT: 5 mi (8 km) NW Mahiyangana, P. and P.



FIGURE 52.—Collecting localities of *Tachysphex gryllivorus* Pulawski, new species, in Sri Lanka.

Spangler (2♀, CAS, USNM). JAFFNA DISTRICT: Kilinochchi, KVK, PF, DWB, VG (2♂, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park, KVK, PF, DWB, VG (1♀, USNM), KVK, TW, SS, TG (1♀, 1♂, CAS; 1♂, USNM); same locality, KVK, PBK, SK, DWB (1♂, USNM); Kondachchi, PBK, TW, MJ, GR (1♀, 1♂, USNM); Marichchukkaddi, PBK, TW, MJ, GR (1♂, USNM). MONARAGALA DISTRICT: Angunakolapelessa, KVK, TW, LW (1♂, CAS; 4♂, USNM), KVK, PBK, TW, SS, TG (2♂, CAS; 4♂, USNM); Nilgala, PBK (1♀, CNC). RATNAPURA DISTRICT: Gilimale, Induruwa Jungle, KVK, PF, DWB, VG (1♀, USNM). TRINCOMALEE DISTRICT: China Bay, KVK, PBK, PF, TW, MJ (1♀, USNM).

7. *Tachysphex haematopus* Pulawski, new species

FIGURES 53-58

NAME DERIVATION.—*Haematopus* is a noun derived from two Greek words, *haima*, *haimatos*, blood, and *pous*, a foot; with reference to the red legs of this species.

DIAGNOSIS.—Among the Sri Lankan species, *haematopus* can be recognized by the black abdomen and all or largely red femora combined with an impunctate, uniformly microsculptured mesopleuron and propodeal side, and straight, not sinuous setae. The male, in addition, has a distinctive clypeus and mandible: clypeal lip conspicuously sinuate, with markedly prominent corner (Figure 54); trimmal carina deeply emarginate and with large subbasal tooth (Figure 57). Two extralimital species resemble *haematopus* in coloration, sculpture, and pilosity: the female of *graecus* Kohl (Balkan Peninsula to Israel), and the Neotropical *spinulosus* Pulawski. In *haematopus*, however, the vertex and scutal setae are appressed, terga I-IV are silvery fasciate, the mesopleural setae are suberect, the female has no ventral spines on the apical tarsomeres, and the male clypeus and mandible are distinctive (as described above). In *graecus*, the setae are erect on the vertex and scutum, and only terga I-III are silvery fasciate. In *spinulosus*, the mesopleural setae are appressed beneath the scrobe and the female tarsomeres V have a central cluster of spines. The male clypeus and mandible are similar in *haematopus* and the western Palearctic *denisi* de Beaumont, but in *haematopus* the vertex width is $0.6-0.75 \times$ length ($1.1-1.2$ in *denisi*), maximum width of hindtarsomeres III and IV equals

that of tarsomere V (exceeds that of tarsomere V), and sternal setae are nearly erect (appressed); also, the mesopleural setae of *denisi* are nearly appressed.

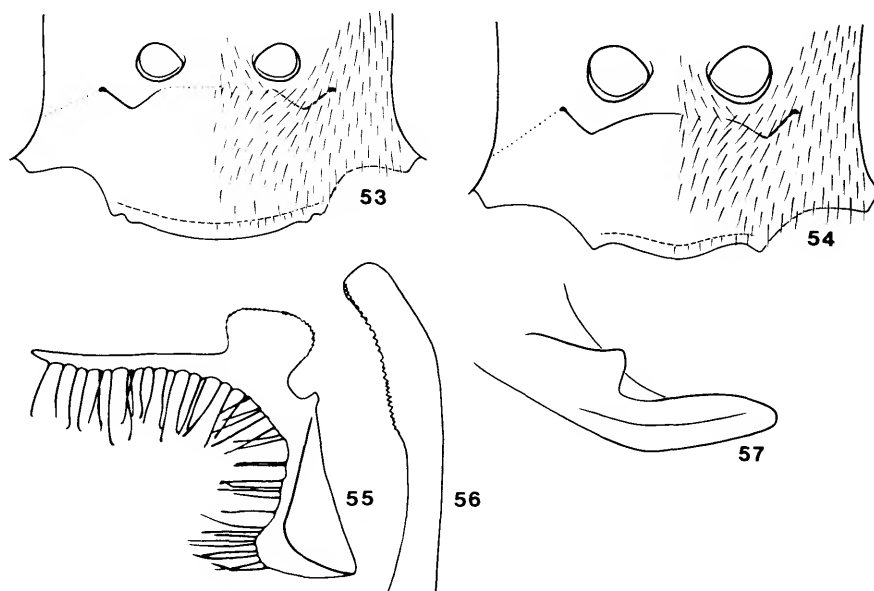
DESCRIPTION.—Vertex and scutal punctures fine, nearly contiguous. Mesopleuron, metapleuron, propodeal dorsum, and propodeal side evenly microareolate. Hindcoxal dorsum: inner margin not angulate nor expanded basally. Sternum I apicomally with narrow, shallow depression.

Setae nearly appressed on vertex, appressed on scutal disk; erect along hypostomal carina, about $0.3 \times$ basal mandibular width; inclined posterad on propodeal dorsum.

Head, thorax, and gaster black, mandible reddish mesally. Coxae and trochanters black, femora, tibiae, and tarsi red except forefemur black in female. Gastral segments I-IV silvery fasciate apically. Humeral plate of forewing yellow, wings yellowish. Frontal and clypeal vestiture golden in male.

♀.—Labrum emarginate mesally. Clypeus (Figure 53): bevel nearly as long as basomedian area; lip arcuate, with two lateral incisions on each side (inner incision small). Vertex width $0.8 \times$ length. Dorsal length of flagellomere I $2.4 \times$ apical width. Outer surface of foretibia with several spines, forebasitarsus with 12 rake spines. Hindtarsomere IV as long as wide, emargination weakly obtuse; apicoventral margin shallowly concave. Hindtarsomere V with long median seta near apicoventral margin; apicoventral margin arcuate but not produced into a lobe. Pygidial plate shiny, sparsely punctate (punctures dense apically near margin). Length 9.0 mm.

♂.—Clypeus (Figure 54): bevel ill defined; free margin of lip markedly sinuate, with conspicuously prominent corner;



FIGURES 53-57.—*Tachysphex haematopus* Pulawski, new species: 53, female clypeus; 54, male clypeus; 55, volsella; 56, penis valve (inner side); 57, male mandible.



FIGURE 58.—Collecting localities of *Tachysphex haematopus* Pulawski, new species, in Sri Lanka.

distance between corners $1.4 \times$ distance between corner and orbit. Mandible (Figure 57): trimmal carina with big subbasal tooth, conspicuously emarginate distad of tooth. Vertex width $0.6\text{--}0.75 \times$ length. Dorsal length of flagellomere I $1.6 \times$ apical width. Forefemoral notch with setose bottom. Outer margin of forebasitarsus without preapical spines. Apical tarsomeres without ventral spines. Sterna densely punctate (punctures increasing in size toward gastral apex). Volsella: Figure 55. Penis valve: Figure 56. Length 7.0–7.8 mm.

Sternal setae dense, suberect, shorter than midocellar diameter on sternum II but longer on sternum V.

HABITAT.—This uncommon species is known from only two

localities in the Dry Zone with an average annual rainfall about 1000 mm and from near sea level to 30 m (Figure 58).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka: Mannar District, 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park, 15–16 Feb 1979, KVK, TW, SS, TG (USNM).

Paratypes: SRI LANKA: MANNAR DISTRICT: Same data as holotype (1♂, CAS); Marichchukkaddi, 26 Jan 1978, PBK, TW, MJ, GR (1♂, USNM), same locality and date, [PBK] (1♂, NMC).

8. *Tachysphex oxychelus* Pulawski, new species

FIGURES 59–71

NAME DERIVATION.—*Oxychelus* is an adjective based on the Greek words *oxys*, sharp, and *chele*, a claw; with reference to the acute female claws.

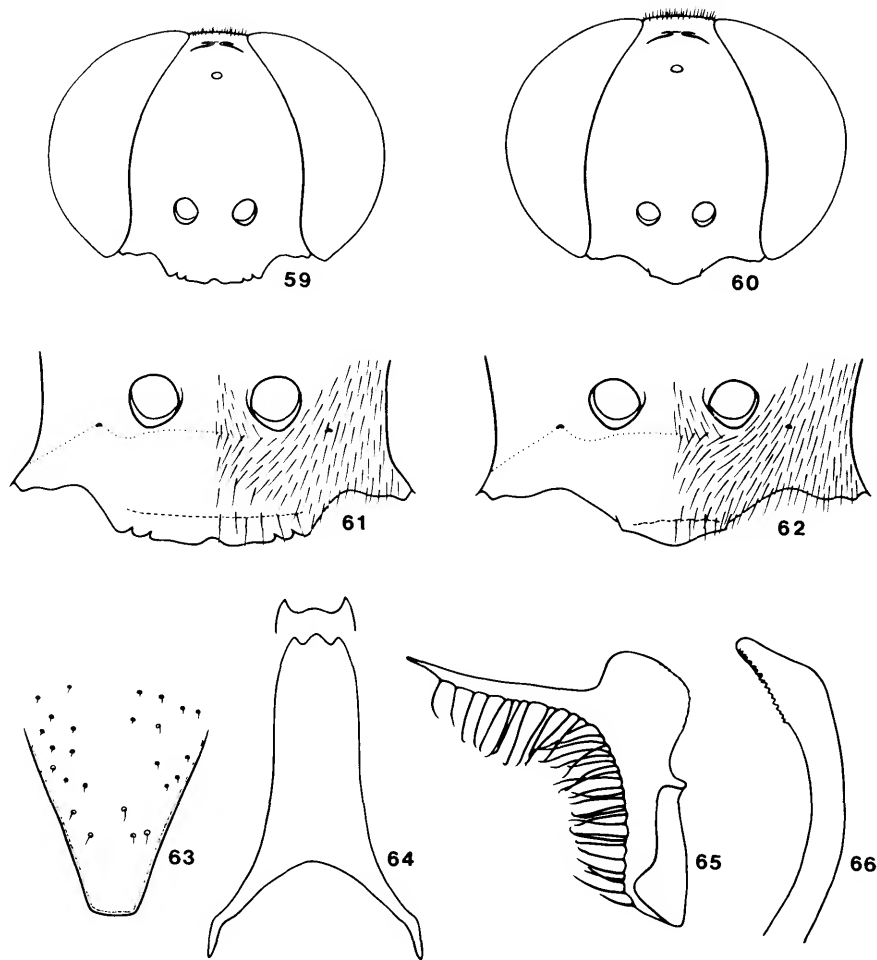
DIAGNOSIS.—The female of *oxychelus* has distinctive claws: instead of being evenly curved, the claws are somewhat expanded dorsally near the midlength and have a straight, thin apical portion (Figure 70). In addition, the mesopleuron is conspicuously microsculptured and shallowly punctate, erect setae of the head and thorax are straight, and the clypeal lip is emarginate mesally (Figures 59, 61). Similar claws are found in many *mediterraneus* (which also occurs in Sri Lanka), but in that species the mesopleuron is rugose, erect setae of the head and thorax are sinuous, and the clypeal lip is obtusely dentate mesally (Figures 72, 74).

The male of *oxychelus* can be recognized by the finely, densely punctate sterna II–VI combined with a dull mesopleuron and apically tridentate sternum VIII (Figure 64), although in some specimens the apex of sternum VIII is not tridentate but has a broad median lobe; and subsidiary recognition features are: propodeal setae slightly inclined posterad (essentially erect), and apical tarsomeres with subapical spines on venter.

DESCRIPTION.—Vertex punctures varying from less than one to several diameters apart. Scutal punctures one diameter apart or less. Mesopleuron dull, strongly microsculptured, with shallow punctures that average about one diameter apart. Propodeal dorsum irregularly ridged, side ridged. Hindcoxal dorsum: inner margin obtusely angulate basally. Sternum I apicomesally with small, shallow depression.

Setae erect on vertex, about one midocellar diameter long; slightly inclined posterad on scutal disk, about one midocellar diameter long; nearly erect along hypostomal carina, about $0.3 \times$ basal mandibular width; inclined posterad on propodeal dorsum except a few anteromedian setae inclined anterad.

Body black except mandible reddish mesally; humeral plate yellowish anteriorly, dark brown posteriorly. Terga I–III silvery fasciate apically. Humeral plate of forewing dark brown mesally, yellow laterally. Wings hyaline. Frontal and clypeal vestiture silvery.

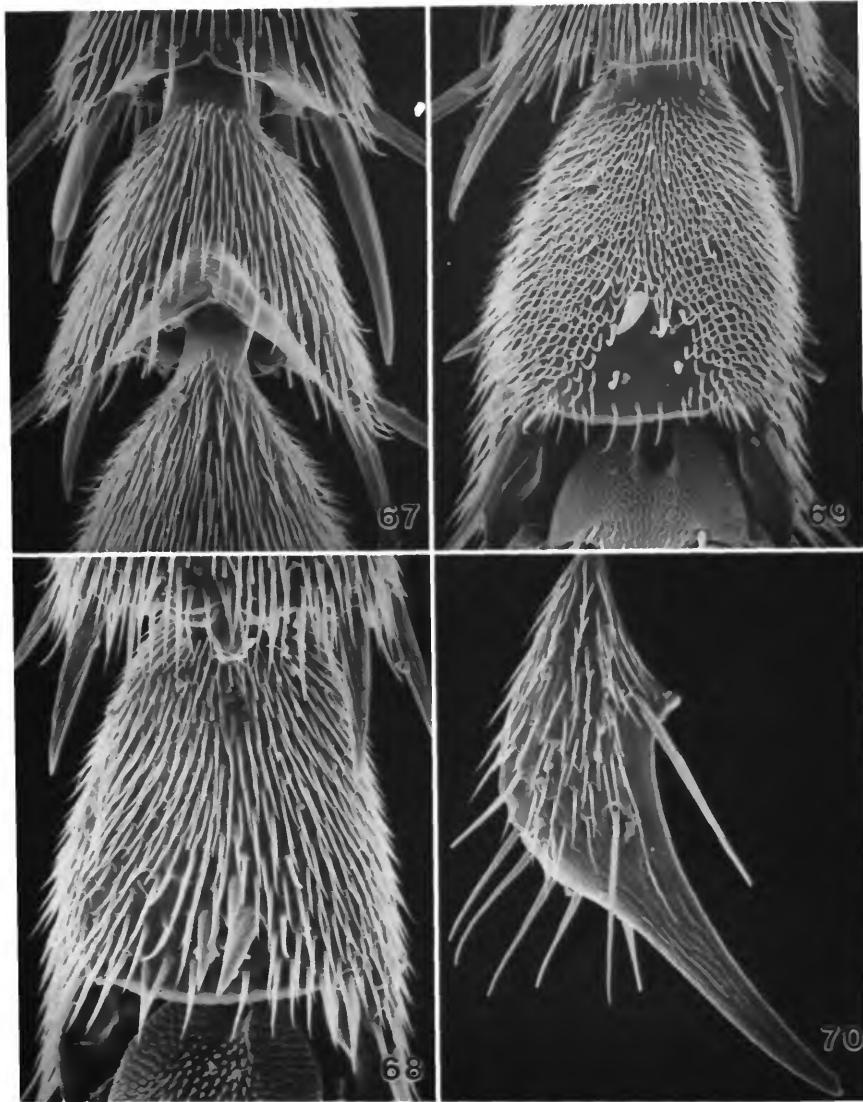


FIGURES 59-66.—*Tachysphex oxychelus* Pulawski, new species: 59, female head frontally; 60, male head frontally; 61, female clypeus; 62, male clypeus; 63, female pygidial plate; 64, male sternum VIII, with outline showing individual variation; 65, volsella; 66, penis valve (inner side).

♀.—Labrum emarginate. Clypeus (Figures 59, 61): bevel varying from shorter than basomedian area to markedly longer mesally; lip emarginate mesally, with two lateral incisions on each side. Vertex width $0.9-1.1 \times$ length. Dorsal length of flagellomere I $1.5 \times$ apical width. Forefemoral venter shiny, with microscopically fine punctures that are several to many diameters apart. Outer surface of foretibia with a few erect, thin bristles but without spines. Forebasitarsus with 10 or 11 rake spines. Hindtarsomere IV: length equal to apical width; emargination weakly acute, almost rectangular (Figure 67); apicoventral margin barely concave, practically straight. Apical tarsomere: apicoventral margin gently arcuate but not expanded into lobe (Figure 69); lateral margin with small spines at about midlength; venter with single median spine on

posterior half. Claws somewhat expanded dorsally near midlength, with straight, thin apical half (Figure 70). Pygidial plate shiny, without microsculpture, sparsely punctate (Figure 63). Length 6.8-7.5 mm.

♂.—Clypeus (Figures 60, 62): bevel ill defined; lip broadened mesally, free margin obtusely angulate to slightly arcuate; distance between lip corners $0.8-0.9 \times$ distance between corner and orbit. Vertex width $1.1-1.2 \times$ length. Dorsal length of flagellomere I $1.2-1.4 \times$ apical width. Bottom of forefemoral notch shiny, glabrous. Outer margin of forebasitarsus without preapical spines. Venter of apical tarsomeres with subapical spines (Figure 68). Punctures of tergum VII about one diameter apart. Sterna uniformly, densely and minutely punctate. Apical margin of sternum VIII



FIGURES 67-70.—*Tachysphex oxychelus* Pulawski, new species: 67, female hindtarsomere IV dorsally; 68, male hindtarsomere V ventrally; 69, female hindtarsomere V ventrally; 70, female claw.

tridentate or with broadly rounded lobe (Figure 64). Volsella: Figure 65. Penis valve: Figure 66. Length 4.8–6.0 mm.

Sternal setae appressed.

COLLECTING PERIOD.—January through May, 24–26 September.

HABITAT.—This abundant species is widespread in the Dry Zone at low elevations with average annual rainfall of 1700 mm or less, and it was collected once in the Wet Zone at sea level (Figure 71).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka, Mannar District,

Kondachchi, Silavathurai, PBK, TW, MJ, GR (USNM).

Paratypes: SRI LANKA: ANURADHAPURA DISTRICT: Nöchchiyagama, R.T. Simon Thomas (1♀, ITZA). COLOMBO DISTRICT: Pamunugama, KVK, TW, LW (3♀, USNM). HAMBANTOTA DISTRICT: Palatupana, KVK, PBK, PF, EGD (3♀, 2♂, USNM); Palatupana tank, KVK, TW, LW (1♂, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte Bungalow in Wilpattu National Park, KVK, PBK, SK, DWB (5♂, USNM); same locality, KVK, TW, SS, TG (3♂, USNM); Kondachchi, PBK, TW, MJ, GR (8♀, CAS; 18♀, 3♂, USNM); Kondachchi, Ma Villu, KVK, LW, PL (2♂, USNM); Kon-



FIGURE 71.—Collecting localities of *Tachysphex oxychelus* Pulawski, new species, in Sri Lanka.

dachchi, Ma Villu, [PBK] (13♀, 3♂, NMC); Kondachchi, Silavathurai, PBK, TW, MJ, GR (10♀, 6♂, CAS; 47♀, 10♂, USNM), [PBK] (9♀, NMC); Mannar, PBK, TW, MJ, GR (1♂, USNM); Ma Villu, KVK, TW, SS, TG (10♂, CAS; 3♀, 20♂, USNM); Marichchukkaddi, PBK, TW, MJ, GR (1♂, USNM), [PBK] (2♀, 4♂, NMC); Silavathurai (5♂, NMC). MONARAGALA DISTRICT: Angunakolapelessa, KVK, TW, LJ, VK (2♂, USNM); Mau Ara, 10 mi (16 km) E Uda Walawe, KVK, PBK, TW, MJ (1♂, USNM). TRINCOMALEE DISTRICT: China Bay, KVK, PF, DWB, VG (1♀, USNM); 7 mi (11.2 km) W Trincomalee, KVK, PBK, SK, DWB (1♀, USNM). VAVUNIYA DISTRICT: Parayanalankulam, D. Davis and W. Rowe (2♂, USNM), KVK, LW, PL (1♀, USNM).

9. *Tachysphex mediterraneus* Kohl

FIGURES 72–80

Tachysphex mediterranea Kohl, 1883:173, ♀, [incorrect original termination. Syntypes: ♀, Italy: Sicilia: Valsavoja (NHMW), examined].—Pulawski, 1971:255 [revision, full bibliography].—Bohart and Menke, 1976:274 [listed].

Tachysphex collaris Kohl, 1898:100, ♀. [Holotype: ♀, Waboniland (= Kenya: Coast Province): no specific locality (NHMW), examined. New synonym. Treated as subspecies of *Tachysphex mediterraneus* by Pulawski, 1971:257.]—Arnold, 1923:177 [listed], 177 [original description translated into English].

Tachysphex lanatus Arnold, 1947:151, ♀, ♂. [Syntypes: Zambia: Abercorn, now Mbata (SAM), examined. New synonym].—Bohart and Menke, 1976:274 [listed].

Tachysphex mediterraneus collaris.—Pulawski, 1971:257 [new status].—Bohart and Menke, 1976:274 [listed].

SYNONYMY.—Pulawski (1971) regarded *collaris* as a subspecies of *mediterraneus* because of the fine frontal punctation in the holotype. I now regard this name as a simple synonym of *mediterraneus* because punctation has proven to vary from one extreme to the other.

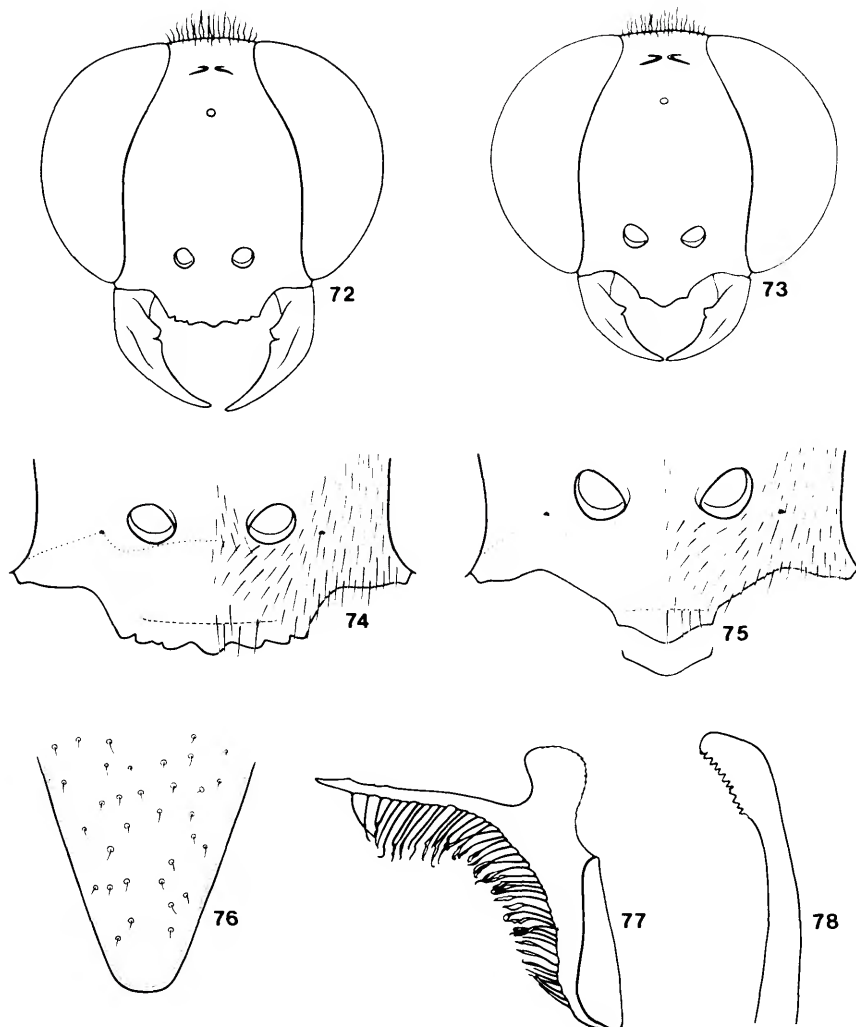
DIAGNOSIS.—*Tachysphex mediterraneus* can be recognized by the setae that are sinuous and suberect to erect on the head and thorax (longest setae about equal to basal width of mandible) in combination with a punctate scutum and a rugose mesopleuron (only the hypopimeral area is rugose in some Afrotropical specimens). The female clypeus is also distinctive (see "Description" below and Figures 72, 74), and the claws of many females are slightly expanded dorsally, as in *oxychelus* (see Figure 70) and unlike the other species of the genus. The dentate hindcoxal dorsum (Figure 79) is an additional recognition feature, and so is the male clypeus: lobe narrow, its corners markedly closer to each other than to orbits (Figures 73, 75).

DESCRIPTION.—Scutal punctures well defined, nearly contiguous to (Kenya) more than one diameter apart on disk. Mesopleuron all rugose or with punctate area adjacent to midcoxa; only hypopimeral area rugose in individuals from Zimbabwe. Propodeal dorsum rugose, side ridged. Hindcoxal dorsum: inner margin conspicuously angulate basally (Figure 79).

Setae suberect to erect and sinuous on head and thorax (longest setae about equal to basal width of mandible), not concealing integument, somewhat inclined posterad on propodeal dorsum.

Body black, apical tarsomeres brown, pygidial plate red in single female from Tarangiri National Park, Tanzania. Wings hyaline.

♀.—Clypeus (Figures 72, 74); free margin of lip with obtuse, median point and three teeth on each side, teeth separated by incisions. Vertex width 1.2–1.4 × length. Dorsal length of flagellomere I 2.1–2.4 × apical width. Forefemoral venter shiny, with minute punctures that are several to many diameters apart. Outer surface of foretibia with one spine or seta near midlength and one near apex. Length of hindtarsomere IV



FIGURES 72-78.—*Tachysphex mediterraneus* Kohl: 72, female head frontally; 73, male head frontally; 74, female clypeus; 75, male clypeus, with outline showing individual variation; 76, pygidial plate of female; 77, volsella; 78, penis valve (inner side).



FIGURE 79 (left).—*Tachysphex mediterraneus* Kohl: female hindcoxa.



FIGURE 80.—Collecting localities of *Tachysphex mediterraneus* Kohl. in Sri Lanka.

equal to apical width, emargination rectangular. Tarsomeres V in most specimens with no spines on venter or lateral margin but with one small preapical spine on venter and two small spines on each lateral margin in some African individuals. Claws of many specimens somewhat expanded dorsally near midlength, with straight, thin apical half (as in *oxychelus*, Figure 70). Pygidial plate sparsely punctate, rounded apically (Figure 76), unsculptured between punctures. Length 9.0–11.0 mm.

♂.—Clypeus (Figures 73, 75): bevel ill defined; free margin of lobe sinuate, angulate laterally, or roundly pointed, not angulate laterally, forming single curved line with rest of clypeal margin. Vertex width 1.3–1.6 × length. Dorsal length

of flagellomere I 1.6–2.0 apical width. Forefemoral notch with finely setose bottom. Outer margin of forebasitarsus without preapical spines. Apical tarsomeres without spines. Sterna with dense micropunctures; apical margin of sterna III–V shallowly concave. Volsella: Figure 77. Penis valve: Figure 78. Length 7.0–8.0 mm.

COLLECTING PERIOD.—January, February, May, June, September.

HABITAT.—In Sri Lanka, this species has a wide distribution within the Dry Zone where it occurs at localities from near sea level to 150 m and with an average annual rainfall ranging from 1000 to 1725 mm (Figure 80).

GEOGRAPHIC DISTRIBUTION.—Southern Europe, Africa south to Zaire and Zambia, Israel, Turkey, Iran, Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan, India, Sri Lanka.

RECORDS (localities given in Pulawski, 1971, are not listed).—GHANA: Aburi (1♀, CAS), Nkawkaw, 80 air km NW Koforidua (2♀, CAS).

INDIA: KARNATAKA: Bangalore: Allsandra (1♀, ZMK).

IRAN: MAZANDERAN: coastal plain between Chalus and Shahsavar (1♀, D. Baker coll.).

IVORY COAST: Bouaké (1♀, CAS; 4♀, UCD), Ferkessedougou (2♂, CAS), 40 km N Man (1♀, CAS), Oumé (2♀, CAS), 40 km S Toumodi (1♀, 3♂, CAS), 50 km S Yamasoukro (1♀, CAS).

KENYA: Archer's Post on Ewaso Nyiro River (1♀, CAS), 30 km S Mombasa (1♀, CAS); Waboniland (= Coast Province): no specific locality (1♀, NHMW, holotype of *collaris*).

SENEGAL: Bandia Forest (2♀, 4♂, CAS); Ferlo, Feté-olé (2♀, 3♂, CAS; 6♀, 14♂, UCD).

SRI LANKA: MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte Bungalow in Wilpattu National Park (3♀, USNM), Marichchukkaddi (2♀, NMC, USNM), Silavathurai and Kondachchi (1♀, NMC). MONARAGALA DISTRICT: Angunakolaplessa (2♀, USNM), Mau Ara, 10 mi (16 km) E Uda Walawe (1♀, USNM). PUTTALAM DISTRICT: Kali Villu in Wilpattu National Park (1♀, 5♂, USNM). RATNAPURA DISTRICT: Uggalkaltota, Irrigation Bungalow (1♀, USNM). TRINCOMALEE DISTRICT: China Bay (1♀, 1♂, USNM).

TANZANIA: Tarangiri National Park (1♀, CAS).

TOGO: Amaoudé, 14 km N Sokodé (1♀, CAS).

ZAMBIA: Mbata (1♀, 1♂, SAM, syntypes of *lanatus*).

ZAIRE: 21 mi (33.6 km) W Popokabaka (1♀, CAS).

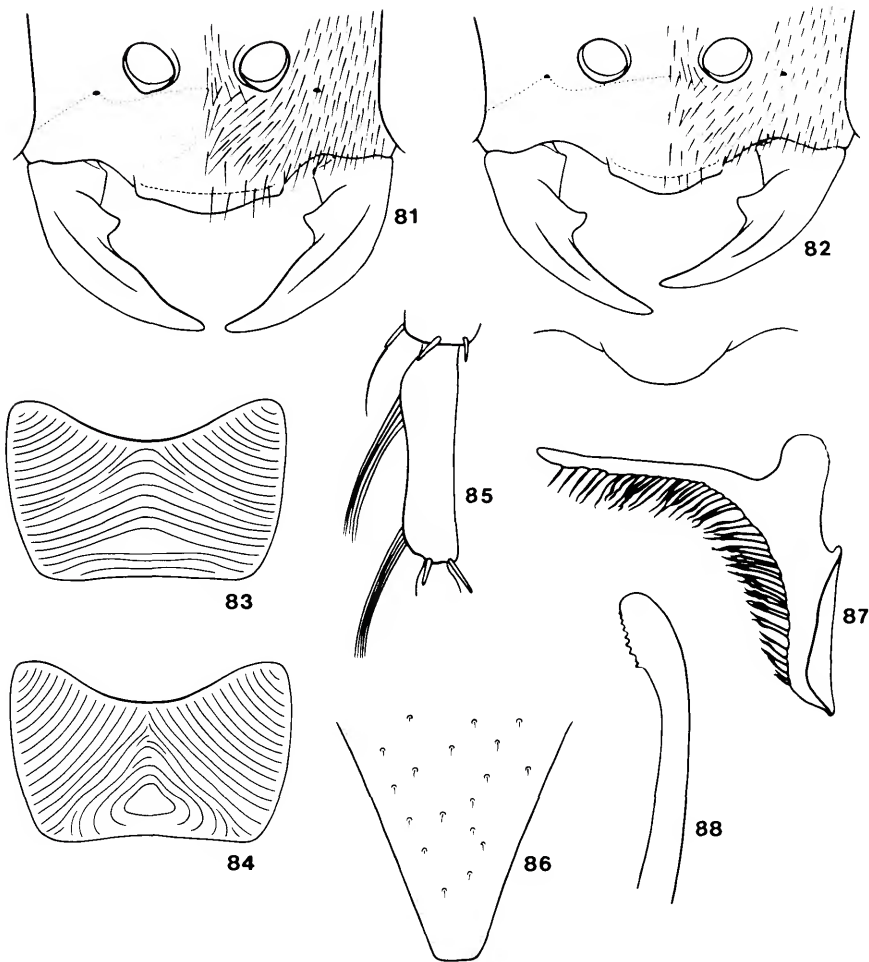
10. *Tachysphex plicosus* (A. Costa)

FIGURES 81–92

Tachytes plicosa A. Costa 1867:83, ♀ [incorrect original termination]. [Holotype: ♀, Italy: Calabria: vallata dell'Aspromonte (NAPOLI), examined. Transferred to *Tachysphex* by Kohl, 1885:396.]

Tachysphex gallica Kohl, 1883:167, ♀ [incorrect original termination]. [Syntypes: ♀, France: Marseille (NHMW), examined. Synonymized with *Tachysphex plicosus* by de Beaumont, 1936a:211 and 1936c:7.]

Tachysphex plicosus.—Kohl, 1885:396.—Pulawski, 1971:258 [revision, full bibliography], 460; 1974b:715 [Bulgaria, nest and prey].—Erlandsson,



FIGURES 81-88.—*Tachysphex plicosus* (A. Costa): 81, female clypeus; 82, male clypeus, with outline of free margin (Moroccan specimen); 83, propodeal dorsum of female; 84, same, another specimen; 85, female forebasitarsus; 86, pygidial plate of female; 87, volsella; 88, penis valve (inner side).

1974:73 [France, Yugoslavia].—Evans, 1974:719 [larva].—Bohart and Menke, 1976:276 [listed].—Hensen and van Ooijen, 1987:16 [Turkey].

Tachysphex striolata Cameron, 1903:126, ♀ [incorrect original termination]. [Holotype: ♀, India: Barrackpore 20 km N Calcutta (OXFORD), examined. Synonymized with *Tachysphex plicosus* by Pulawski, 1971:460.]

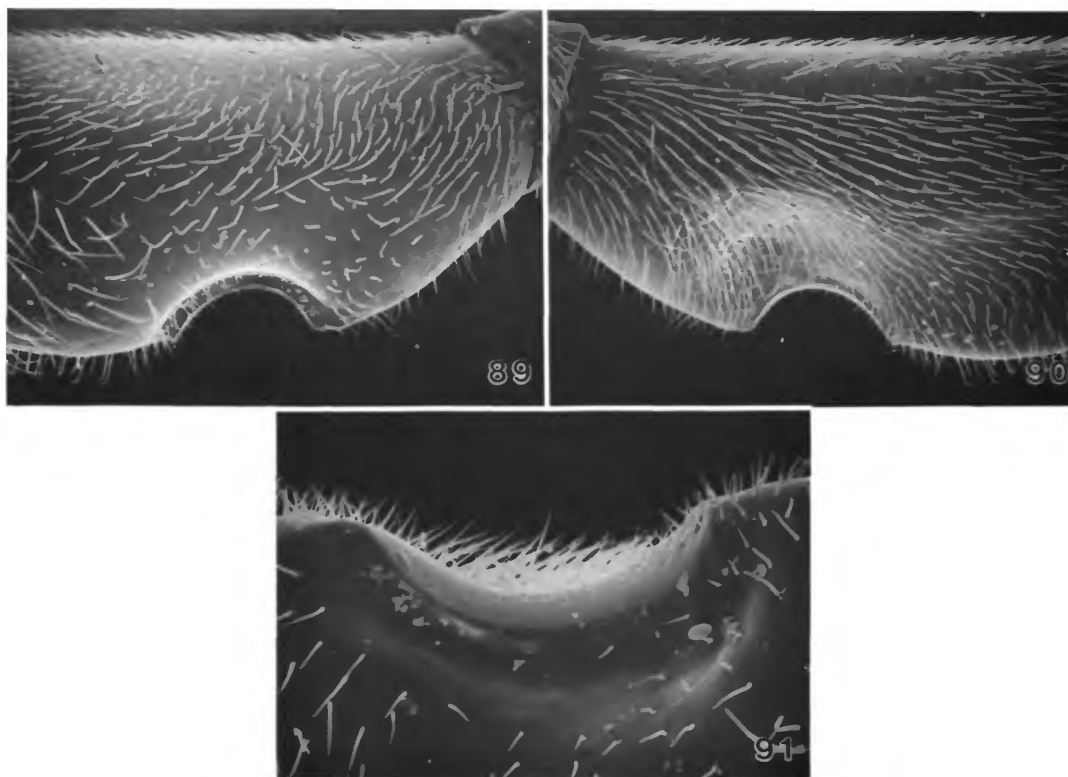
Tachysphex egregius Arnold, 1924:66, ♂. [Holotype: ♂, Zimbabwe: Bulawayo (TMP), examined. New synonym]; 1929:384 [description of ♀, South Africa]; 1951:155 [Ghana, Mali].—Bohart and Menke, 1976:273 [listed].

DIAGNOSIS.—*Tachysphex plicosus* has a distinctive propodeum; the side is largely punctate, separated by a carina from dorsum, which is obliquely ridged except ridges are transverse mesally or posteromesally (Figures 83, 84); all dorsum is transversely ridged in occasional specimens. Also, the forebasitarsus has no ventral spines and the trimmal carina has a big tooth but no cleft (Figures 81, 82). In the female, the rake spines

of the forebasitarsus are separate in two groups, one distal and one apical (Figure 85). Additional recognition features are: hindcoxal dorsum with basal tooth, and clypeal lip markedly sinuate in female (Figure 81), rounded in male (Figure 82).

DESCRIPTION.—Trimmal carina of mandible with big subbasal tooth but no cleft (Figures 81, 82). Mesopleuron with conspicuous punctures; punctures of mesothoracic venter, in many specimens, averaging more than one diameter apart. Propodeal side largely punctate (interspaces shiny), but ridged adjacent to anterior, ventral, and posterior margins. Forebasitarsus without ventral spines. Hindcoxal dorsum: inner margin conspicuously angulate basally. Apical tarsomeres with no spines on margin or lateral margins.

Setae suberect to erect and sinuous on head and thorax (longest setae about half length of basal mandibular width), not



FIGURES 89-91.—*Tachysphex plicosus* (A. Costa): 89, base of male forefemur, posterior face; 90, same, anterior face; 91, forefemoral notch, oblique view.

concealing integument, somewhat inclined posterad on propodeal dorsum.

Body black, apical tarsomeres brown, wings hyaline.

♀.—Clypeus (Figure 81): free margin of lip markedly sinuate, with roundly prominent corner, not emarginate mesally or laterally. Vertex width $1.9-2.2 \times$ length. Dorsal length of flagellomere I $1.8-2.1 \times$ apical width. Forefemoral venter shiny, with minute punctures that are several to many diameters apart. Outer surface of foretibia with a few short, suberect bristles but without spines. Forebasitarsus with concave outer margin, its rake spines divided into a basal and an apical group (Figure 85). Length of hindtarsomere IV equal to apical width, emargination forming right angle. Pygidial plate sparsely punctate, rounded or truncate apically (Figure 86), aciculate between punctures. Length 7.0–8.5 mm.

♂.—Clypeus (Figure 82): bevel ill defined; free margin of lobe arcuate, angulate laterally in most specimens, but not angulate in single male from Morocco (here forming single curved line with rest of clypeal margin). Vertex width $2.2-2.4 \times$ length. Dorsal length of flagellomere I $1.5-1.8 \times$ apical width. Forefemoral notch markedly expanded on anterior face, bottom compressed into crest, crest glabrous (Figures 89–91).

Outer margin of forebasitarsus without preapical spines. Sterna shiny, II (except basally) and following with fine punctures that are many diameters apart; apical margin of sterna III and IV concave. Volsella: Figure 87. Penis valve: Figure 88. Length 6.0–7.5 mm.

COLLECTING PERIOD.—May.

HABITAT.—This widely distributed species occurs rather rarely in Sri Lanka in Dry Zone localities at low elevations and with average annual rainfall not exceeding 1725 mm (Figure 92).

GEOGRAPHIC DISTRIBUTION.—Europe north to southern France and Romania, Africa south to Cape Province, Turkey, India, Sri Lanka, and Thailand.

RECORDS (localities given in Pulawski, 1971:258 and 460, and 1974b:715, are not repeated).—GHANA: 30 km N Kintampo (1♀, CAS), Labadi (Arnold, 1951).

INDIA: MAHARASHTRA: Krishnagiri Upavan National Park, 12 air km NNW Bombay International Airport (1♀, CAS). TAMIL NADU: Karikal (1♀, FSAG). WEST BENGAL: Barrackpore, 20 km N Calcutta (OXFORD; holotype of *Tachysphex striolatus*).

IVORY COAST: Bouaké: Foro-foro (1♀, CAS; 2♀, UCD).



FIGURE 92.—Collecting localities of *Tachysphex plicosus* (A. Costa) in Sri Lanka.

MALI: Tillembeya (Arnold, 1951).

NAMIBIA: Okahandja (1♀, H.N. Empey coll.).

SOUTH AFRICA: CAPE PROVINCE: Lady Gray (1♀, SAM).

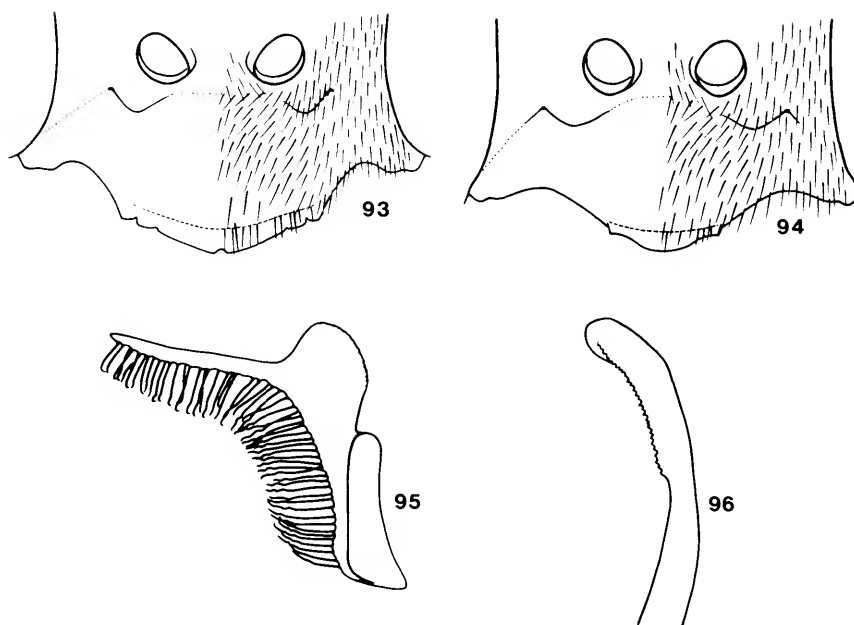
TRANSVAAL: Redbank (1♂, SAM).

SRI LANKA: MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte Bungalow in Wilpattu National Park (1♀, CAS), Kondachchi (1♀, USNM). TRINCOMALEE DISTRICT: China Bay Ridge Bungalow (2♀, USNM).

TANZANIA: Amani in Usumbara Mts. (1♀, CAS; 2♀, ZMK).

THAILAND: KANCHANABURI: Lam Ta Pen River, 5 km NW Lat Ya (1♀, CAS).

ZIMBABWE: Bulawayo (1♂, TMP, holotype of *egregius*).



FIGURES 93-96.—*Tachysphex eucharistus* Pulawski, new species: 93, female clypeus; 94, male clypeus; 95, volsella; 96 penis valve (inner side).

11. *Tachysphex eucharistus* Pulawski, new species

FIGURES 93-102

NAME DERIVATION.—*Eucharistus* is derived from the Greek word *eucharistos*, meaning agreeable, pleasant, grateful.

DIAGNOSIS.—The female of *eucharistus* has the tarsomeres and claws of the *brullii* type; the apical tarsomeres lack ventral spines but have one or two spines at the midlength of each lateral margin (Figures 97-99, 101). This combination is unique among Sri Lankan species. Many females of *aequalis* (western North America) are similar, but in *eucharistus* the forefemoral venter is densely punctate (punctures two to three diameters apart), the gaster is black, and the wings are yellowish (in *aequalis*, the punctures of forefemoral venter are several to many diameters apart, the gaster is red basally, and the wings are hyaline).

The male of *eucharistus* differs from other Sri Lankan species by the combination of the black gaster and legs, microareolate propodeal dorsum, nonridged propodeal side, and setae of the propodeal dorsum oriented posterad (except basomedially). Several extralimital species are similar, but *eucharistus* can be recognized by the following: venter of mid- and hindtarsomeres V with one preapical spine, terga I-IV silvery fasciate, and sterna without graduli; the shape of the clypeus (Figure 94) and the yellowish wings also help

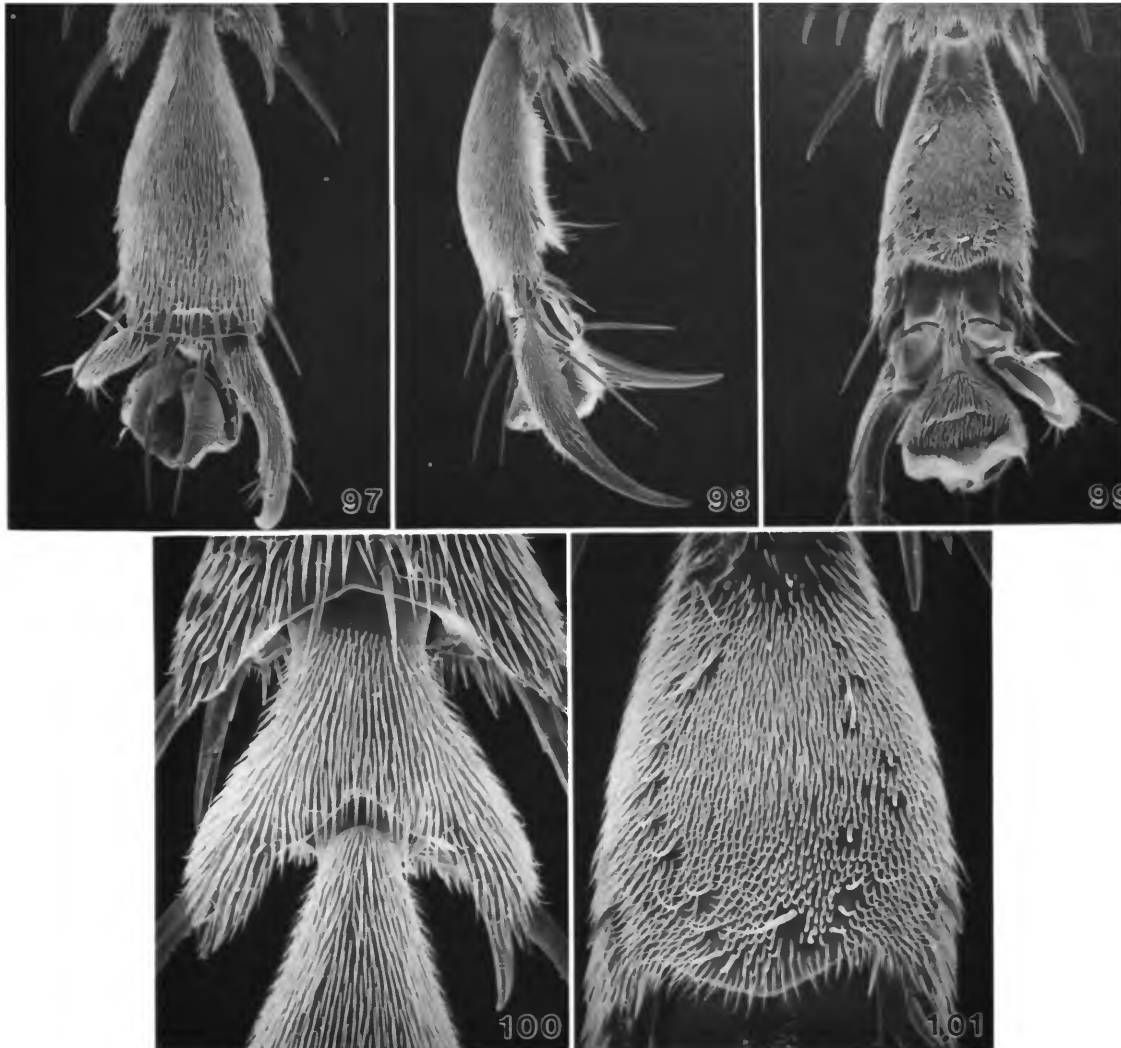
identification. The posteriorly yellowish pronotal lobe is also distinctive, but this character is probably variable (yellow evanescent in one of the two specimens examined).

DESCRIPTION.—Scutal punctures about one to two diameters apart. Mesopleuron evenly, conspicuously microsculptured, with minute, evanescent punctures. Propodeal dorsum evenly microareolate; side finely ridged or microsculptured and minutely punctate. Apical tarsomeres without spines on venter or lateral margins.

Setae appressed on vertex and scutum; erect along hypostomal carina, about as long as midocellar diameter; on propodeal dorsum inclined posterad on sides and inclined anterad on median triangle.

Head, thorax, legs, and gaster black, mandible dark reddish mesally, pronotal lobe yellowish posteriorly in some specimens. Tegula and humeral plate yellowish brown. Wings yellowish. Terga I-IV silvery fasciate apically. Frontal vestiture silvery.

♀.—Labrum with small median notch. Clypeus (Figure 93): bevel about as long as basomedian area; lip with small, median notch (notch absent in a worn specimen), with two lateral incisions on each side. Vertex width $0.7-0.8 \times$ length. Dorsal length of flagellomere I $2.0-2.2 \times$ apical width. Forefemoral venter uniformly, minutely punctate, punctures about two to three diameters apart. Outer surface of foretibia with spines.



FIGURES 97-101.—*Tachysphex eucharistus* Pulawski, new species: 97, female hindtarsomere V dorsally; 98, same, laterally; 99, same, ventrally; 100, female hindtarsomere IV dorsally; 101, female hindtarsomere V ventrally.

Tarsi of *brullii* type, forebasitarsus with 12-15 rake spines. Tarsomeres IV slightly wider than long (length of hindtarsomere IV $0.9 \times$ apical width); apical emargination broadly rounded (Figure 100); apicoventral margin concave. Tarsomeres V elongate (Figures 97-99), venter covered with erect setae, apicoventral margin markedly convex (Figure 101). Claws elongate (Figure 98). Pygidial plate shiny, with sparse punctures (punctures denser along margins) and a few setae. Length 9.7-10.5 mm.

♂.—Clypeus (Figure 94): bevel ill defined; lip sinuate, with well-defined corner; distance between corners $0.8-0.9 \times$

distance between corner and orbit. Vertex width $0.8 \times$ length. Dorsal length of flagellomere I $1.8 \times$ apical width. Forefemoral notch: bottom minutely punctured, setose. Outer margin of forebasitarsus without preapical spines. Venter of tarsomeres IV and V with one preapical spine. Sternal punctures about one to two diameters apart (about two to three on sternum VI), sternal setae appressed. Volsella: Figure 95. Penis valve: Figure 96. Length 8.3-9.5 mm.

COLLECTING PERIOD.—1-20 March, 15 April, 22-25 May, 1-14 July.

HABITAT.—This species occurs uncommonly in the Dry and



FIGURE 102.—Collecting localities of *Tachysphex eucharistus* Pulawski, new species, in Sri Lanka.

Intermediate Zones at low elevations with average annual rainfall of 1500 mm or less (Figure 102).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka, Mannar District: 0.5 mi (0.8 km) NE Kokmotte Bungalow in Wilpattu National Park, 22–25 May 1976, KVK, PBK, SK, DWB (USNM).

Paratypes: SRI LANKA: ANURADHAPURA DISTRICT: Anuradhapura, R.T. Simon Thomas (2♂, CAS, ITZA). MONARAGALA DISTRICT: Nilgala, 1–14 Jul 1968, PBK (1♀, CAS). PUTTALAM DISTRICT: Arukallu, Eluamkulam, 15 mi (24 km) N Puttalam, PBK (1♀, CNC).

12. *Tachysphex crinitus* Pulawski, new species

FIGURES 103, 104

NAME DERIVATION.—*Crinitus* is a Latin adjective meaning hairy, long-haired.

DIAGNOSIS.—The female of *crinitus* can be recognized by the apical tarsomeres of the *brullii* type combined with the conspicuously punctate mesopleuron and sinuous setae on scutum, mesopleuron, propodeum, and along hypostomal carina (setal length about $0.3 \times$ basal mandibular width on vertex and $0.5 \times$ along hypostomal carina).

DESCRIPTION.—Punctures conspicuous, well defined on frons, vertex, scutum, and mesopleuron; about one diameter apart on vertex, about one to two diameters on scutal disk and mesopleuron. Propodeal dorsum irregularly ridged; side ridged. Hindcoxal dorsum: inner margin insignificantly broadened basally. Sternum I with apical depression that is bisected by obtuse carina.

Setae: sinuous on scutum, mesopleuron, propodeum, and along hypostomal carina; erect on vertex ($0.3 \times$ basal mandibular width) and along hypostomal carina ($0.5 \times$); uniformly inclined posterad on scutal disk ($0.3\text{--}0.4 \times$); inclined posterad on propodeal dorsum.

Head, thorax, gaster and legs black; mandible reddish mesally; tegula brown-yellow; humeral plate brown-yellow except dark brown mesally. Wings with yellow tinge. Terga I–IV silvery fasciate apically (tergum IV weakly so).

♀.—Labrum shallowly emarginate. Clypeus (Figure 103): bevel longer than basomedian area; lip arcuate, with one lateral incision. Vertex width $0.9 \times$ length. Dorsal length of flagellomere I $2.2 \times$ apical width. Forefemoral venter shiny, with minute punctures that are several diameters apart. Outer surface of foretibia with a few short, erect bristles but without spines. Forebasitarsus with 10 rake spines. Length of hindtarsomere IV about equal to apical length; apical emargination acutely angulate. Tarsomeres V as in *eucharistus* (see Figures 97–99): elongate, without spines on venter or lateral margins, with markedly convex apicoventral margin; claws elongate, as in that species. Pygidial plate sparsely punctate, rounded apically. Length 9.0 mm.

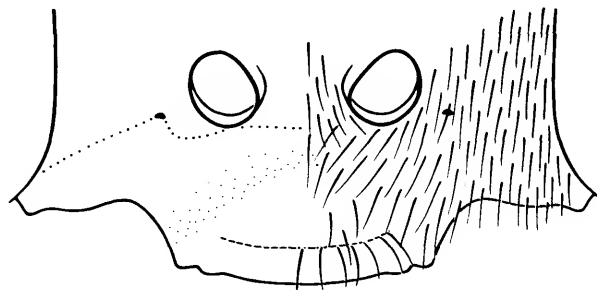


FIGURE 103.—*Tachysphex crinitus* Pulawski, new species: female clypeus.



FIGURE 104.—Collecting locality of *Tachysphex crinitus* Pulawski, new species, in Sri Lanka.

♂.—Unknown.

HABITAT.—This species is known from the unique holotype that was taken at a low elevation in the Intermediate Zone with low average annual rainfall (Figure 104).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka, Monaragala District: Nilgala, 1–14 July 1968, PBK (CNC).

13. *Tachysphex xanthoptesimus* Pulawski, new species

FIGURES 105–108

NAME DERIVATION.—*Xanthoptesimus* derives from the Greek words *xanthos*, yellow, and *ptesimos*, winged, with

reference to the yellow wings of this species.

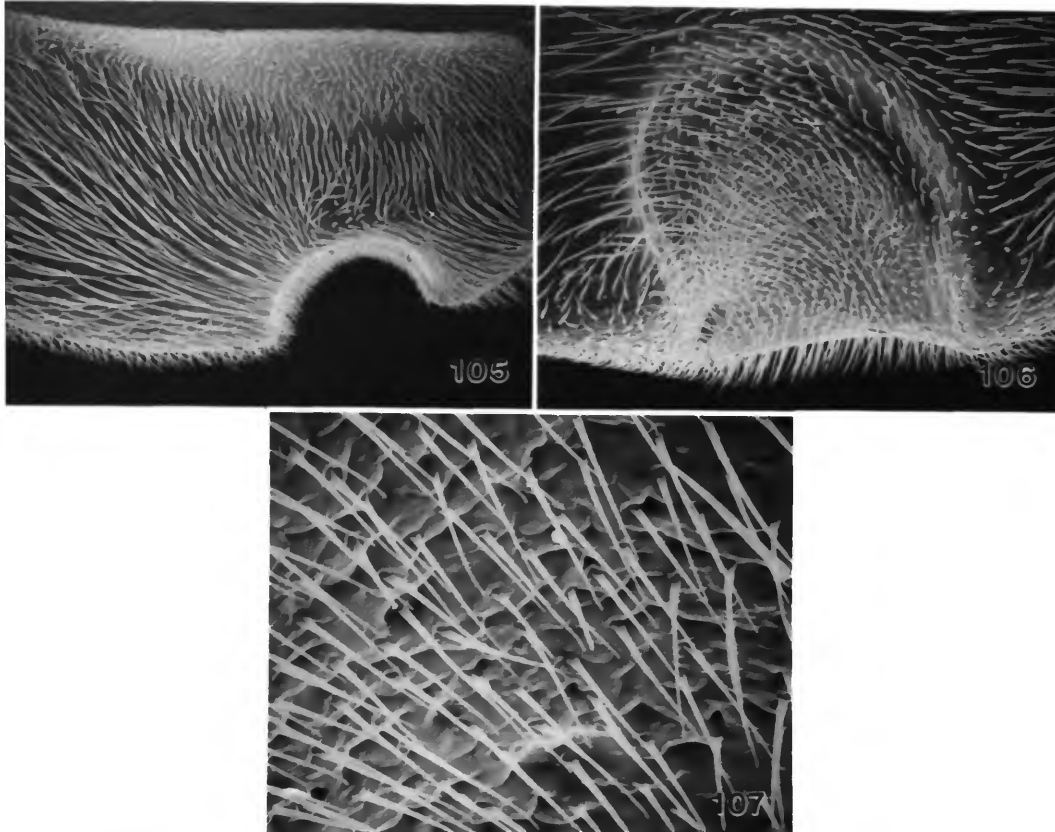
DIAGNOSIS.—*Tachysphex xanthoptesimus* differs from other *Tachysphex* in having the following combination: mesopleural punctures well defined, one to two diameters apart; apex of sternum I with longitudinal, obtuse carina that bisects apical depression (the latter ill-defined in some specimens); setae oriented posterad on the propodeal dorsum (except on a small, basomedian area); wings markedly yellowish; female tarsi of the *obscuripennis* type; and clypeal lip of male with sharp corners. *Tachysphex chiastotrichus* is similar, but in *xanthoptesimus* the midscutal setae are nearly appressed, slightly shorter than midocellus diameter, and directed uniformly posterad.

DESCRIPTION.—This species is closely related to *chiastotrichus*, *changi*, *drymobius*, and *bengalensis*, as indicated by the modified female tarsi and claws of the *obscuripennis* type. The following characters shared by all five species are described here and not repeated elsewhere. Head transverse in frontal view (Figures 129, 130). Scutum and mesopleuron with well-defined punctures. Propodeal side ridged. Sternum I with apicomedian depression that is bisected by longitudinal carina (depression or carina inconspicuous in some specimens). Setae erect on vertex and along hypostomal carina. Female: labrum and clypeal lip emarginate mesally (clypeal emargination disappearing in worn specimens); forefemoral venter densely setose; outer surface of foretibia with a few thin, erect bristles but without spines; tarsomeres IV wider than long, shallowly, obtusely emarginate apically (Figure 120), with convex apicoventral margin (Figure 121); tarsomeres V angulate basoventrally in lateral view (Figure 118), with apicoventral margin expanded into a lobe (Figures 119, 122); claws uneven (inner claws of foretarsus and outer claws of mid and hindtarsus smaller than their mate), short, stout, the arolium extending beyond their midlength (Figure 118); pygidial plate somewhat broadened (Figure 113), shiny, with punctures that concentrate mainly near margins. Male: clypeal bevel not differentiated, clypeal lip arcuate, with well-defined, sharp corner; outer margin of forebasitarsus without preapical spines.

Tachysphex xanthoptesimus itself is characterized by the following. Scutal punctures averaging less than one diameter apart, but midscutal punctures, in some individuals, up to about two diameters apart. Mesopleural punctures less than one diameter apart anteriorly and up to one or two diameters apart posteriorly. Episternal sulcus complete. Propodeal dorsum irregularly rugose, irregularly ridged longitudinally in some specimens. Hindcoxal dorsum: inner margin obtusely angulate basally.

Setae: about one midocellar diameter long on vertex, about $0.5 \times$ basal mandibular width along hypostomal carina; nearly appressed on midscutum, slightly shorter than midocellar diameter, oriented uniformly posterad; inclined posterad on propodeal dorsum.

Head, thorax, gaster, and legs black, but mandible dark reddish mesally; tegula yellowish, humeral plate brown. Terga



FIGURES 105-107.—*Tachysphex xanthoptesimus* Pulawski, new species: 105, base of male forefemur; 106, male forefemoral notch; 107, sculpture of male forefemoral notch.

I-III silvery fasciate apically, also tergum IV in some females. Frontal vestiture golden in males.

♀.—Clypeus: bevel markedly shorter than basomedian area; lip with two lateral incisions on each side. Vertex width 1.1-1.3 × length. Dorsal length of flagellomere I 2.1-2.4 × apical width. Forefemoral venter with minute punctures that are several to many diameters apart. Forebasitarsus with 7-11 rake spines. Venter of tarsomeres V with basomedian group of spines and few setae on each lateral margin basally. Length 9.0-9.8 mm.

♂.—Clypeus: lip arcuate, distance between lip corners equal to 0.7-0.9 of distance between corner and orbit. Vertex width 1.2-1.4 × length. Dorsal length of flagellomere I 1.7-1.9 × apical width. Forefemoral notch moderately large to deep (Figures 105-107). Venter of tarsomeres V with cluster of small, subapical spines. Punctures fine on sternum II basally, medium size to coarse on sternum II apically, and coarse on sterna III-VI; in most specimens, most punctures of sterna III-VI many diameters apart mesally, but only one to two diameters in some. Length 6.0-9.0 mm. Volsella and penis

valve as in *bengalensis* and *drymobius* (see Figures 126, 127, 133, 134).

Sterna with usual erect bristles and with setae erect or inclined posterad; setae shorter than midocellar diameter on sternum II, slightly longer than midocellar diameter on IV-VI, sparse or dense, depending on punctation.

COLLECTING PERIOD.—18-28 January, 15-16 February, 1-3 March, 15 April (India), 16-23 June, 5-6 September.

HABITAT.—In Sri Lanka, this species occurs mostly in the Dry Zone at low elevations with average annual rainfall not exceeding 1100 mm (Figure 108). A few specimens were taken in the Wet Zone where annual rainfall may be as much as 2400 mm.

GEOGRAPHIC DISTRIBUTION.—Southern India, Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka: Monaragala District: 13 mi (20.8 km) E Uda Walawe along Mau Aru, 16 June 1976, KVK, TW, VK, JL (USNM).

Paratypes: INDIA: KARNATAKA: Mysore: Nandy Hills, R.T. Simon Thomas (2♂, CAS, ITZA). TAMIL NADU: Coimbatore, P.S. Nathan (1♂, OSU).



FIGURE 108.—Collecting localities of *Tachysphex xanthoptesimus* Pulawski, new species, in Sri Lanka.

SRI LANKA: BADULLA DISTRICT: Ulhitiya Oya, 15 mi (24 km) NNE Mahiyangana, KVK, PBK, TW, LJ, VG (1♂, USNM). COLOMBO DISTRICT: Ratmalana Zoo Farm, KVK, PBK, PF, NVTAW (1♀, CAS; 1♀, 2♂, USNM). HAMBANTOTA DISTRICT: Palatupana Tank, KVK, PBK, TW, SS, TG (1♀, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park, KVK, TW, SS, TG (1♂, CAS; 2♂, USNM); Kondachchi, PBK, TW, MJ, GR (1♀, USNM); Marichchukkaddi, PBK, TW, MJ, GR (1♀, USNM); Silavathurai, Kondachchi, PBK, TW, MJ, GR (1♀, 1♂, CAS; 1♀, 2♂, USNM), [PBK] (6♂, NMC). MATALE DISTRICT:

Kibissa Jungle, 0.5 mi (0.8 km) W Sigiriya, KVK, TW, SS, LJ, TG (1♀, USNM). MONARAGALA DISTRICT: 10 mi (16 km) E Uda Walawe along Mau Aru, KVK, PBK, TW, SS, TG (2♂, USNM); 12 mi (19.2 km) E Uda Walawe along Mau Aru, KVK, PBK, SK (1♀, USNM), 13 mi (20.8 km) E Uda Walawe along Mau Aru, KVK, TW, VK, JL (1♀, 4♂, CAS; 6♂, USNM). RATNAPURA DISTRICT: Uggalkaltota, KVK, PBK, TW, LJ, NK (1♂, USNM).

14. *Tachysphex chiasotrichus* Pulawski, new species

FIGURES 109, 110

NAME DERIVATION.—*Chiasotrichus* is derived from two Greek words, *chastos*, arranged crosswise, and *thrix*, *trichos*, a hair; with reference to the midscutal setal pattern of this species.

DIAGNOSIS.—*Tachysphex chiasotrichus* can be recognized by its setal pattern combined with tarsal structures: midscutal setae oriented posterolaterad on each side of midline (Figure 109), female tarsi of the *obscuripennis* type, and venter of male tarsomeres V with subapical cluster of spines. Furthermore, the scutal setae are erect or nearly so in *chiasotrichus* but appressed or nearly so in *xanthoptesimus*. The densely punctate mesopleuron is a subsidiary recognition feature (most or all punctures less than one diameter apart).

DESCRIPTION (see also *xanthoptesimus*, page 50).—Scutal punctures nearly contiguous near margins but about one or two diameters apart on disk. Mesopleural punctures (all or most) less than one diameter apart. Episternal sulcus complete or incomplete. Propodeal dorsum rugose or irregularly ridged longitudinally. Hindcoxal dorsum: inner margin not angulate or minimally angulate basally.

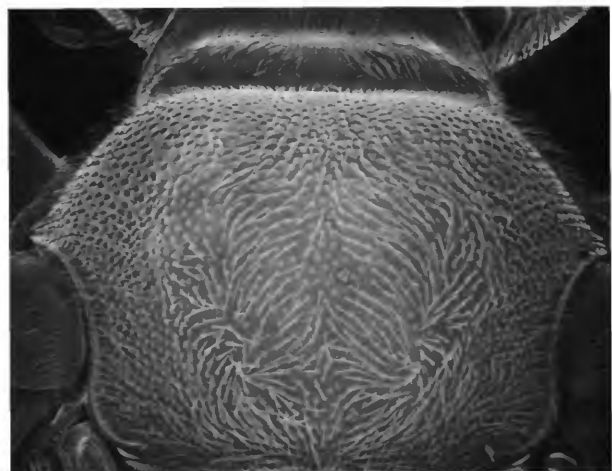


FIGURE 109.—*Tachysphex chiasotrichus* Pulawski, new species: female scutum showing setal pattern.



FIGURE 110.—Collecting localities of *Tachysphex chiastotrichus* Pulawski, new species, in Sri Lanka.

Setal length about one midocellar diameter long on vertex, about $0.4-0.5 \times$ basal mandibular width along hypostomal carina; setae inclined but not appressed on scutum, midscutal setae oriented posterolaterad on each side of midline (Figure 109); suberect on mesopleuron; inclined posterad on propodeal dorsum.

Head, thorax, and legs black, but mandible dark reddish mesally and tarsi dark brown. Tegula light brown, humeral plate varying from light brown to dark brown. Wings yellowish, veins light brown. Terga I-IV silvery fasciate apically, also tergum V in female. Frontal vestiture silvery, with golden tinge in some males.

♀.—Clypeus: bevel shorter than basomedian area; lip weakly arcuate, shallowly emarginate mesally, with two lateral incisions on each side. Vertex width $1.0 \times$ length. Dorsal length of flagellomere I $2.2 \times$ apical width. Forefemoral venter shiny, with minute punctures that are several to many diameters apart. Forebasitarsus with 8-11 rake spines. Venter of tarsomeres V with basomedian group of spines and few setae on each lateral margin basally. Length 6.0-9.0 mm.

♂.—Clypeus: lip arcuate, distance between lip corners equal to 0.7 of distance between corner and orbit. Vertex width $1.0-1.1 \times$ length. Dorsal length of flagellomere I $1.6-1.7 \times$ apical width. Forefemoral notch deep, with finely setose bottom. Venter of tarsomeres V with median group of spines. Punctures fine on sternum II basally, moderately large on sternum II apically, and coarse on sterna III-VI. Length 5.5-7.5 mm. Volsella and penis valve as in *bengalensis* and *drymobiis* (see Figures 126, 127, 133, 134).

Sterna with usual erect bristles and with setae erect or inclined posterad; setae shorter than one midocellar diameter on sternum II, slightly longer than that on IV-VI.

COLLECTING PERIOD.—January through March, 18-19 May, 22-25 October.

HABITAT.—This species occurs most commonly in the Dry Zone at low elevations with average annual rainfall not exceeding 1700 mm, but two specimens are from the Wet Zone near sea level and average annual rainfall of 2400 mm (Figure 110).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

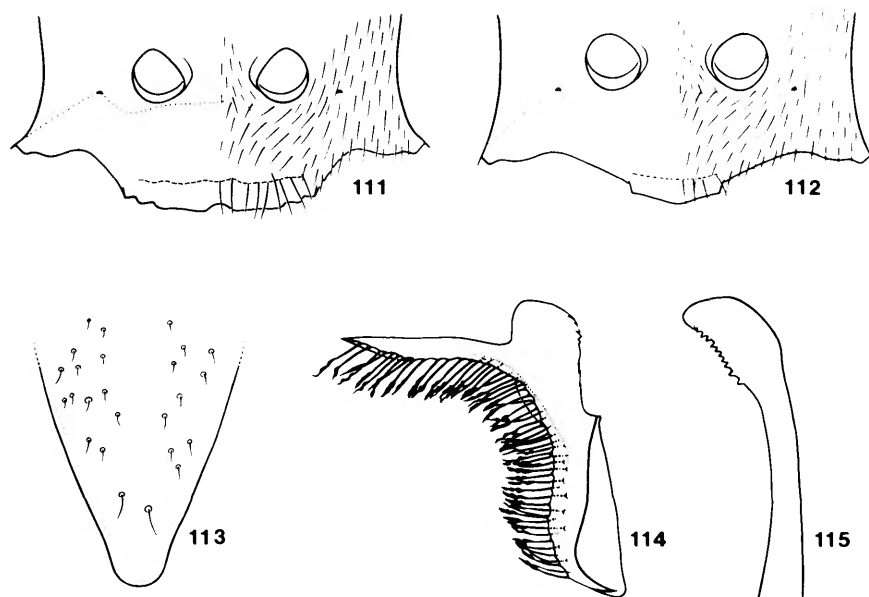
RECORDS.—*Holotype*: ♀, Sri Lanka, Hambantota District, Palatupana, 22-25 Oct 1970, O.S. Flint (USNM).

Paratypes: SRI LANKA: ANURADHAPURA DISTRICT: Padaviya, KVK, PBK, SK, DWB (1♂, USNM). COLOMBO DISTRICT: Pamunugama, KVK, TW, LW (1♂, CAS; 2♂, USNM); Ratmalana, KVK, PBK, PF, NVTAW (1♂, USNM). HAMBANTOTA DISTRICT: Hambantota, T.B. Fletcher (1♀, BMNH); Palatupana, Wildlife and Nature Protection Society Bungalow, KVK, PBK, TW, SS, TG (2♂, CAS, USNM), KVK, PBK, PF, EGD (1♀, 2♂, USNM); Yala, Palatupana, KVK, PBK (1♂, CAS, 2♂, USNM). MANNAR DISTRICT: Silavathurai, PBK, TW, MJ, GR (2♂, CAS, USNM), [PBK] (1♂, NMC); Kondachchi, PBK, TW, MJ, GR (1♂, USNM). TRINCOMALEE DISTRICT: Trincomalee, China Bay Ridge Bungalow, KVK, TW, SS, LJ, TG (1♂, USNM).

15. *Tachysphex changi* Tsuneki

FIGURES 111-125

Tachysphex changi Tsuneki, 1967:53. ♂, ♀. [*Holotype*: ♂, Taiwan: Chiayi Prefecture: Chuchi (originally K. Tsuneki coll., now USNM), paratypes (1 ♀, 1 ♂) examined]; 1971:20 [Ryukyu Islands]; 1982b:60 [known from the Ryukyu archipelago]; 1983:68, 69 [in key].—Haneda, 1971:30 [Taiwan]; 1972:4 [Taiwan].—Tano, 1972:24 [Ryukyu Islands].—Bohart and Menke, 1976:273 [listed].—Krombein, 1981:123 [Sri Lanka].



FIGURES 111–115.—*Tachysphex changi* Tsuneki: 111, female clypeus; 112, male clypeus; 113, female pygidial plate; 114, volsella; 115, penis valve (inner side).

Tachysphex nambui Tsuneki, 1973:5, ♀. [Holotype: ♀, Ryukyu Islands: Iriomote Island: Komi (T. Nambu personal coll., Sakurazawa), not examined. Synonymized with *Tachysphex changi* by Tsuneki, 1983:60.; 1982b:60 [known from the Ryukyu archipelago].—Bohart and Menke, 1976:275 [listed].

Tachysphex changi luzonicus Tsuneki, 1983:60, ♂. [Holotype: ♂, Philippines: Luzon: Laguna Province: Los Baños (originally K. Tsuneki coll., now lost?, not transferred to USNM), not examined. Valid subspecies.]; 68, 69 [in key].

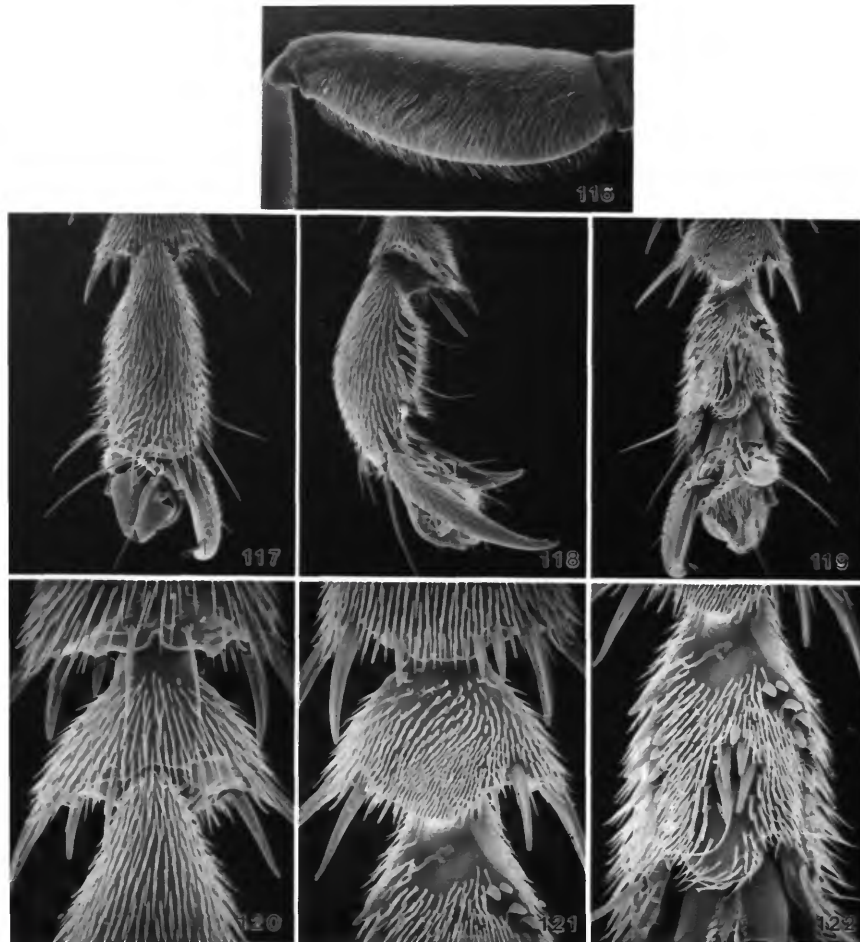
DIAGNOSIS.—*Tachysphex changi* shares the following characters with *drymobius*: mesopleural punctures well defined; setae straight (not sinuous), erect or nearly so on vertex, thorax, and along hypostomal carina, slightly inclined posterad on propodeal dorsum; and female tarsi of the *obscuripennis* type. Other species are similar, but in *changi* and *drymobius* the setae of the midfemoral venter form a conspicuous, dense fringe about $0.2 \times$ maximum femoral width, or about one midocellar diameter (Figure 116); the fringe, in other species, is either lower or consists of sparse or sinuous setae.

Only the males can be distinguished with certainty: in *changi*, the apical tarsomeres are somewhat swollen, with a row of minute spines on each lateral margin, and with numerous ventral spines (Figures 123, 124), a type unique within the genus. In *drymobius*, the apical tarsomeres are not swollen, without spines on lateral margins and with only a few ventral spines.

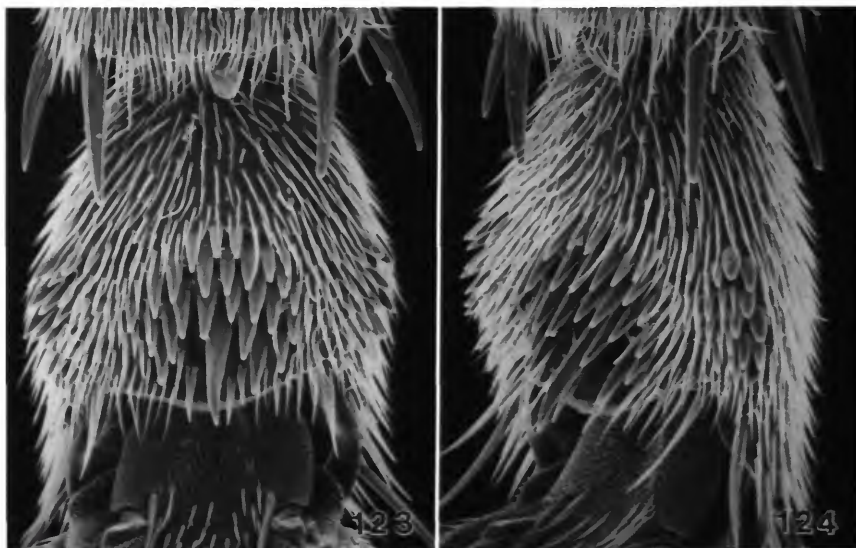
Most females can be recognized as belonging to one or the other species based on geographic distribution, mesopleural punctation, and silvery gastral fasciae. Specifically, *changi* ranges from Sri Lanka to Ryukyu Archipelago, while *drymo-*

bius is known only from the southern part of Sri Lanka (Galle and Ratnapura Districts), where the two species are sympatric. Also, in many *changi* tergum IV is silvery fasciate, not contrasting or contrasting only slightly with tergum III, and the mesopleural punctures, at the center, average about two to three diameters apart. In *drymobius* (females as well as males), tergum IV is not fasciate (thus contrasting with tergum III), and the mesopleural punctures, at the center, average one diameter apart or less. Exceptions are as follows: one female from Angunakolapelessa, Sri Lanka, has dense mesopleural punctures but a fasciate tergum IV; a female from Kokmotte Bungalow area, Sri Lanka, resembles *drymobius* in both punctation and gastral fasciae but probably is *changi* since several *changi* but no unquestionable *drymobius* were found in that locality; in the single female of *changi* from Ulu Sedili, Malaysia, the mesopleural punctation is sparse (as in Sri Lankan females), but tergum IV is not fasciate; females from Laos have dense mesopleural punctation (about one diameter apart) and tergum IV is weakly fasciate; females from Taiwan and Thailand resemble *drymobius* in having dense mesopleural punctures (about one diameter apart) and nonfasciate tergum IV, but the male tarsi clearly indicate *changi*.

DESCRIPTION (see also *xanthoptesimus*, page 50).—Scutal punctures nearly contiguous near margins but averaging one to two or two to three diameters apart on disk. Mesopleural punctures averaging two to three diameters apart in most specimens, but one to two in some (see “Diagnosis” above). Episternal sulcus incomplete in most specimens, but complete in some. Propodeal dorsum irregularly rugose longitudinally.



FIGURES 116–122.—*Tachysphex changi* Tsuneki: 116, female midfemur; 117, female hindtarsomere V dorsally; 118, same, laterally; 119, same, ventrally; 120, female hindtarsomere IV dorsally; 121, same, IV ventrally; 122, female hindtarsomere V ventrally, higher magnification.



FIGURES 123, 124.—*Tachysphex changi* Tsuneki: 123, male hindtarsomere V, ventral view; 124, same, oblique view.



FIGURE 125.—Collecting localities of *Tachysphex changi* Tsuneki, in Sri Lanka.

Hindcoxal dorsum: inner margin weakly expanded basally.

Setal length expressed as a fraction of basal mandibular width: 0.3–0.4 on vertex and along hypostomal carina, 0.3 on scutum (setae inclined posterad), 0.25–0.3 on midfemoral venter (setae erect); setae of propodeal dorsum slightly inclined posterad, essentially erect.

Head, thorax, and legs black (tarsi brown red in the single male seen from Sabah), humeral plate dark brown. Terga I–IV silvery fasciate apically or tergum IV nonfasciate (see “Diagnosis” above). Wings slightly infumate. Frontal vestiture silvery, with golden tinge in most males.

♀.—Labrum emarginate. Clypeus (Figure 111): bevel shorter than basomedian area except mesally in some individuals; lip emarginate mesally and with two lateral incisions on

each side. Vertex width 0.9–1.0 × length. Dorsal length of flagellomere I 2.0–2.7 × apical width. Forefemoral venter with minute punctures that are several to many diameters apart. Forebasitarsus with 9–12 rake spines. Venter of tarsomeres V with central cluster of spines and with row of spines on each lateral margin (Figures 119, 122). Length 7.0–9.5 mm.

♂.—Clypeus (Figure 112): lip arcuate to sinuate; distance between lip corners equal to 0.6–0.7 of distance between corner and orbit. Vertex width 0.8–1.0 × length. Dorsal length of flagellomere I 1.5–1.6 × apical width, equal to about 0.65 of II. Forefemoral notch finely setose. Venter of tarsomeres V somewhat swollen, with numerous minute spines on venter and also with row of minute spines on each lateral margin (Figures 123, 124). Sterna III–VI with large punctures that are several diameters apart, with usual, long bristles at base of apical depressions, and also with suberect, sparse setae that are as long as midocellar diameter or shorter. Volsella: Figure 114. Penis valve: Figure 115. Length 6.0–7.5 mm.

COLLECTING PERIOD.—In Sri Lanka, all months except December.

HABITAT.—This species has a wide distribution in Sri Lanka, occurring at low elevations in all three ecological zones at localities where the average annual rainfall ranges from 850 to nearly 4000 mm (Figure 125).

GEOGRAPHIC DISTRIBUTION.—Sri Lanka, India, and south-eastern Asia (Laos, Thailand, Vietnam, Malaysia, Philippines, Taiwan, Ryukyu Islands).

RECORDS.—INDIA: KERALA: Walayar Forest (1♀, USNM).

JAPAN: RYUKYU ISLANDS: Iriomote Island: Komi (Tsuneki, 1973); Ishigaki Island (Tano, 1972).

LAOS: SAYABOURY PROVINCE: Sayaboury (1♀, BISH). VIENTIANE PROVINCE: Ban Van Eue (2♀, BISH; 1♀, CAS), Ci Sion Village, de Tha Ngone (9♀, BISH; 2♀, CAS). Also: Nongteveda (1♀, BISH).

MALAYSIA: JOHOR: Ulu Sedili (1♀, CAS). SABAH: Belantan near Sandakan (1♂, CAS).

PHILIPPINES: Luzon: LAGUNA PROVINCE: Los Baños (Tsuneki, 1983).

SRI LANKA: AMPARAI DISTRICT: Ekgal Aru (6♀, 2♂, CAS; 8♀, 4♂, USNM), Inginiyagala (1♀, USNM), Lahugala Sanctuary (1♀, USNM). ANURADHAPURA DISTRICT: Padaviya, Antiquities Site (2♀, USNM). COLOMBO DISTRICT: Gampaha Botanic Garden (1♀, 2♂, USNM), Labugama Reservoir Jungle (1♀, CAS; 2♀, USNM). GALLE DISTRICT: Kanneliya Jungle (1♀, 2♂, CAS; 1♀, 2♂, USNM); Hiniduma in Kottawa Forest Reserve (1♀, USNM). HAMBANTOTA DISTRICT: Bundala Sanctuary (2♀, USNM), Palatupana tank (2♀, CAS; 7♀, USNM). JAFFNA DISTRICT: Kilinochchi (1♀, 2♂, USNM). KEGALLA DISTRICT: Kitulgala, Makande Mukalana (1♂, USNM). KURUNEGALA DISTRICT: Kurunegala, Badegamuwa Jungle (1♂, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte Bungalow in Wilpattu National Park (4♀, 4♂, USNM, also a questionable female discussed under Diagnosis), Kondachchi (3♂, USNM), Kondachchi, Ma Villu (1♀, CAS,

2♀; USNM), Kondachchi, Ma Villu (2♂, NMC), Silavathurai, Kondachchi (2♀, 2♂, USNM), [PBK] (1♀, NMC). MATALE DISTRICT: Kibissa Jungle, 0.5 mi (0.8 km) W Sigiriya (1♀, CAS; 2♀, USNM). MONARAGALA DISTRICT: Angunakolapelessa (1♀, CAS; 3♀, USNM). PUTTALAM DISTRICT: Kali Villu in Wilpattu National Park (1♀, USNM), Panikka Villu in Wilpattu National Park (1♀, CAS; 2♀, USNM). RATNAPURA DISTRICT: Gilimale, Induruwa Jungle (1♀, CAS; 3♀, 1♂, USNM). TRINCOMALEE DISTRICT: China Bay Ridge Bungalow (2♀, 3♂, CAS; 2♀, 4♂, USNM), Kanniyai (1♂, USNM). VAVUNIYA DISTRICT: Cheddikulam, Malwatu Oya (1♀, USNM), Parayanalankulam (1♀, USNM).

TAIWAN: CHIAYI PREFECTURE: Chuchi (1♀, USNM, paratype). PINGTUNG PREFECTURE: Kuaru (Haneda, 1971), Manchou (1♂, CAS). TAITUNG PREFECTURE: Chihpenchi (1♀, CAS). TAIPEI PREFECTURE: Tsukang (Haneda, 1972). TAOYUAN PREFECTURE: Kuangyin (1♂, USNM, paratype).

THAILAND: KANCHANABURI: Erawan National Park, 65 km NW Kanchanaburi (1♀, CAS), Lam Ta Pen River bank, 5 km NW Lat Ya (1♂, CAS). PHETCHABURI: Cha-am (4♂, CAS).

VIETNAM: 24 km E Dilinh (= Djiring) (1♀, BISH).

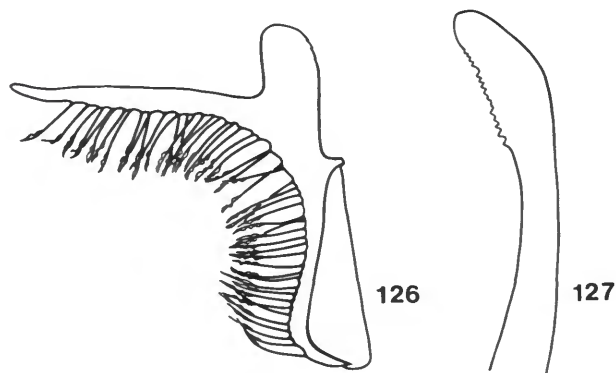
16. *Tachysphex drymobius* Pulawski, new species

FIGURES 126-128

NAME DERIVATION.—*Drymobius* is a combination of two Greek words, *drymos* (forest, wood), and *bios*, (life; a woods dweller.)

DIAGNOSIS.—*Tachysphex drymobius* is very similar to *changi* (see that species for differences, page 54). A character differentiating the male from extralimital species is: vertex width at most $1.1 \times$ length.

DESCRIPTION (see also *xanthoptesimus*, page 50).—Many scutal punctures one or two diameters apart. Mesopleural punctures below scrobe averaging one diameter apart or less. Episternal sulcus complete. Propodeal dorsum rugose or irregularly ridged longitudinally. Hindcoxal dorsum: inner margin weakly angulate basally.



FIGURES 126, 127.—*Tachysphex drymobius* Pulawski, new species: 126, volsella; 127, penis valve (inner side).

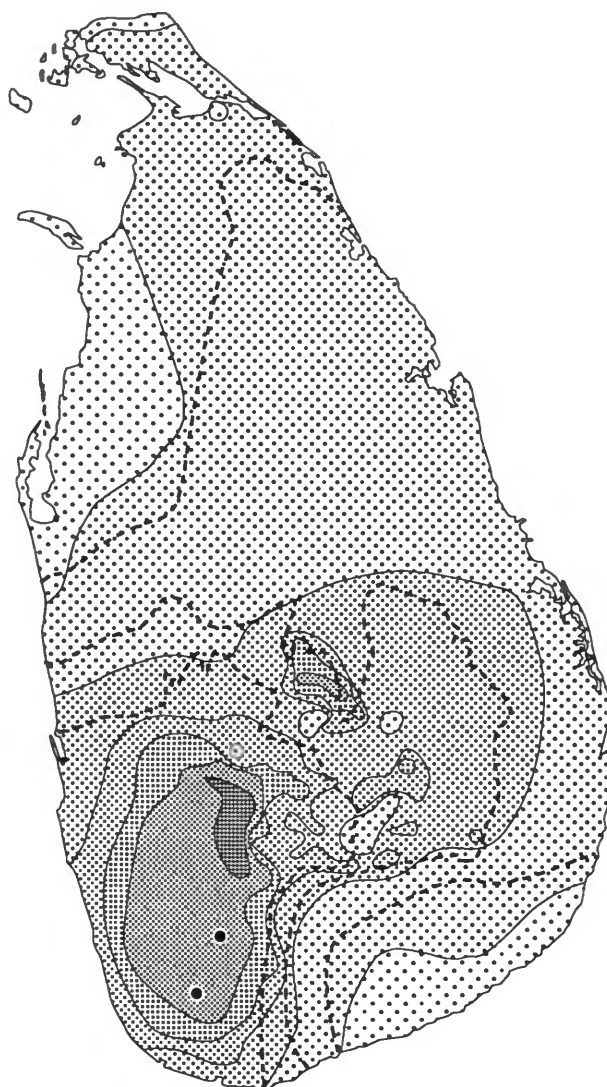


FIGURE 128.—Collecting localities of *Tachysphex drymobius* Pulawski, new species, in Sri Lanka.

Setal length expressed as a fraction of basal mandibular width: 0.2–0.3 on vertex, 0.4 along hypostomal carina, 0.3 on scutum (setae inclined posterad), 0.2 on midfemoral venter (setae nearly erect); setae of propodeal dorsum slightly inclined posterad, essentially erect.

Head, thorax, and legs black, humeral plate dark brown. Terga I–III silvery fasciate apically. Wings slightly infumate. Frontal vestiture silvery.

♀.—Clypeus: bevel ill defined, as long as basomedian area or shorter; lip with two lateral incisions on each side. Vertex width 0.9 – $1.0 \times$ length. Dorsal length of flagellomere I 2.2 – $2.4 \times$ apical width. Forefemoral venter with fine punctures that are several diameters apart. Forebasitarsus with 9–11 rake spines. Venter of tarsomeres V with central cluster of spines and with

row of spines on each lateral margin. Length 8.5–10.0 mm.

♂.—Clypeus: lip arcuate or sinuate, with small median notch in some individuals; distance between lip corners equal to 0.6 of distance between corner and orbit. Vertex width 1.0–1.1 × length. Dorsal length of flagellomere I 1.8 × apical width, equal to 0.8 of II. Forefemoral notch finely setose. Venter of tarsomeres V with a few minute, preapical spines. Sterna III–VI with large punctures that are several diameters apart, with the usual long bristles at base of apical depressions, and also with suberect, sparse setae that are about as long as midocellar diameter. Length 7.2–8.5 mm. Volsella: Figure 126. Penis valve: Figure 127.

COLLECTING PERIOD.—11–16 January, 8–12 February, 11–12 March.

HABITAT.—This uncommon species apparently occurs only in lowland rain forest where average annual rainfall may be as great as 3900 mm at elevations of 150–400 m (Figure 128).

GEOGRAPHIC DISTRIBUTION.—Southwestern Sri Lanka.

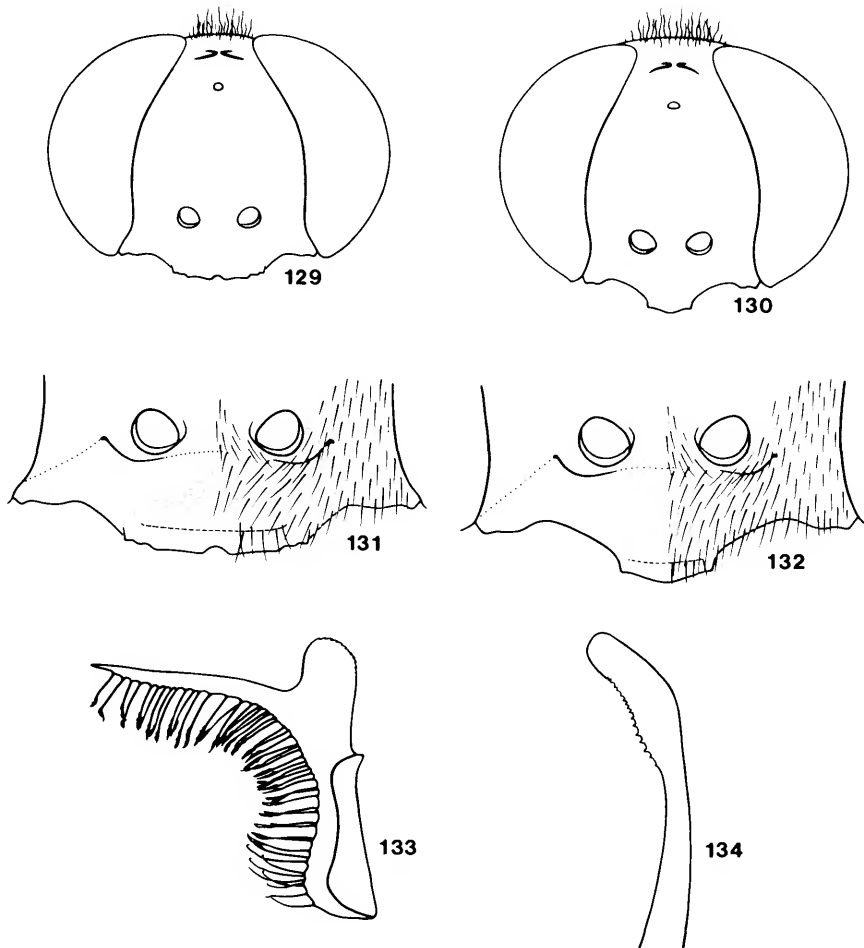
RECORDS.—*Holotype*: ♀, Sri Lanka, Galle District, Kanneliya Jungle, 15 Jan 1975, P.B. Karunaratne, Biological Record 11575 F (USNM).

Paratypes: SRI LANKA: GALLE DISTRICT: Kanneliya Jungle, KVK (1♀, USNM), Kanneliya Jungle, KVK, PBK, PF, NVTAW (2♀, 3♂, CAS; 3♀, 5♂, USNM), Hiniduma in Kanneliya Jungle, KVK (1♀, 2♂, USNM). RATNAPURA DISTRICT: 2 mi (3.2 km) S Weddagala, Sinharaja Jungle, KVK, PF, DWB, VG (1♀, 1♂ CAS; 1♀, 1♂, USNM).

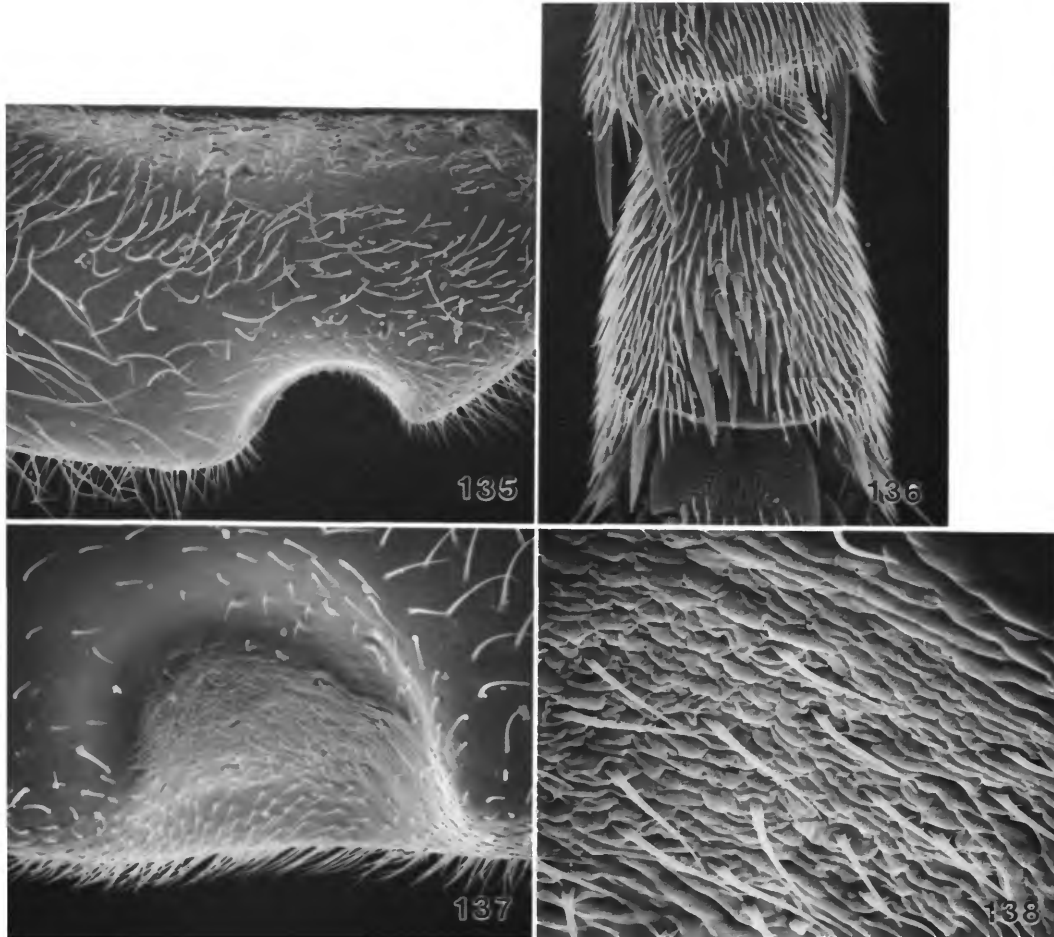
17. *Tachysphex bengalensis* Cameron

FIGURES 129–139

Tachysphex bengalensis Cameron, 1889:144, ♀. [Lectotype: ♀, India: "Bengal: Tirhoot" = Bihar: Muzalfarpur (OXFORD), designated by Pulawski, 1975:311, examined].—R. Turner, 1917b:198 [Bingham, 1897, incorrectly



FIGURES 129–134.—*Tachysphex bengalensis* Cameron: 129, female head frontally; 130, male head frontally; 131, female clypeus; 132, male clypeus; 133, volsella; 134, penis valve (inner side).



FIGURES 135-138.—*Tachysphex bengalensis* Cameron: 135, base of male forefemur; 136, male apical hindtarsomere ventrally; 137, male forefemoral notch obliquely; 138, microsculpture of male forefemoral notch, $\times 1400$.

interpreted the species].—Nec following authors [= *Tachysphex morosus*]: Bingham, 1897:193; Williams, 1928:92; Krombein, 1949:393].—Tsuneki, 1963:7; 1967:49.—Iwata, 1964:369; Haneda, 1971:30.—Nec Yasumatsu, 1940:97 [= *Tachysphex nigricolor*].

Tachysphex brevitarsis Kohl, 1901:783. ♀. [Syntypes: Sri Lanka: Badureliya (NHMW), examined. Synonymized with *Tachysphex bengalensis* by Pulawski, 1975:311].

DIAGNOSIS.—*Tachysphex bengalensis* closely resembles the Australian species *mackayensis* R. Turner. Both have sinuous setae on the head and thorax (setal length $0.5 \times$ basal mandibular width on vertex and $0.3-0.4$ on scutal disk), the labrum is flat, emarginate apically, the female tarsi are of the *obscuripennis* type, and the female forebasitarsus has no fewer than eight rake spines; also, the episternal sulcus is complete in *bengalensis* and some *mackayensis*. The mesopleural punctures, however, are large and conspicuous in *bengalensis* and

fine to evanescent in *mackayensis*. Furthermore, the male of *bengalensis* has a subapical cluster of minute spines on the venter of the apical tarsomeres, while only one or two relatively long spines are present in *mackayensis*.

DESCRIPTION (see also *xanthoptesimus*, page 50).—Scutal punctation varying, but at least a few punctures about two diameters apart; in some specimens most discal punctures several diameters apart. Mesopleural punctures varying from less than one to about two diameters apart at center. Episternal sulcus complete. Propodeal dorsum rugose or irregularly ridged longitudinally. Hindcoxal dorsum: inner margin obtusely angulate basally.

Setae sinuous on head, thorax, forefemur, and midfemoral venter. Setal length expressed as fraction of basal mandibular width: 0.5 on vertex and along hypostomal carina, $0.3-0.4$ on

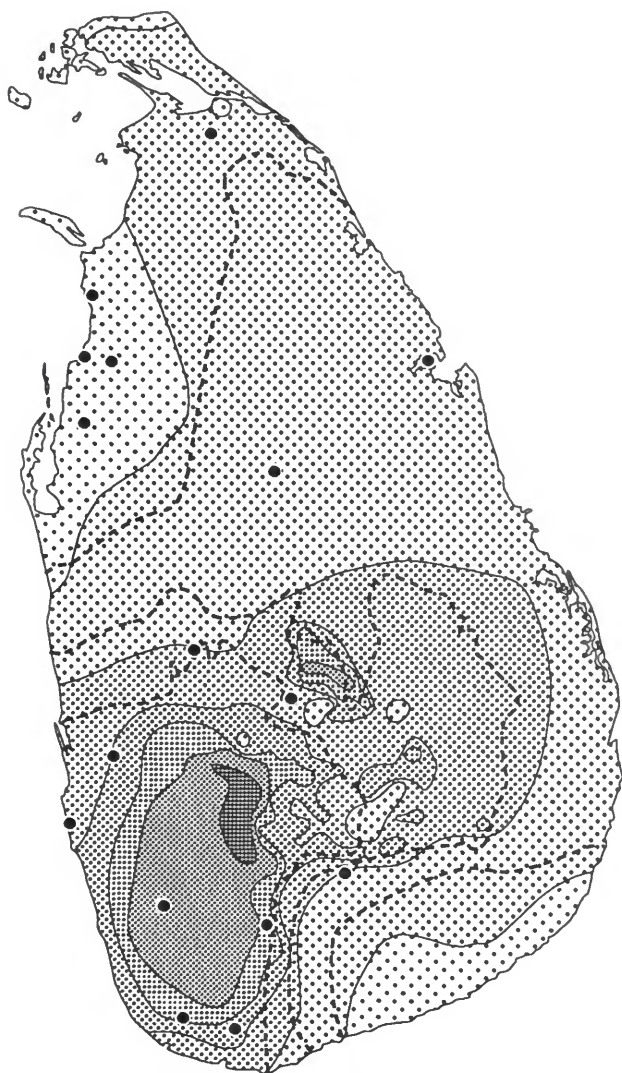


FIGURE 139.—Collecting localities of *Tachysphex bengalensis* Cameron in Sri Lanka.

scutal disk, 0.6 on propodeal dorsum, 0.4–0.5 on midfemoral venter. Setae appressed on scape, inclined posterad on propodeal dorsum.

Body black, including mandibles and tarsi. Tegula yellow brown, humeral plate of forewing dark brown. Wings slightly infumate, veins dark brown. Terga I–III silvery fasciate apically, also tergum IV in some individuals. Frontal and clypeal vestiture silvery, with golden tinge in some males.

♀—Labrum emarginate mesally. Clypeus (Figures 129, 131): bevel ill defined, about as long as basomedian area; lip emarginate mesally, with two shallow, ill-defined lateral incisions on each side. Vertex width 1.1–1.2 × length. Dorsal length of flagellomere I 2.4–2.6 × apical width. Punctures

averaging about two diameters apart on vertex and scutal disk, about one diameter on mesopleuron beneath scrobe (interspaces uneven). Forefemoral venter shiny, punctures many diameters apart. Forebasitarsus with ten rake spines. Tarsomeres V: lateral margins with row of minute spines near base. Length 9.5–10.0 mm.

♂.—Clypeus (Figures 130, 132): lip arcuate, distance between lip corners equal to 0.5–0.6 of distance between corner and orbit. Vertex width 1.2–1.3 × length. Dorsal length of flagellomere I 1.7–1.8 × apical width, about 0.7 of II. Punctures more than one diameter apart on vertex and scutal disk, about one diameter apart to nearly contiguous on mesopleuron below scrobe. Bottom of forefemoral notch finely setose (Figures 135, 137, 138). Venter of apical tarsomere with median cluster of minute spines, but without such spines on lateral margins (Figure 136). Sterna III–VI with large, sparse punctures. Length 6.0–9.0 mm. Volsella: Figure 133. Penis valve: Figure 134.

COLLECTING PERIOD.—January through June, November.

HABITAT.—*Tachysphex bengalensis* has a wide distribution in Sri Lanka and occurs in all three ecological zones where the average annual rainfall ranges from 1000 to 4000 mm, mostly at low altitudes, although one specimen was taken at an altitude of 900 m (Figure 139).

GEOGRAPHIC DISTRIBUTION.—India, Sri Lanka.

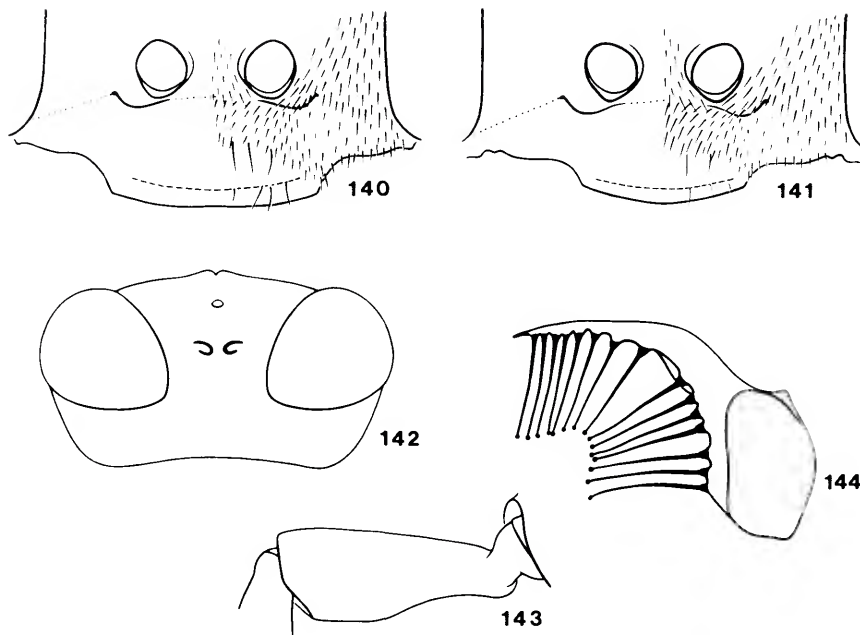
RECORDS.—INDIA: BIHAR: Muzalfarpur (lectotype and paralectotype of *bengalensis*). MAHARASHTRA: Krishnagiri Upawan National Park, 12 air km NNW Bombay International Airport (1♂, CAS). TAMIL NADU: Anamalai Hills, Cinchona (1♂, OSU).

SRI LANKA: ANURADHAPURA DISTRICT: Ritigala Natural Reserve (5♂, USNM). COLOMBO DISTRICT: Henaratgoda (1♀, 3♂, USNM), Ratmalana (1♀, 1♂, USNM). JAFFNA DISTRICT: Kilinochchi (1♀, USNM). KALUTARA DISTRICT: Badureliya (Kohl, 1901, as *brevitarsis*). KANDY DISTRICT: Kandy, Udawattakele (1♀, USNM). KURUNEGALA DISTRICT: Kurunegala, Badegamuwa Jungle (3♂, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park (2♂, USNM), Silavathurai, Kondachchi (1♀, 1♂, USNM); Marichchukkaddi (1♀, NMC). MATARA DISTRICT: Paraduwa (1♀, CAS). PUTTALAM DISTRICT: Panikka Villu Bungalow in Wilpattu National Park (1♀, USNM). RATNAPURA DISTRICT: Deerwood, Kuruwita, 6 mi (9.6 km) NNW Ratnapura (1♀, LUND); Bulutota Pass, 3000 ft (1♀, USNM); Uggalkaltota (2♂, CAS, USNM). TRINCOMALEE DISTRICT: Trincomalee, China Bay Ridge Bungalow (1♀, USNM).

18. *Tachysphex sympleuron* Pulawski, new species

FIGURES 140–146

NAME DERIVATION.—*Sympleuron* is derived from the Greek prefix *syn-* (spelled *sym-* before *p*), meaning together, with; and from *pleuron*, rib; with reference to the undivided mesopleuron of this species.



FIGURES 140-144.—*Tachysphex sympleuron* Pulawski, new species: 140, female clypeus; 141, male clypeus; 142, female head dorsally; 143, female scape laterally; 144, volsella.

DIAGNOSIS.—*Tachysphex sympleuron* is the only Sri Lankan species (also found in India) that lacks an episternal sulcus (as in Figure 198). This reduction is shared with eight extralimital species: *brevipennis* Mercet, 1909 (Iberian Peninsula), *carli* de Beaumont, 1947 (Gibraltar, Morocco), *convexus* Pulawski, 1971 (Kazakhstan, Turkmenistan), *fulvicornis* R. Turner, 1918 (Morocco to West Bengal), *heterochromus* de Beaumont, 1955 (Morocco), *minutus* Nurse (Namibia and Zimbabwe to India, north to Sicily, southeastern Europe and Uzbekistan), *miscophoides* Arnold, 1923 (South Africa), and *sinaiticus* Pulawski, 1971 (Sinai Peninsula). All these species have a short malar space (a character shared with the Nearctic species *papago* Pulawski, *psilocerus* Kohl, and *scopaeus* Pulawski), and in most specimens the metapleural sulcus is ill defined to absent between the upper pit and midcoxa. Arnold (1923) established the genus *Atelosphex* for this assemblage, but de Beaumont (1940) placed them in his *imperfectus* group of *Tachysphex* (renamed *brevipennis* group by Pulawski, 1971).

Tachysphex sympleuron itself is very similar to *minutus*. The two species are largely allopatric, but both occur in Deesa, India. The most obvious difference is in the male forefemoral notch: the bottom is setose in *sympleuron* (Figure 145) but glabrous in *minutus*; the notch is also glabrous in the remaining species except *carli* (which differs by the same characters as the female, see below). Both male and female differ in mesopleural integument and head form: in *sympleuron*, the mesopleuron is dull, either punctatorugose or densely punctate beneath the scrobe, and the gena is thick in dorsal view (Figure 142). In

minutus, the mesopleuron is punctate, the interspaces are shiny in most specimens and the gena, in dorsal view, is narrow in specimens from the Indian subcontinent and several other areas, but thick in southeastern Europe and Turkey. The following characters differentiate the female of *sympleuron* from the other related species: clypeal lip not incised laterally (incised in *carli*), basal half of scape concave ventrally (straight in *carli*), antenna black (four basal flagellomeres reddish or

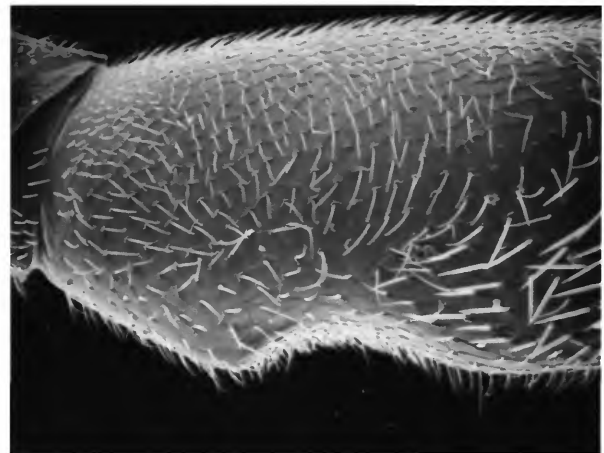


FIGURE 145.—*Tachysphex sympleuron* Pulawski, new species: base of male forefemur.



FIGURE 146.—Collecting localities of *Tachysphex sympleuron* Pulawski, new species, in Sri Lanka.

brown in *fulvicornis*), mesopleuron punctatorugose in most specimens, not ridged (punctate in *brevipennis*, *minutus*, and *sinaiticus*, ridged posteriorly in *carli*), propodeal dorsum densely setose (with only a few, sparse setae in *sinaiticus*), foretibia densely setose throughout (outer surface sparsely setose in *convexus*), gaster, femora, and tibiae black (red in *heterochromus*; gastral base and tibiae reddish in *miscophoides*; gastral base red in *brevipennis*; femora and tibiae all or largely red in *convexus*), wings yellowish (slightly infumate in other species but slightly yellowish in *fulvicornis* and some *minutus*).

DESCRIPTION.—Frons punctatorugose, without well-defined

interspaces. Gena thick in dorsal view (Figure 142). Malar space present. Basal half of scape concave ventrally (Figure 143). Scutum with well-defined punctures that are less than one diameter apart (some punctures slightly more than one diameter apart in some individuals). Mesopleuron dull, punctatorugose below scrobe, at most with a few well-defined interspaces. Episternal sulcus absent. Metapleural sulcus almost completely reduced between upper pit and midcoxa. Propodeal dorsum longitudinally ridged except rugose laterally; side ridged. Hindcoxal dorsum: inner margin carinate basally, carina insignificantly expanded. Apical tarsomeres with no spines on venter or lateral margins. Punctures of tergum II averaging less than one diameter apart, contiguous or nearly so in some males.

Setae appressed on vertex and scutum, inclined between mandible and occipital carina, and oriented anterad on propodeal dorsum except laterally (setae oriented postero-laterad) and basally (setae oriented posterad).

Head, gaster, thorax, and legs black, but mandible broadly red or yellowish red mesally (dark red in some males); clypeal bevel reddish apically in some specimens; and tarsi red to brown. Terga I-III silvery fasciate apically. Wings yellowish in most specimens, but almost hyaline in males from Gujarat and Rajasthan.

♀.—Clypeus (Figure 140): bevel slightly shorter than basomedian area; lip arcuate, not incised laterally. Vertex width $1.9-2.3 \times$ length. Dorsal length of flagellomere I $2.6-2.7 \times$ apical width. Foretibia densely, uniformly punctate and setose throughout, outer surface without spines. Forebasitarsus with five to seven rake spines. Pygidial plate microscopically reticulate (except apically) and with sparse punctures (as in Figure 199). Length 5.0–7.5 mm.

♂.—Clypeus (Figure 141): bevel slightly shorter than basomedian area; lip weakly arcuate, not incised laterally, with well-defined corner; distance between corners $1.3-1.5 \times$ distance between corner and orbit. Vertex width $2.3-2.5 \times$ length. Dorsal length of flagellomere I $2.0-2.1 \times$ apical width. Forefemoral notch setose (Figure 145). Outer margin of forebasitarsus with two to four preapical spines, mostly three (number of spines may be different on each leg, e.g., two and three, or three and four); at least one spine longer than apical width of basitarsus. Venter of tarsomeres V with no spines. Sterna densely, evenly punctate and setose. Volsella: Figure 144. Length 4.1–5.9 mm.

COLLECTING PERIOD.—January, February, May, June, August, September, October (Sri Lanka); April through July (India).

HABITAT.—The specimens from Deesa and Udaipur, India, were collected in dry river beds on sand and gravel. Within Sri Lanka, *sympleuron* occurs in the Dry Zone except for one specimen from Ratnapura in the Wet Zone. It is found at localities from near sea level to an elevation of 60 m, with an average annual rainfall in the Dry Zone of 920–1500 mm (Figure 146). The average annual rainfall at Ratnapura is 3888 mm, and the elevation is 36 m. Most specimens were collected

on sand or soil with a large content of sand.

GEOGRAPHIC DISTRIBUTION.—India to Sri Lanka.

RECORDS.—*Holotype*: ♀, Sri Lanka, Mannar District, 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park, 15–16 Feb 1979, KVK, TW, SS, TG (USNM).

Paratypes: INDIA: GUJARAT: Deesa, W.J. Pulawski (1♂, CAS). KARNATAKA: Bangalore, K. Ghorpade (1♀, ZMK); Nandy Hills, R.T. Simon Thomas (1♂, ITZA). RAJASTHAN: Udaipur, W.J. Pulawski (1♂, CAS). TAMIL NADU: Karikal, P. Susai Nathan (1♀, CAS), Koyampattur, P. Susai Nathan (1♀, ITZA).

SRI LANKA: ANURADHAPURA DISTRICT: Padaviya, KVK, PBK, SK, DWB (1♀, CAS; 3♀, USNM), O.S. Flint (1♂, USNM); Padaviya archeological site, KVK, PBK, PF, TW, MJ (1♀, CAS; 4♀, USNM) HAMBANTOTA DISTRICT: Bundala Sanctuary, near circuit bungalow, KVK, PBK, TW, LJ, LW (1♀, USNM); Hambantota, T.B. Fletcher (11♀, 9♂, BMNH; 1♀, 1♂, CAS); Palatupana, KVK, PBK (1♂, USNM), KVK, PBK, PF, EGD (1♀, 3♂, USNM). JAFFNA DISTRICT: Elephant Pass, KVK, PBK (2♂, USNM), Kilinochchi, KVK, PF, DWB, VG (1♂, CAS; 2♂, USNM). MANNAR DISTRICT: Kokmotte Bungalow, 0.5 mi (0.8 km) N Wilpattu National Park, KVK, TW, SS, TG (1♀, 2♂, CAS; 1♀, 5♂, USNM), same locality, KVK, PBK, SK, DWB (3♀, 2♂, CAS; 8♀, 3♂, USNM); same locality, KVK, PF, DWB, WG (1♂, USNM); Pesalai, TW, LJ, RS (1♂, USNM). MONARAGALA DISTRICT: Angunakolapelessa, KVK, PBK, TW, SS, TG (1♀, USNM), KVK, PBK, TW, MJ (1♂, USNM); 13 mi (20.8 km) E Uda Walawe, KVK, PBK, SK (1♀, 1♂, USNM). PUTTALAM DISTRICT: Kali Villu in Wilpattu National Park, D.H. Messersmith, G.L. Williams, PBK (2♀, USNM). RATNAPURA DISTRICT: Ratnapura, KVK, PBK (1♀, USNM). TRINCOMALEE DISTRICT: Trincomalee, China Bay Ridge Bungalow, PBK (1♀, USNM, Biological Note 10977A), 7 mi (11.2 km) W Trincomalee, KVK, PBK, SK, DWB (1♂, CAS; 1♂, USNM). VAVUNIYA DISTRICT: Parayanalankulam Irrigation Canal, 25 mi (40 km) NW Medawachchiya D. Davis, W. Rowe (1♂, USNM).

19. *Tachysphex panzeri* (Vander Linden)

FIGURES 147–153

Tachytes panzeri Vander Linden, 1829:22. ♂, ♀ [♀ = *Tachysphex pseudopanzeri*. Syntypes: Spain (lost). Neotype: ♂, Spain: Toledo (RMNH), designated by Pulawski, 1971:262, examined. Transferred to *Tachysphex* by Kohl, 1883:177.]

Lyrops rufiventris Spinola, 1839:479. ♀. [Holotype or syntypes: ♀, France: Corse (probably lost; see de Beaumont, 1952:47; not listed by Casolari and Casolari Moreno, 1978–1979). New synonym. Transferred to *Larrada* by F. Smith and to *Tachysphex* by Kohl, 1885:356; treated as subspecies of *Tachysphex panzeri* by Pulawski, 1971:270.]

Tachytes Oraniensis Lepeletier, 1845:253. ♀, ♂ [incorrect original capitalization]. [Syntypes: Algeria: Oran (MNHN), not examined. New synonym. Transferred to *Tachysphex* by Kohl, 1884:368; treated as form of *Tachysphex panzeri* by de Beaumont, 1955:175, and as subspecies by Pulawski, 1971:273.]

Tachytes aurifrons Lucas, 1849:246. ♀. [Syntypes: Algeria: La Calle (MNHN), not examined. Synonymized with *Tachysphex panzeri* by de Beaumont, 1947b:662.]

Tachytes discolor Frivaldszky, 1876:351. ♂. [Syntypes: Hungary: Budapest, also Grebenáč in Temes Komitat, now in Timis District in Romania (lost), not examined. Neotype: ♂, Hungary: Budapest-Rákos, 9 August (year not indicated), A. Mocsáry collector (TMB), present designation. Synonymized with *Tachysphex panzeri* by Kohl, 1884:368.]

Tachysphex panzeri.—Kohl, 1883:177.—Pulawski, 1971:262 [revision, full bibliography on Palearctic populations].—Bohart and Menke, 1976:275 [listed].

Tachytes pulverosus Radoszkowski, 1886:32. ♀, ♂. [Lectotype: ♂, Uzbekistan: Samarkand (KRAKÓW) designated by de Beaumont, 1936b:610, examined, new synonym. Transferred to *Tachysphex* by de Beaumont, 1936b:610; treated as subspecies of *Tachysphex panzeri* by Pulawski, 1971:274.]

Tachytes ceylonica Cameron, 1900:21. ♂ [incorrect original termination]. [Holotype: ♂, Sri Lanka: no specific locality (OXFORD), examined. Synonymized with *Tachysphex panzeri* by Pulawski, 1975:312.]

Tachytes aurifrons Cameron, 1900:23. “♀” = ♂. [Lectotype: ♂, Sri Lanka: Trincomalee (BMNH), designated by Pulawski, 1975:312, examined.]—Nec *Tachytes aurifrons* Lucas, 1849. Synonymized with *Tachysphex panzeri* by Pulawski, 1975:312.

Tachysphex Pantheri Cameron, 1905b:212. ♂ [incorrect original capitalization]. [Holotype or syntypes: ♂, South Africa: Cape Province: Grahamstown (originally Albany Museum, now lost?), not examined.—Arnold, 1923a:167 [“a variety of *panzeri*, but owing to the loss of the type the status of the species cannot be settled”], 175 [listed], 176 [original description copied].]

Tachysphex ablati Nurse, 1909:516. ♀. [Lectotype: ♀, India: Gujarat: Deesa (BMNH), designated by Pulawski, 1975:312, examined. Synonymized with *Tachysphex panzeri pulverosus* by Pulawski, 1975:312.]

Tachysphex Panzeri var. *Caliban* Arnold, 1923:169. ♀, ♂ [incorrect original capitalization]. [Syntypes: Zimbabwe: Bulawayo and Sawmills (SAM), not examined.]—Arnold, 1935:497 [South Africa: Kalahari]; Bohart and Menke, 1976:275 [as synonym of *Tachysphex panzeri pantheri*].

Tachysphex Panzeri var. *dolosus* Arnold, 1923:171. ♀, ♂. [Syntypes: Zimbabwe: Sawmills (SAM), not examined. Raised to subspecies of *Tachysphex panzeri* by Bohart and Menke, 1976:275.]

Tachysphex Panzeri var. *nanus* Arnold, 1924:71. ♀, ♂. [Syntypes: South Africa: Willowmore (TMP), not examined. Raised to subspecies of *Tachysphex panzeri* by Bohart and Menke, 1976:275.]

Tachysphex Panzeri var. *Sycorax* Arnold, 1923:196. ♂ [incorrect original capitalization]. [Syntypes: Zimbabwe: Bulawayo (SAM), not examined. Raised to subspecies of *Tachysphex panzeri* by Bohart and Menke, 1976:275.]

Tachysphex Panzeri var. *Zavattarii* Guiglia, 1939:74. ♀ [incorrect original capitalization]. [Holotype: ♀, Ethiopia: Sidamo: Neghelli = Negele in Boran area (GENOVA), not examined. Raised to subspecies of *Tachysphex panzeri* by Bohart and Menke, 1976:275.]

Tachysphex auriceps Cameron.—Giner Marl, 1945:856 [India: Varsoba near Bombay, misidentification, present correction to *Tachysphex panzeri*].

Tachysphex panzeri fortunatus de Beaumont, 1968a:261. ♀, ♂. [Holotype: ♀, Canary Islands: Gran Canaria: Maspalomas (BMNH), not examined. New synonym.—Pulawski, 1971:270 [revision].—Bohart and Menke, 1976:275 [listed].—Gayubo, 1986:999 [prey: acridid *Sphingonotus rubescens rubescens* (Walker)].

Tachysphex panzeri cyprius Pulawski, 1971:272. ♀, ♂. [Holotype: ♀, Cyprus: Limassol (W.J. Pulawski coll.), examined. New synonym.]—Bohart and Menke, 1976:275 [listed].

Tachysphex panzeri oraniensis.—Pulawski, 1971:273 [revision, full bibliography].—Bohart and Menke, 1976:275 [listed].

Tachysphex panzeri pulverosus.—Pulawski, 1971:274 [new status, revision]; Bohart and Menke, 1976:275 [listed].

Tachysphex panzeri rufiventris.—Pulawski, 1971:270 [new status, revision].—Bohart and Menke, 1976:275 [listed].

Tachysphex panzeri sareptanus Pulawski, 1971:272, ♀, ♂. [Holotype: ♀, Russia: Sarepta, now Krasnoarmeysk (ZIN), examined. New synonym.].—Bohart and Menke, 1976:275 [listed].

Tachysphex panzeri dolosus.—Bohart and Menke, 1976:275 [new status; listed].

Tachysphex panzeri nanus.—Bohart and Menke, 1976:275 [new status; listed].

Tachysphex panzeri pentheri.—Bohart and Menke, 1976:275 [listed].—Gess, 1981:20 [South Africa: 18 km WNW Grahamstown; nesting in friable soils].

Tachysphex panzeri sycorax.—Bohart and Menke, 1976:275 [new status; listed].

Tachysphex panzeri zavattarii.—Bohart and Menke, 1976:275 [new status; listed].

DIAGNOSIS.—*Tachysphex panzeri* has a convex labrum that protrudes beyond the clypeal margin (Figures 147–151), elongate mouthparts (galea longer than wide), a narrow vertex (width less than length), and the male forefemur is emarginate basally. Many other species share these characters, but only *noar* and *diadelus* occur in Sri Lanka. Unlike the latter two, Sri Lankan females of *panzeri* have a partly yellow clypeus (rather than all black); in addition, the clypeal lip is sinuous laterally (incised laterally in *diadelus*, evenly arcuate or sinuous in *noar*). The males of the three species are indistinguishable externally except for the sparsely punctate galea of *diadelus* (Figure 157), but the dorsal volsellar process of *panzeri* (low, broadly rounded) is distinctive (Figure 152).

COMPARISON WITH EXTRALIMITAL SPECIES.—Many extralimital species greatly resemble *panzeri* and some are indistinguishable externally. The presence, in the male, of a well-defined foretarsal rake helps in identification, although a similar rake is found in many other species. The best recognition character is the shape of the volsella, with its low, rounded dorsal process (Figure 152). The volsellar process is also low and broad in several other species, but then the overall shape of the volsella is different except in *pulcher* Pulawski (Turkey to Tajikistan) and *tessellatus* Dahlbom (Greece, Turkey), where it is identical to *panzeri*. The former differs in having the setae sinuous between the mandibular base and occipital carina and dense, hiding the integument, on the outer surface of the hindfemur (setae straight, not obscuring the femoral integument in *panzeri*). As indicated below, *tessellatus* may be merely an individual variation of *panzeri*.

In the female, the main recognition features are: clypeal lip emarginate mesally and, in most specimens, sinuate laterally (not emarginate), genal setae straight (not sinuous), propodeal side not ridged, tergum V densely punctate and setose throughout, including apical depression; at least terga I–III silvery fasciate apically, and gaster red at least basally except all black in the Canary Islands populations (= *panzeri fortunatus* de Beaumont). Extralimital species with the same character combination are the following:

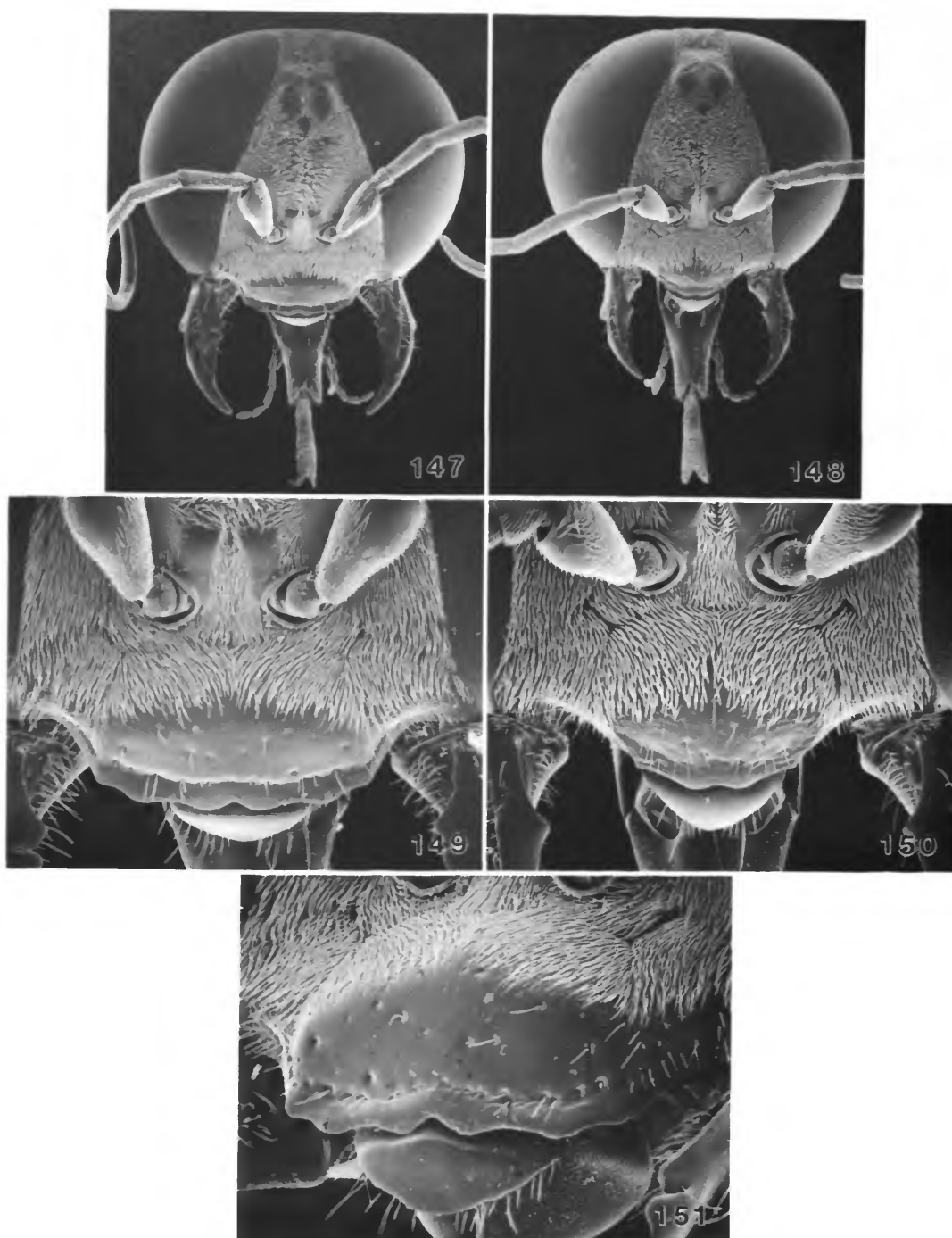
1. *tessellatus* (Dahlbom, 1845) (Greece, Turkey). De Beaumont (1947b) synonymized this species with *panzeri*, but

recognized it subsequently (1960b) as a form of *panzeri*, and Pulawski (1971) raised it to full species. According to de Beaumont (1960b) and Pulawski (1971), *panzeri* differs in having no longitudinal line on the vertex (or at most a rudimentary one), the postocellar impression with an obtusely angulate hindmargin, the female pygidial plate dull, microsculptured between the punctures, and the dorsal volsellar process slightly higher in most specimens. In *tessellatus*, the vertex has a fine, longitudinal line, the postocellar impression in most specimens is more angulate, almost rectangular, the female pygidial plate is shiny, practically not microsculptured between punctures, and the dorsal volsellar process is slightly lower. On the island of Rhodes, the two species differ also by their coloration: in the females of *panzeri*, gastral segment III and the femora are black, and in the male the entire gaster and the mid and hindtibiae are black; in the female of *tessellatus*, gastral segment III is red, the femora are partly red, and in the male the gastral base and the tibiae are red. These differences are minimal and variable, and the status of *tessellatus* needs reevaluation.

2. *pseudopanzeri* de Beaumont, 1955 (southern France, Iberian Peninsula, Morocco). The species is externally identical to *panzeri*, but the male has a distinctive volsella, with a sharply pointed dorsal process. De Beaumont (1955) and Pulawski (1971) thought that the females could be differentiated by their color pattern and silvery gastral fasciae, but this is probably erroneous. They assigned to *panzeri* those French and Iberian specimens in which the gaster was red basally and black apically, and to *pseudopanzeri* the females that had the gaster red basally and apically but black preapically (segment IV or III and IV black). They thought that Moroccan females with an all red gaster were *pseudopanzeri* if silvery fasciae were present on terga I–IV, and *panzeri* if the fasciae were present on terga I–III. The difference in the color pattern is most likely meaningless: females colored as the supposed *pseudopanzeri* occur in many areas where the males of *pseudopanzeri* have never been found (Rumania to Sri Lanka). Most likely, the true female of *pseudopanzeri* is still unrecognized.

3. *cheops* de Beaumont, 1940 (Mauritania, Libya, Egypt, Israel; new records include Pakistan: Karachi, 2♀, 5♂, BMNH; and Sandspit Beach near Karachi, 3♀, 10♂, CAS). Unlike *cheops*, the clypeal free margin of *panzeri* is markedly concave between the lobe and orbit (Figures 149, 150), and the longest genal setae of *panzeri* (those between the occipital and hypostomal carinae) are about 0.25 × basal mandibular width. In *cheops* (both sexes), the free margin is only shallowly concave and the setae are about 0.4 × basal mandibular width. Although seemingly insignificant, these differences are obvious when specimens are compared.

4. *lucillus* Pulawski, 1971 (Turkmenistan). In *panzeri*, the setae adjacent to the hypostomal carina are erect (at least posteriorly), the clypeal free margin is markedly concave



FIGURES 147-151.—*Tachysphex panzeri* (Vander Linden): 147, female head frontally; 148, male head frontally; 149, female clypeus; 150, male clypeus; 151, female clypeus and labrum obliquely.

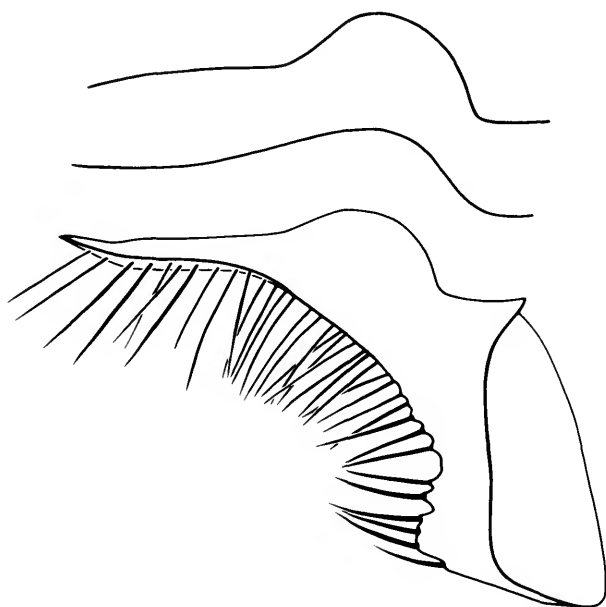


FIGURE 152.—*Tachysphex panzeri* (Vander Linden): volsella, with outlines showing individual variation.

between the lobe and orbit (Figures 147–150), the marginal cell is densely setose, and (except in desert populations) the thoracic vestiture does not conceal the integument. In *lucillus*, the setae are appressed along the hypostomal carina, the clypeal free margin is shallowly concave between the lobe and orbit, the setae of the marginal cell are sparser, and the mesothoracic setae totally conceal the integument.

STATUS OF AFROTROPICAL FORMS.—Arnold (1923, 1924), Bischoff (1913), and Guiglia (1939) described several varieties of *panzeri* from the Afrotropical Region. Three of them were subsequently raised to species: *aethiopicus* Arnold (by Pulański in Bohart and Menke, 1976), *miniatus* Arnold (by Arnold, 1947), and *rhodesianus* Bischoff (by Arnold, 1947). The status of the remaining forms (listed above in bibliographic citations) is unclear. They may be individual, ecological, or geographic forms of *panzeri*, or they may be full species. At this time, the occurrence of *panzeri* in Ethiopia and southern Africa needs verification.

NEOTYPE DESIGNATION.—The type material of *Tachytes discolor* Frivaldszky has not been found in the Budapest or Vienna museums (letters of Dr. J. Papp of 16 November 1990 and of Dr. M. Fischer of 20 December 1990) and is presumed to be lost. Consequently, I have designated a neotype, a male collected in Budapest (Rákos), Hungary, by A. Mocsáry that Dr. J. Papp kindly sent on loan. The specimen agrees well with the original description and was collected in one of the two original localities.

DESCRIPTION.—Clypeal middle section conspicuously con-

vex, slightly so in smallest males. Labrum convex, protruding beyond clypeal free margin (Figures 147–151); galea longer than wide, densely punctate except anteriorly. Punctures minute, about one diameter apart or less on scutum and mesothoracic venter; mesopleuron dull, microsculptured, impunctate. Episternal sulcus effaced anteroventrally. Propodeal dorsum and side evenly microsculptured. Hindcoxal dorsum: inner margin ecarinate. Apical tarsomeres without spines on venter or lateral margins, with a few thin, erect setae on venter.

Setae appressed on frons, vertex, scutum, mesopleuron, and midfemoral venter; subappressed between mandibular base and occipital carina (setal length, near occipital carina, about 0.25 basal mandibular width); most setae of propodeal dorsum inclined obliquely anterad, but lateral setae inclined obliquely posterad and joining apicomesally.

Coloration: see "Variation" below.

♀.—Clypeus (Figures 147, 149, 151): bevel as long as basomedian area or longer; lip arcuate, emarginate mesally, in most specimens sinuous laterally. Vertex width 0.6–0.7 × length. Dorsal length of flagellomere I 2.4–3.1 × apical width. Foretibia densely, uniformly punctate and setose throughout, outer surface with two to several spines. Forebasitarsus with seven or eight rake spines. Tergum V uniformly micropunctate throughout (including apical depression). Pygidial plate shallowly punctate, interspaces microsculptured to unsculptured. Length 9.0–14.0 mm.

♂.—Clypeus (Figures 148, 150): bevel as long as basomedian area or shorter, delimited laterally by oblique carina that emerges from lip corner; lip arcuate, shallowly emarginate mesally (emargination vestigial in some specimens), angulate laterally; distance between corners 0.8–1.0 × distance between corner and orbit. Vertex width 0.6–0.8 × length. Dorsal length of flagellomere I 1.5–2.3 × apical width. Forefemoral notch setose (setae appressed). Outer margin of forebasitarsus with three to five preapical spines, apical spine about twice as long as basitarsus width; apical spine of foretarsomere II longer than tarsomere III. Sterna densely, evenly punctate, densely setose. Volsella: Figure 152. Length 6.5–10.0 mm.

Frontal setae golden, silvery in smallest specimens.

VARIATION.—*Tachysphex panzeri* is widely distributed and varies considerably over its range, mainly in head shape, amount of vestiture, and color, as described below:

1. Gena. The gena is moderately thick in dorsal view in most populations, but thin in specimens from North African and Asian deserts, particularly females.

2. Thoracic vestiture. Vestiture is moderately dense in most specimens (not concealing female mesopleuron), but markedly denser in desert populations (almost totally concealing female mesopleuron).

3. Propodeal setae. The propodeal side, in most specimens, is glabrous anteriorly (along the metapleuron), but entirely setose in desert specimens.

4. Silvery fasciae of female gaster. Terga I–IV are silvery fasciate apically in most populations, but only I–III in females

from Canary Islands and in many specimens from North Africa (Morocco, Algeria, Tunisia, Egypt), Israel, and in one female examined from Carpentras, southern France (Pulawski, 1971).

5. Color of female clypeus. The female clypeus is: a. all black (most European specimens, Canary Islands), b. the bevel is reddish brown (many specimens from southern Europe and Asian Turkey, some from Morocco, Syria, Iran), c. the bevel is red (many specimens from North Africa, Israel, and Kazakhstan), or d. the bevel is predominantly yellow (Egypt, Transcaspia, Pakistan, India, Sri Lanka, Thailand, some specimens from Morocco and Iran).

6. Color of gaster. In the female, the gaster is: a. red basally and black apically (most European specimens, Turkey), b. all red (most specimens from Corsica, Sardinia, Cyprus, southeastern European Russia, North Africa, Pakistan, many from Iran), c. all black (Canary Islands), or d. red basally and apically, with segments IV and V black or brown (India, Sri Lanka, Thailand, also some specimens from Romania, Corsica, Sardinia, and Cyprus). In the male, the gaster is all black (Canary Islands, many specimens from northern Europe, Kazakhstan, and Crete), red basally and black apically (most populations; the amount of red increasing toward the South), or all red (some species from Cyprus, many species from North Africa).

7. Color of femora. In the female, the femora are: a. all black (Holland, Hungary, Poland), b. all black except red apically (France including Corsica, Italy including Sardinia, Spain, Canary Islands, Turkey), c. varying from all black to largely red (Romania, Bulgaria, Hoggar Mountains in Algeria, Transcaspia, Iran, Sri Lanka), or d. all red or nearly so (Cyprus, North Africa, Transcaspia, Pakistan, India). In the male, the femora are all black (Europe, Canary Islands, Syria), or black except red apically (Turkey, some from Cyprus, some from Transcaspia and India, Sri Lanka), or all red or nearly so (North Africa, most from Cyprus, many from Transcaspia, some from India).

8. Color of tibiae and tarsi. It varies from all black to all red.

CHARACTERISTICS OF SRI LANKAN POPULATIONS.—Head moderately thick in dorsal view. Vestiture moderately dense, not obscuring mesopleural integument. Female: clypeal middle section yellowish except black basally; gastral segments I-III and also VI all or largely red, terga IV and V contrastingly black; terga I-IV silvery fasciate apically; femora varying from mostly red to all black. Male: gastral segments I and II red, remainder black.

RECOGNITION OF SUBSPECIES.—Following various papers by de Beaumont, Pulawski (1971) recognized six Palearctic subspecies of *panzeri* in addition to the nominotypical form, and characterized them by head shape, color, number of tergal fasciae, and vestiture. Also, the varieties described by Arnold (1923, 1924) and Guiglia, 1939 (see "Status of Afrotropical Forms") were treated as subspecies by Bohart and Menke (1976). I now believe that subspecies are untenable in *panzeri* for the following reasons. First, morphotypes that qualify for

two subspecies are sometimes intermixed within the same population (e.g., two color types in females from Sardinia and Corsica, see Pulawski, 1971:271). Second, in many cases variation reflects ecological but not geographic differences, e.g., populations separated by only an insignificant distance could be assigned to two subspecies. Third, the transition from one subspecies to another is clinal (as between *panzeri sareptanus* and *panzeri pulverosus*), and many populations are intermediate. Finally, recognition of formal subspecies leads to an unnecessary proliferation of names.

RELATIONSHIPS.—Species with a convex, protruding labrum and elongate mouthparts were placed in the *panzeri* group by de Beaumont, 1936a, and Pulawski, 1971. The *geniculatus* group of de Beaumont (1940) and Pulawski (1971) is similar but differs in several characters (such as unusually wide vertex, nonemarginate male forefemur) that appear to be derived in *Tachysphex*. Since the corresponding character states in the *panzeri* group are plesiomorphic within the genus (narrow vertex, emarginate male forefemur), this group is most likely paraphyletic with respect to the *geniculatus* group.

COLLECTING PERIOD.—January through July, September, October.

HABITAT.—Within Sri Lanka, *panzeri* is found in the three ecological zones from near sea level to 90 m with average annual rainfall of 860 to 2400 mm (Figure 153).

GEOGRAPHIC DISTRIBUTION.—Europe north to North and Baltic Seas between Holland and Poland (unknown from British Isles), North Africa (Canary Islands, Morocco, Algeria, Tunisia, Libya, Egypt, Sudan), Asia east to Kazakhstan and Sri Lanka, also Thailand. Records from Sub-Saharan Africa (see "Status of Afrotropical Forms") need verification.

RECORDS (only those from India, Pakistan, Sri Lanka, and Thailand).—INDIA: ANDRA PRADESH: Patancheru (1♂, BMNH). GUJARAT: Deesa (1♀, 1♂, BMNH). KARNATAKA: Bangalore (1♀, ♂, CAS; 2♂, ZMK), Nandy Hills (1♀, ITZA), 20 km N Yelburga (1♂, ZMK). MADHYA PRADESH: Jabalpur (1♂, BMNH). MAHARASHTRA: Varsoba near Bombay (1♂, MNCN, determined as *auriceps* by Giner Marí, 1945). PUNJAB: Firozpur (1♂, BMNH). RAJASTHAN: Jaisamand Wildlife Sanctuary, 45 km SSE Udaipur (2♀, 5♂, CAS), Mount Abu (4♂, CAS), Udaipur (3♂, CAS). TAMIL NADU: Coimbatore (1♂, CAS), Koyampattur (1♂, ITZA), Thanjavur (1♀, CAS; 2♀, 1♂, USNM).

PAKISTAN: BALUCHISTAN: Quetta (6♀, 6♂, BMNH). PUNJAB: Lal Suhandra National Park, 34 km E Bahawalpur (1♀, 2♂, CAS). SIND: Clifton Beach in Karachi (1♂, CAS), Haleji Lake, 34 km W Tatta (1♀, CAS), Malir River, 5 km ESE Karachi Airport (1♀, 4♂, CAS), Sandspit Beach near Karachi (1♂, CAS).

SRI LANKA: AMPARAI DISTRICT: Ekgal Aru (2♂, USNM), Ekgal Aru Reservoir Jungle (1♀, USNM, Biological Note 61276A), Lahugala Sanctuary (1♀, 4♂, USNM), Nochchiyagama (1♀, ITZA), Panama, Raddella Tank (3♂, USNM). ANURADHAPURA DISTRICT: Anuradhapura (1♂,

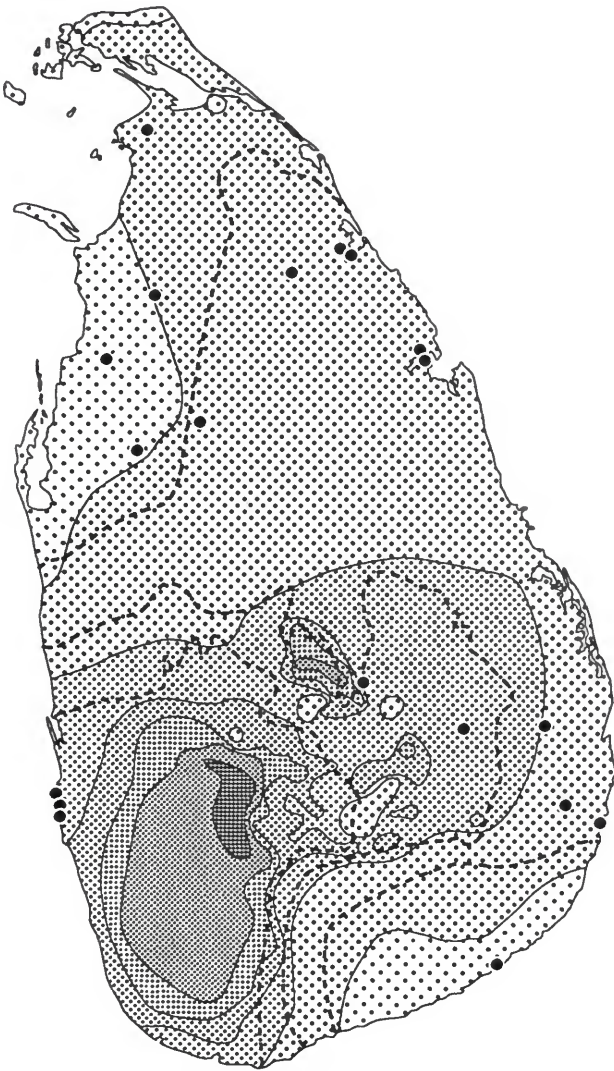


FIGURE 153.—Collecting localities of *Tachysphex panzeri* (Vander Linden), in Sri Lanka.

ITZA), Hunuwilagama (1♀, USNM), Padaviya (6♀, USNM), Wildlife Society Bungalow, Hunuwilagama in Wilpattu National Park (1♀, 1♂, USNM). COLOMBO DISTRICT: Colombo, Museum Garden (1♂, CAS; 1♀, 3♂, USNM; 2♀, USNM, Biological Notes 2875B and 2275B), Colombo, Zoo Farm (1♀, 3♂, USNM), Kohuwala, Nugegoda (1♂, USNM), Ratmalana airport (9♀, 26♂, USNM). HAMBANTOTA DISTRICT: Palatupana Tank (1♀, 10♂, USNM), Yala, Palatupana (3♀, 2♂, CAS; 5♂, USNM). JAFFNA DISTRICT: 10 mi (16 km) S Pooneryn (1♀, USNM). KANDY DISTRICT: Hasalaka (1♀, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park (2♀, USNM), Kokmotte Bungalow, 0.5 mi (0.8 km) NE Wilpattu National Park (4♂, USNM). MONARAGALA DISTRICT:

Nilgala (2♀, CNC). TRINCOMALEE DISTRICT: Amarivayal (1♂, USNM), China Bay (1♀, USNM), China Bay Ridge Bungalow (4♀, 5♂, USNM), Tennamaravadi (1♂, USNM), Trincomalee (Pulawski, 1975, lectotype of *Tachytes aurifrons*), 7 mi (11.2 km) W Trincomalee (1♂, USNM). VAVUNIYA DISTRICT: Parayanalankulam Irrigation Canal, 25 mi (40 km) NW Medawachchiya (1♀, USNM).

THAILAND: HUA HIN: Hua Hin, 135 air km SSW Bangkok (1♀, CAS).

20. *Tachysphex noar* Pulawski, new species

FIGURES 154, 155

NAME DERIVATION.—*Noar*, Greek for phantom, specter, a noun in apposition to the generic name.

DIAGNOSIS.—*Tachysphex noar* is one of the three Sri Lankan species in which the labrum is convex and protrudes beyond the clypeal free margin, and the mouthparts are elongate (as in Figures 147–151). The female is characterized by an all black clypeus (middle section yellow in Sri Lankan populations of *panzeri*), the clypeal lip sinuous or entire laterally (emarginate laterally in *diadelus*), and the propodeal side evenly microsculptured (side with ridges behind spiracle in *diadelus*). The male has a distinctive volsella that is somewhat similar to *panzeri* but with a well-defined dorsal process (Figure 154). The female is identical to that of *conclusus* (page 84), known from the Indian States of Gujarat and Rajasthan, and to many extralimital populations of *panzeri*, and similar to the closely related species (see *panzeri* for details, page 64).

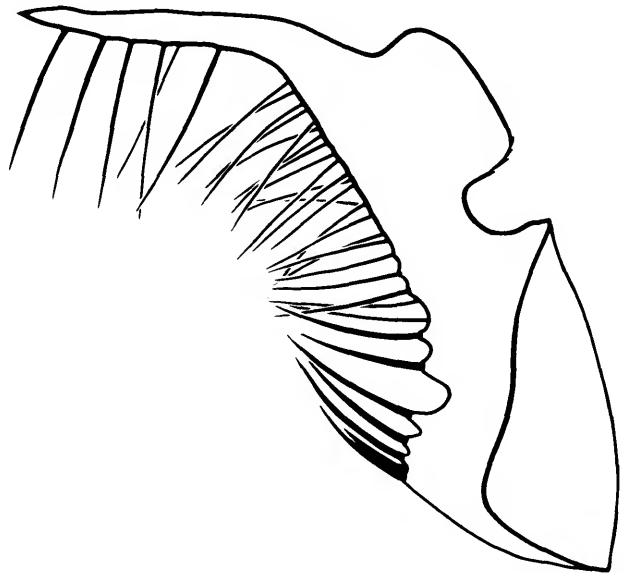


FIGURE 154.—*Tachysphex noar* Pulawski, new species: volsella.

DESCRIPTION.—Clypeal middle section conspicuously convex. Labrum convex, protruding beyond clypeal free margin; galea longer than wide, densely punctate at least posteriorly. Punctures minute, about one diameter apart or less on scutum and mesothoracic venter; mesopleuron dull, microsculptured, impunctate. Episternal sulcus effaced anteroventrally. Propodeal dorsum and side evenly microsculptured, side not ridged. Hindcoxal dorsum: inner margin ecarinate. Apical tarsomeres without spines on venter or lateral margins, with a few thin, erect setae on venter.

Setae appressed on frons, vertex, scutum, mesopleuron, and midfemoral venter; subappressed between mandibular base and occipital carina; most setae of propodeal dorsum inclined obliquely anterad, but lateral setae inclined obliquely posterad and joining apicomeresally. Mesopleural setae not concealing integument (integument easily visible).

Head, thorax, and legs black with the following exceptions: mandibles reddish (black apically), inner face of foretibia red, and apical tarsomeres brown. Gaster: see below. Wings hyaline with yellow tinge.

♀.—Clypeus: bevel as long as basomedian area or longer; lip arcuate, its free margin emarginate mesally, laterally sinuate or simple. Vertex width $0.8-0.9 \times$ length. Dorsal length of flagellomere I $2.6-2.7 \times$ apical width. Foretibia densely, uniformly punctate and setose throughout, outer surface with one spine near midlength and one subbasal. Forebasitarsus with seven or eight rake spines. Tergum V uniformly micropunctate throughout (including apical depression). Pygidial plate shallowly punctate, interspaces microsculptured. Length 9.8–12.8 mm.

Gaster red basally and apically, but black preapically; black are terga IV and V and sterna III and IV (all or largely). Terga I-IV silvery fasciate apically (fascia of tergum IV interrupted).

♂.—Clypeus: bevel slightly shorter than basomedian area, delimited laterally by oblique carina that emerges from lip corner; lip arcuate, at most shallowly emarginate mesally, angulate laterally; distance between corners $0.9 \times$ distance between corner and orbit. Vertex width $0.9-1.0 \times$ length. Dorsal length of flagellomere I $1.8-2.0 \times$ apical width. Forefemoral notch setose (setae appressed). Outer margin of forebasitarsus with four or five preapical spines, apical spine about twice as long as basitarsus width; apical spine of foretarsomere II longer than tarsomere III. Sterna densely, evenly punctate, densely setose. Volsella: Figure 154. Length 7.5–10.0 mm.

Gaster red basally, black apically (red are terga I and II or I-III, and sternum I or sterna I and II). Frontal setae golden, at least near midocellus. Terga I-IV or I-V silvery fasciate apically.

COLLECTING PERIOD.—16–26 January, 6–21 February, 10–25 March, October (India).

HABITAT.—This species occurs mostly in the Dry Zone from sea level to 100 m and an average annual rainfall of 1000–1200

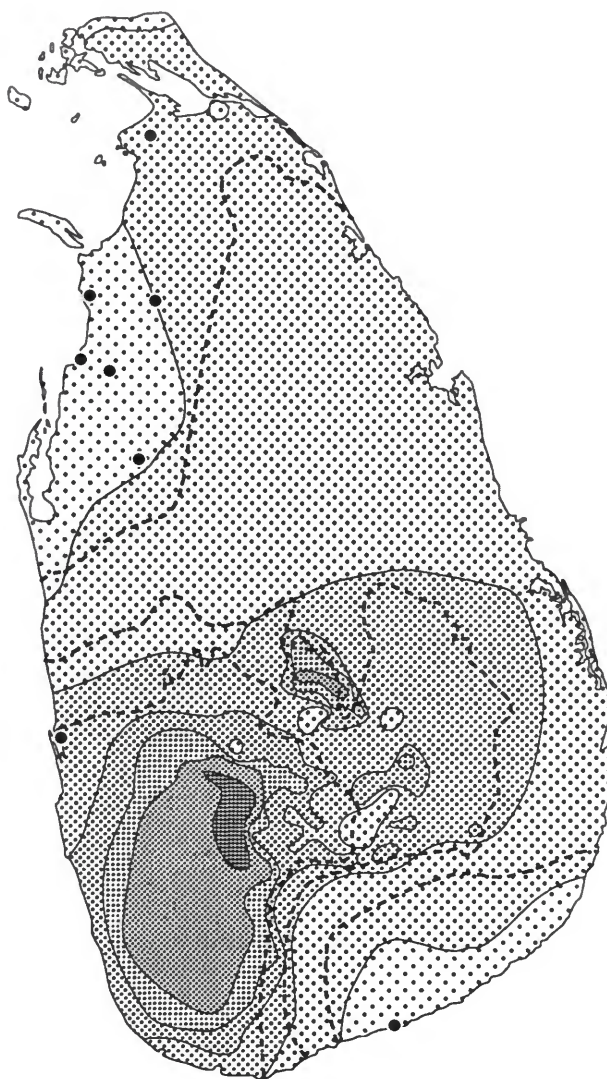


FIGURE 155.—Collecting localities of *Tachysphex noar* Pulawski, new species, in Sri Lanka.

mm (Figure 155). There is, however, one record from the Wet Zone on sandy soil near sea level with an average annual rainfall of 1960 mm.

GEOGRAPHIC DISTRIBUTION.—Central India to Sri Lanka.

MATERIAL EXAMINED.—*Holotype*: ♂, Sri Lanka: Mannar District: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park, 22–23 Jan 1977, KVK, PF, DWB, VG (USNM).

Paratypes: INDIA: "Central India: Arula, 2000 ft." P.S. Nathan (1♀, OSU).

SRI LANKA: ANURADHAPURA DISTRICT: Hunuwilagama in Wilpattu National Park, Wildlife Society Bungalow, D. Davis and W. Rowe (1♂, USNM). COLOMBO DISTRICT: Katunayaka, near airport, KVK, PF, DWB, VG (1♀, USNM). HAMBANTOTA

DISTRICT: Hambantota, T.B.F. collector (2♂, BMNH). JAFFNA DISTRICT: 10 mi (16 km) S Pooneryn, KVK, PF, DWB, VG (1♀, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park, KVK, PF, DWB, VG (1♀, 4♂, CAS; 1♀, 4♂, USNM), KVK, TW, SS, TG (1♂, USNM); Kondachchi, PBK, TW, MJ, GR (1♀, CAS); Kondachchi, Silavathurai, PBK, TW, MJ, GR (1♂, USNM); Marichchukkaddi, PBK, TW, MJ, GR (1♀, CAS; 2♀, USNM); Ma Villu, Cashew Corporation, KVK, TW, SS, TG (2♀, USNM). VAVUNIYA DISTRICT: Parayanalankulam Irrigation Canal, 25 mi (40 km) NW Medawachchiya, D. Davis and W. Rowe (1♂, USNM).

21. *Tachysphex diadelus* Pulawski, new species

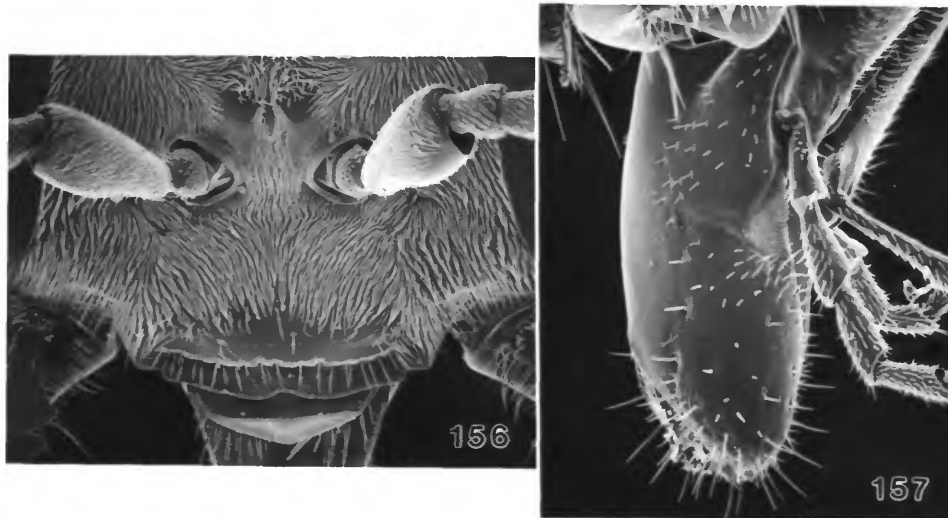
FIGURES 156–159

NAME DERIVATION.—*Diadelus*, from the Greek word *diadelos*, distinguishable, distinctive.

DIAGNOSIS.—Like *panzeri*, *noar*, and many extralimital species, *diadelus* has a convex labrum, elongate mouthparts (Figures 147–151), a narrow vertex (width less than length), and a basally emarginate male forefemur. Within this lineage, the female of *diadelus* can be recognized by the combination of a laterally incised (rather than sinuate) clypeal lip, the propodeal side ridged behind the spiracle, terga I–IV silvery fasciate apically, and the apical depression of tergum V punctate and setose throughout. These characteristics are shared with *mocsaryi* Kohl (Morocco to Libya, Spain, southeastern Europe, Kazakhstan, Uzbekistan, Tajikistan, Turkey to Jordan to Afghanistan). The only difference is that the galea is sparsely punctate in *diadelus* (Figure 157) but densely punctate (except anteriorly) in *mocsaryi*.

Within the same lineage, the male is characterized by a well-developed foretarsal rake (apical spine of tarsomere II longer than tarsomere III), terga I–IV silvery fasciate apically, and a narrow (at least basally) dorsal process of the volsella (Figure 158). The presence, in some specimens, of fine ridges behind the propodeal spiracle is a subsidiary diagnostic character. Several species are similar, but *diadelus* has the following: galea sparsely punctate (Figure 157), whereas densely punctate except anteriorly in *mocsaryi*; setae straight (many setae conspicuously sinuous in *micans* (Radoszkowski), North Africa, Transcaspia, Iran); mesopleural setae not concealing integument (largely concealing in *rubicundus* Pulawski, Transcaspia); marginal cell densely setose, as in most other species (sparsely setose, particularly posteriorly, in *rubicundus*); bottom of forefemoral notch with appressed setae (setae erect in *mocsaryi*; notch glabrous or with rudimentary setae, thus contrasting with adjacent integument, in *palopterus* (Dahlbom), North Africa, Israel, Arabian Peninsula). Furthermore, the dorsal volsellar process is markedly broader in many *palopterus*. I have found only minimal differences between *diadelus* and *ptah* Pulawski (Egypt, Israel, Aden) and they are difficult to describe or to quantify. In *diadelus*, the galea is slightly shorter, the clypeal free margin slightly more concave between the lobe and orbit, the gena slightly thicker in dorsal view, the mesopleural setae are less dense, not concealing the integument (partly concealing in *ptah*), and the bottom of the forefemoral notch is broader.

DESCRIPTION.—Clypeal middle section conspicuously convex. Labrum convex, protruding beyond clypeal free margin; galea longer than wide, sparsely punctate (Figure 157). Punctures minute, about one diameter apart or less on scutum and mesothoracic venter; mesopleuron dull, microsculptured, impunctate. Episternal sulcus effaced anteroventrally. Propo-



FIGURES 156, 157.—*Tachysphex diadelus* Pulawski, new species, female: 156, clypeus; 157, galea.

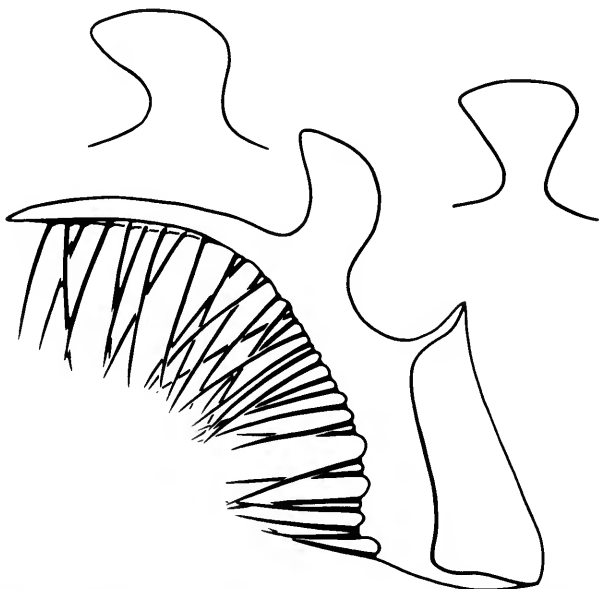


FIGURE 158.—*Tachysphex diadelus* Pulawski, new species: volsella, with outlines showing individual variation.

deal dorsum and side evenly microsculptured, side finely ridged along dorsal margin in female, without ridges or with evanescent ridges behind spiracle in male. Hindcoxal dorsum: inner margin ecarinate. Apical tarsomeres without spines on venter or lateral margins, with a few thin, erect setae on venter.

Setae appressed on frons, vertex, scutum, mesopleuron, and midfemoral venter; subappressed between mandibular base and occipital carina; most setae of propodeal dorsum inclined obliquely anterad, but lateral setae inclined obliquely posterad and joining apicomesally. Mesopleural setae not concealing integument (integument easily visible).

Head and thorax black, mandible reddish mesally. Gastral segments I and II red, remainder black (only segment I red in smallest specimen). Female legs black except foretibia reddish on inner surface. Male legs variable: black except foretibia reddish on outer surface and foretarsus reddish in darkest specimens; in lightest, the following are red: fore- and midfemoral apex, fore- and midtibia, fore- and midtarsus, and hindtarsal apex. Terga I–IV or I–V silvery fasciate apically. Wings yellowish.

♀.—Clypeus (Figure 156): bevel as long as basomedian area or longer; lip arcuate, emarginate mesally, with angulate lateral incision. Vertex width $0.6\text{--}0.7 \times$ length. Dorsal length of flagellomere I $2.4\text{--}2.6 \times$ apical width. Foretibia densely, uniformly punctate and setose throughout, outer surface with one spine or thin seta near midlength (and also with apical spines). Forebasitarsus with seven to nine rake spines. Tergum V uniformly micropunctate throughout (including apical depression). Pygidial plate shallowly punctate, interspaces microsculptured to unsculptured. Length $9.0\text{--}9.8$ mm.

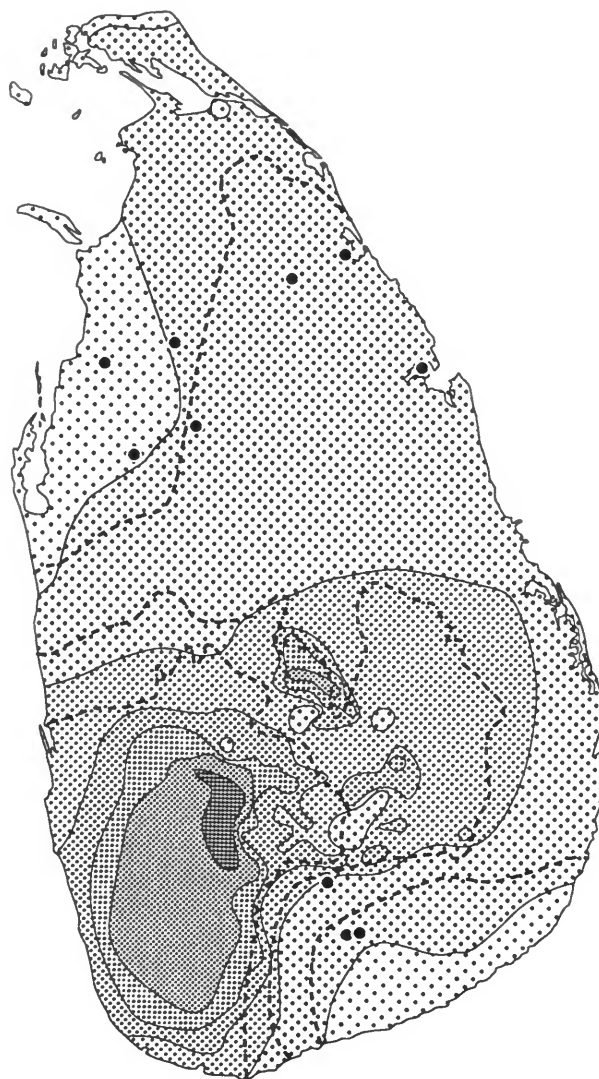


FIGURE 159.—Collecting localities of *Tachysphex diadelus* Pulawski, new species, in Sri Lanka.

♂.—Clypeus: bevel slightly shorter than basomedian area, delimited laterally by oblique carina that emerges from lip corner; lip arcuate, shallowly emarginate mesally (emargination vestigial in some specimens), angulate laterally; distance between corners $0.8 \times$ distance between corner and orbit. Vertex width $0.5\text{--}0.7 \times$ length. Dorsal length of flagellomere I $1.6\text{--}1.9 \times$ apical width. Forefemoral notch setose (setae appressed). Outer margin of forebasitarsus with three to five preapical spines, apical spine about twice as long as basitarsus width; apical spine of foretarsomere II longer than tarsomere III. Sterna densely, evenly punctate, densely setose. Volsella: Figure 158. Length $6.5\text{--}10.5$ mm.

Frontal setae golden, but silvery (with golden tinge near midocellus) in the smallest specimen.

COLLECTING PERIOD.—27–31 Jan, 13–22 and 27–28 Mar, 18–26 May, 15 Apr, 15–16 June.

HABITAT.—This species occurs primarily in the Dry Zone, but was collected also in the Intermediate Zone (Figure 159). It occurs from sea level to 100 m, in areas where the average annual rainfall ranges from 1200 to 2500 mm.

GEOGRAPHIC DISTRIBUTION.—Sri Lanka.

MATERIAL EXAMINED.—*Holotype*: ♂, Sri Lanka, Monaragala District: Angunakolapelessa, 27–28 Mar 1981, KVK, TW, LW (USNM).

Paratypes: SRI LANKA: ANURADHAPURA DISTRICT: Anuradhapura, R.T. Simon Thomas (ITZA); Hunuwilagama, KVK, PBK, SK, DWB (1♂, CAS; 2♂, USNM); Hunuwilagama, Wildlife Society Bungalow, D. Davis and W. Rowe (1♀, 2♂, CAS; 1♀, 2♂, USNM); Padaviya, KVK, PBK, SK, DWB (1♂, USNM), PBK, SK, DWB (1♀, 3♂, USNM); Padaviya, Archaeological site, KVK, PBK, SK, DWB (1♂, CAS; 1♂, USNM); Padaviya, Irrigation Bungalow, KVK, PBK, SK, DWB (1♂, CAS; 1♂, USNM); Padaviya Tank, KVK, PBK, SK, DWB (4♂, CAS; 1♀, 3♂, USNM). MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte Bungalow in Wilpattu National

Park, KVK, PBK, SK, DWB (1♂, USNM). MONARAGALA DISTRICT: Angunakolapelessa, KVK, TW, LW (3♂, USNM); Mau Aru, 10 mi (16 km) E Udawalawa, KVK, PBK, TW, MJ (1♂, USNM). RATNAPURA DISTRICT: Uggalkaltota, KVK, PBK, TW, LJ, NK (2♂, USNM). TRINCOMALEE DISTRICT: China Bay, KVK, PF, DWB, VG (1♂, USNM); Tennamara-vadi, KVK, PBS, SK, DWB (2♂, CAS; 2♂, USNM). VAVUNIYA DISTRICT: Cheddikulam, Malwatu Oya, D.H. Messersmith, G.L. Williams, PBK (1♂, USNM).

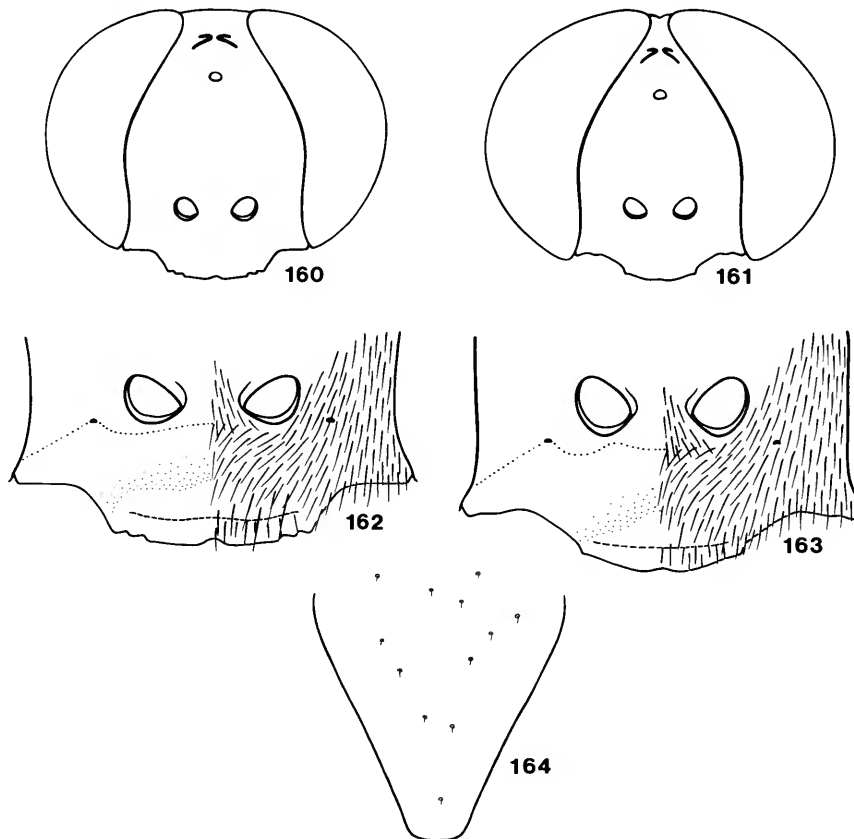
22. *Tachysphex selectus* Nurse

FIGURES 160–167

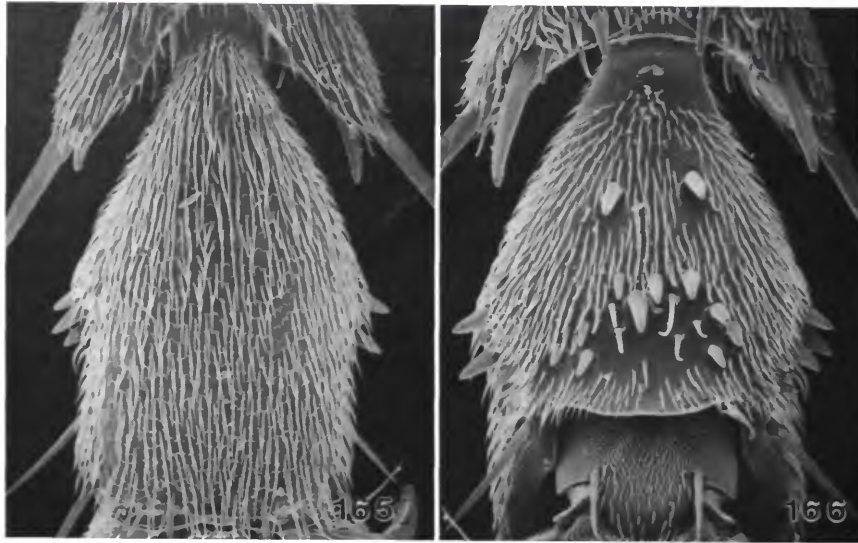
Tachysphex selectus Nurse, 1909:514, ♂. [Holotype: ♂, India: Bombay (BMNH)].—R. Turner, 1917b:198 [as synonym of *Tachysphex sericeus* (F. Smith)].—Bohart and Menke, 1976:276 [listed].

Tachysphex actaeon de Beaumont, 1960a:16, ♀, ♂. [Holotype: ♂, Israel: Jerusalem (LAUSANNE)]. Synonymized with *Tachysphex selectus* by Pulawski, 1975:313.].—Pulawski, 1967:398 [Turkey], 1971:412 [revision].—de Beaumont, Bytinski-Salz, and Pulawski, 1973:13 [Israel].

DIAGNOSIS.—*Tachysphex selectus* resembles the African



FIGURES 160–164.—*Tachysphex selectus* Nurse: 160, female head frontally; 161, male head frontally; 162, female clypeus; 163, male clypeus; 164, female pygidial plate.



FIGURES 165, 166.—*Tachysphex selectus* Nurse: 165, female apical hindtarsomere dorsally; 166, same, ventrally.

species *maidli* and *sericeus* in having hindwing vein cu-a at least slightly inclined (anterior end closer to wing base than posterior end, see Figure 234); sternum I posteriorly with longitudinal, obtuse carina (as in Figure 236); setae sinuous along hypostomal carina, on mesopleuron anteriorly, and on propodeum; apical depressions of male sterna III–V with erect or suberect setae that are longer than on remaining surface; and black gaster combined with red tibiae (all or partly). Unlike these species, the setal length in *selectus* is no more than one midocellar diameter on the vertex, interocellar area, and midfemoral venter. In the other two, the setae are longer than midocellar diameter on the vertex and also (except some males of *sericeus*) on the interocellar area and midfemoral venter. Furthermore, the male forefemoral notch is markedly deeper in *selectus* than in *maidli*, and not compressed laterally (compressed to form a longitudinal crest in *sericeus*).

DESCRIPTION.—Scutal punctures up to several diameters apart, interspaces microsculptured and dull to smooth and shiny. Mesopleuron dull; propodeal side ridged but ridges evanescent or absent in small individuals. Episternal sulcus incomplete. Hindwing (as in Figure 234): crossvein cu-a inclined, but only slightly so in some specimens; jugal lobe enlarged, jugal excision absent. Hindcoxal dorsum: inner margin not carinate or carinate only basally.

Setae appressed on interocellar area and scape; erect, about one midocellar diameter long on vertex; sinuous, about $0.4 \times$ basal mandibular width; not obscuring thoracic integument; sinuous, 1.5 (female) to 2.0 (male) midocellar diameters on mesopleuron beneath pronotal lobe; on propodeal dorsum erect or inclined posterad, sinuous to nearly straight, about $0.4 \times$ basal mandibular width; forecoxal setae sinuous in most

specimens but straight in single male from Jabalpur.

Head, thorax and gaster black, mandible reddish mesally. Terga I–IV fasciate apically (I–III in some males).

♀.—Labrum emarginate mesally. Clypeus (Figures 160, 162): bevel shorter than basomedian area; free margin of lip variable, entire in some specimens, but shallowly notched mesally and with two lateral incisions on each side in others. Vertex width $1.1 \times$ length. Dorsal length of flagellomere I $2.1\text{--}2.2 \times$ apical width. Outer surface of foretibia with thin spines. Forebasitarsus with nine or ten rake spines divided into a basal and an apical group. Length of hindtarsomere IV about $1.1 \times$ apical width, apical emargination acute. Apical tarsomeres (Figures 165, 166): lateral margins with one to three spines at midlength, venter with two basal and subapical spines. Pygidial plate not constricted preapically (Figure 164). Length 8.5–12.0 mm.

Forefemur black, midfemur largely red (black basally), hindfemur red except narrowly black basally. Tibiae and tarsi red.

♂.—Clypeus (Figures 161, 163): free margin of lobe arcuate, angulate laterally; distance between corners $1.2\text{--}1.3 \times$ distance between corner and orbit. Vertex width $0.3\text{--}0.4 \times$ length. Dorsal length of flagellomere I $1.7\text{--}2.0 \times$ apical width. Forefemoral venter, between base and notch, with setae whose length is about $0.25 \times$ midocellar diameter; notch not compressed, basally with a group of setae that are about $0.3 \times$ midocellar diameter. Outer margin of forebasitarsus without preapical rake spines. Apical tarsomere with one preapical spine on venter. Apical depressions of sterna III–VI with suberect setae that are not agglutinated except on sternum III apicomeres; setae markedly longer than those on remaining

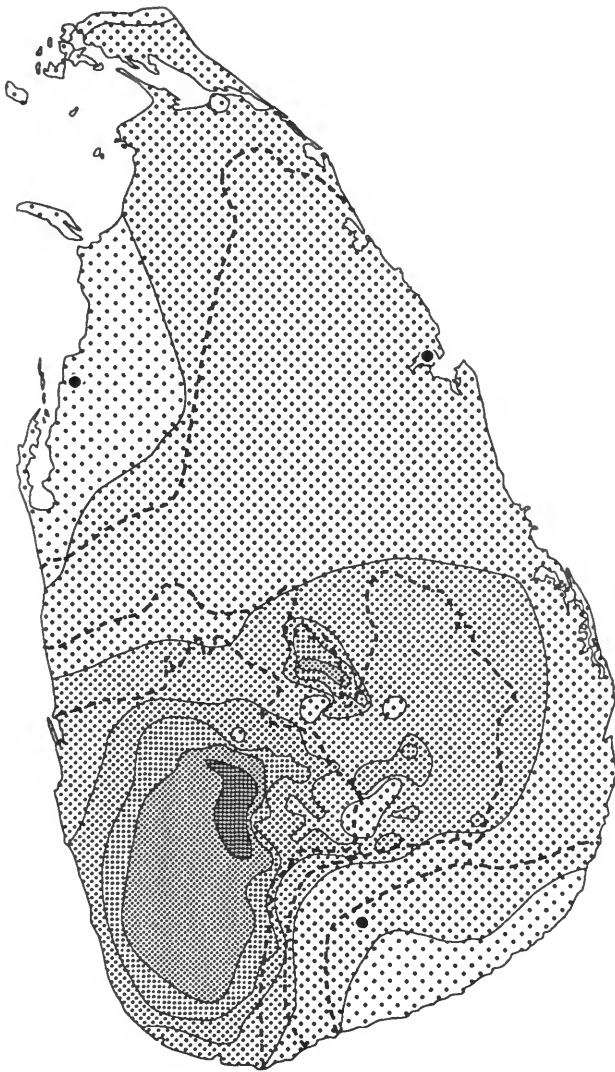


FIGURE 167.—Collecting localities of *Tachysphex selectus* Nurse in Sri Lanka.

surface. Volsella as in *erythropus* (see Figure 235). Length 8.0–11.0 mm.

Femora black, tibiae all red or black dorsally and reddish ventrally. Tarsi red to dark brown.

RELATIONSHIPS.—*Tachysphex selectus* is a member of a monophyletic lineage, the *fluctuatus* group of de Beaumont, 1936a (renamed *erythropus* group by Pulawski, 1971). Most species of the lineage are characterized by the following unique combination of apomorphic structures: propodeal hindface intersecting dorsum at about right angle; hindwing vein cu-a inclined (anterior end closer to wing base than posterior end); sternum I posteriorly with longitudinal, obtuse carina; and apical depressions of male sterna III–V with setae (suberect to subappressed) that are markedly longer than setae on remaining

surface. However, some Sri Lankan *selectus* have an almost vertical vein cu-a. Nine species are included: *costae* (De-stefani), *erythropus* (Spinola), *grandissimus* Gussakovskij, *maidli* de Beaumont, *osiris* de Beaumont, *schoenlandi* Cameron, *selectus* Nurse, *sericeus* F. Smith, and *sordidus* (Dahlborn). Mantids, either immatures or small adults, are collected as prey. Ranges include Africa and the Mediterranean Basin, western Asia to Transcaspia, India, and Sri Lanka.

COLLECTING PERIOD.—12 May through 11 October.

HABITAT.—In Sri Lanka, this species was found in three localities at low altitudes in the Dry Zone where the average annual rainfall ranges from 1100 to 1700 mm (Figure 167).

GEOGRAPHIC DISTRIBUTION.—Turkey, Cyprus, Israel, Lebanon, Pakistan, India, Sri Lanka.

RECORDS (localities in Pulawski, 1971, under *actaeon*, are not repeated here).—**INDIA:** MADHYA PRADESH: Jabalpur (1♂, BMNH). MAHARASHTRA: Bombay (holotype of *selectus*). TAMIL NADU: Coimbatore (3♂, CAS; 1♀, USNM), Karikal (1♂, CAS), Dohnavur in Tirunelveli (= Tinnevelley) District (1♀, BMNH), Karikal (1♂, CAS).

PAKISTAN: Hazarganji Chiltan National Park, 20 km SW Quetta (1♂, CAS).

SRI LANKA: MONARAGALA DISTRICT: Mau Ara, 10 mi (16 km) E Uda Walawe (1♂, USNM). PUTTALAM DISTRICT: Kali Villu in Wilpattu National Park (1♂, USNM). TRINCOMALEE DISTRICT: Trincomalee, China Bay (2♂, USNM), China Bay Ridge Bungalow (5♀, 20♂, USNM; 1♀, 1♂, CAS).

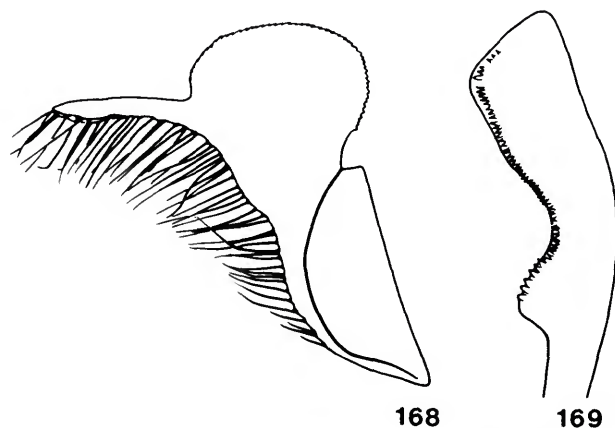
23. *Tachysphex indicus* Pulawski, new species

FIGURES 168–170

NAME DERIVATION.—*Indicus* is a Latin adjective derived from India, the country where the holotype was collected.

DIAGNOSIS.—Among Sri Lankan *Tachysphex*, *indicus* is unique in having the forebasitarsus somewhat expanded apically on the outer margin (as in Figures 255, 256), the pygidial plate of the female densely, uniformly microsculptured and broadly rounded apically (as in Figure 257), and male sterna IV–VI largely glabrous. Additional recognition features are: hindwing crossvein cu-a inclined (as in Figure 234), mesopleuron impunctate, sternum I not carinate, and male foretarsus with well-developed rake. *Tachysphex albocinctus* (Lucas), ranging from South Africa to India, is similar, but in *indicus* the tergal setae are short and appressed (setal length less than one midocellar diameter). In *albocinctus* the base of tergum I is covered with long, suberect setae (setal length about 0.5 × basal mandibular width). The light brown subcostal vein of *indicus*, not contrasting with other veins, is also distinctive.

DESCRIPTION.—Vertex punctures shallow, at least some punctures more than one diameter apart. Scutum dull, with well-defined punctures that are less than one diameter apart. Mesopleuron finely, irregularly rugose. Episternal sulcus incomplete. Propodeal dorsum irregularly microrugose; side



FIGURES 168, 169.—*Tachysphex indicus* Pulawski, new species: 168, volsella; 169, penis valve (inner side).

irregularly rugose except evenly microsculptured anteriorly; hindface intersecting dorsum at about right angle. Jugal lobe of hindwing broadened, jugal excision absent, crossvein cu-a inclined, media diverging beyond cu-a by a distance shorter than cu-a. Forebasitarsus slightly expanded apically on outer margin (more so in female than in male). Hindcoxal dorsum: inner margin not carinate or carinate only basally. Apical tarsomeres without spines on venter or lateral margins, venter with a few erect setae. Gastral sternum I without longitudinal carina, shallowly depressed apically.

Setae sinuous on vertex, gena, on scutum anteriorly, mesopleuron, and propodeum (including hindface); erect on scape apicoexternally and on midfemoral venter apically; bent toward gaster on scutum except erect anteriorly; slightly inclined anterad on propodeal dorsum except strongly inclined posterad on side of dorsum; short, appressed on gastral tergum I (no longer than one midocellar diameter); setal length (expressed as fraction of basal mandibular width): 0.6–0.7 along hypostomal carina, 0.5 on vertex (0.3 in some females).

Body black. Gastral terga I–IV silvery fasciate apically. Wings hyaline, yellowish basally, all veins light brown (including subcostal vein).

♀.—Labrum not emarginate. Clypeus as average in *albocinctus* (see Figures 249, 251): bevel convex, shorter than basomedian area; lip evenly arcuate, with two incisions on each side. Length of flagellomere I 2.4–2.6 × apical width. Vertex width 0.8–1.0 × length. Outer surface of foretibia with spines; outer margin of forebasitarsus straight. Length of hindtarsomere IV about equal to apical width, apical emargination acute. Pygidial plate broad, densely, uniformly micropunctate, and with large, sparse punctures (as in Figure 257). Length 9.5–10.5 mm.

Mesopleural setae concealing integument from most angles.

♂.—Clypeus: bevel weakly convex, about one third length of basomedian area; lip arcuate, corners obtuse, not prominent;

corners closer to orbit than to each other. Length of flagellomere I 1.9–2.0 × apical width. Vertex width 0.7–0.9 × length. Forefemoral notch shallow, covered with erect microsetae. Outer margin of forebasitarsus with seven rake spines, apical spine of tarsomeres I–III longer than following article. Punctures of tergum VII averaging more than one diameter apart (except apically and laterally). Sterna IV–VI largely glabrous. Volsella: Figure 168. Penis valve: Figure 169. Length 9.5–10.5 mm.

Mesopleural setae not concealing integument.

RELATIONSHIPS.—*Tachysphex indicus* belongs to a monophyletic lineage, the *albocinctus* group of de Beaumont (1940) and of Pulawski (1971, 1974a, 1977). The group has a unique

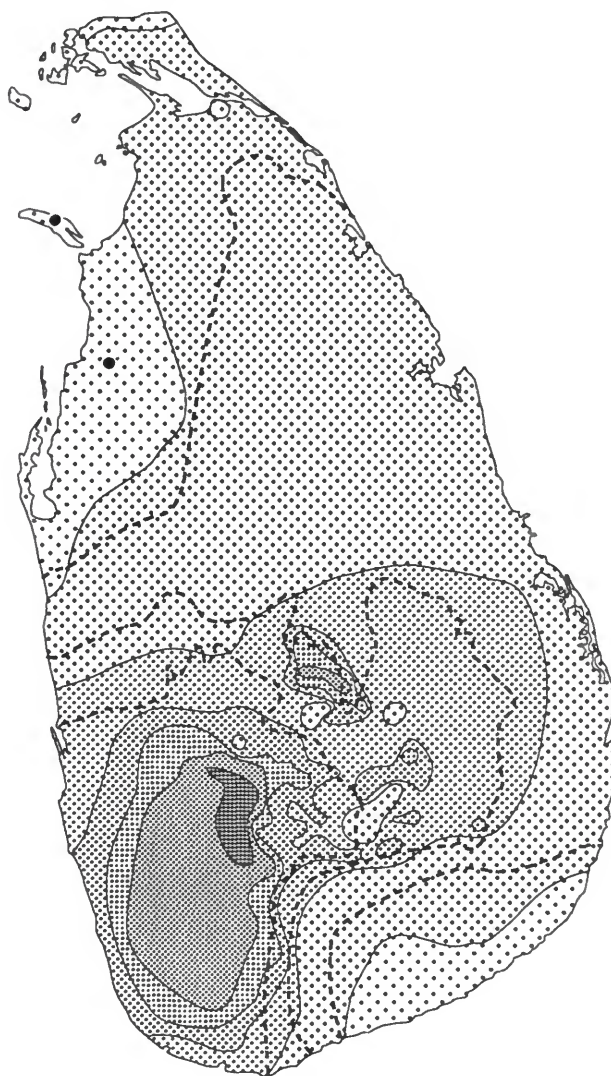


FIGURE 170.—Collecting localities of *Tachysphex indicus* Pulawski, new species, in Sri Lanka.

combination of apomorphic structures: forebasitarsus expanded apically on outer margin (more so in female than in male); propodeal hindface intersecting dorsum at about right angle, not sloping obliquely; and male sterna IV-VI all or largely glabrous; the presence of a conspicuous foretarsal rake in the male is an additional recognition feature. Eleven species are included: *aborigenus* Pulawski, *albocinctus* (Lucas), *brasilianus* Pulawski, *indicus* Pulawski, new species, *laticauda* Gussakovskij, *maculipennis* Pulawski, *multifasciatus* Pulawski, *nubilipennis* de Beaumont, *pilosulus* R. Turner, *remotus* Pulawski, and *tenuisculptus* Pulawski. Both immature and adult mantids are collected as prey. Representatives of the group are found in Africa, Iberian Peninsula, Crete Island, western Asia to Transcaspia, India, Sri Lanka, Australia, and South America north of the equator.

COLLECTING PERIOD.—20 Jan through 15 Feb (Sri Lanka), 8 Mar and May (India).

HABITAT.—Within Sri Lanka, this species has been collected at two localities in the Dry Zone from sea level to an altitude of 30 m and with average annual rainfall of 950 to 1200 mm (Figure 170).

GEOGRAPHIC DISTRIBUTION.—Southern India, Sri Lanka.

RECORDS.—*Holotype*: ♀, India, Tamil Nadu: Coimbatore, 8 Mar 1962, E.S. Ross and D.Q. Cavagnaro (CAS).

Paratypes: INDIA: KERALA: Walayar Forest in former Malabar District, July 1957, ex coll. D.G. Shapirio (1♀, USNM). TAMIL NADU: Coimbatore, May, P.S. Nathan (1♀, BISH).

SRI LANKA: MANNAR DISTRICT: 0.5 mi (0.8 km) NE Kokmotte in Wilpattu National Park, 22-23 Jan 1977, KVK, PF, DWB, VG (1♀, USNM), 15-16 Feb 1979, KVK, TW, SS,

TG (1♀, 1♂, CAS; 2♀, USNM), Pesalai Beach, PBK, TW, MJ, GR (1♂, USNM).

Appendix: Selected Oriental Species

This section deals with 17 species currently unknown from Sri Lanka but recorded or recently found in India (excluding the Himalayas), Burma and Thailand. Some of them may be discovered subsequently in Sri Lanka. They probably represent a small fraction of the actual fauna, as suggested by isolated specimens in various collections that cannot be determined to species. Those specimens are not described here because they are poorly preserved or the series are insufficient.

24. *Tachysphex erythrophorus* Dalla Torre

FIGURES 171-174

Tachysphex erythrogaster Cameron, 1889:143, ♀. [Holotype: ♀, India: Maharashtra: Pune (OXFORD), examined.].—Nec *Tachysphex erythrogaster* [A. Costa, 1882].—Nurse, 1909:14 [description of ♂].

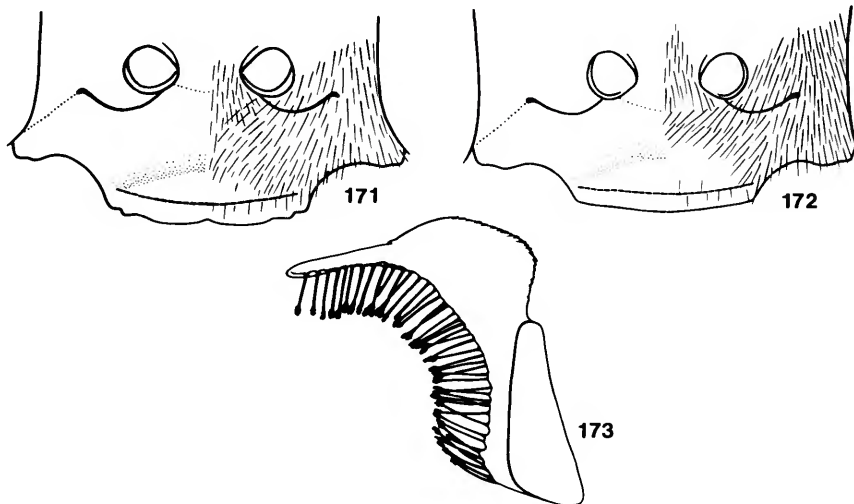
Tachysphex erythrophorus Dalla Torre, 1897:679 [new name for *Tachysphex erythrogaster* Cameron, 1889].—Pulawski, 1975:310 [synonymy, diagnostic characters].—Bohart and Menke, 1976:273 [listed].

Tachysphex latissimus R. Turner, 1917b:199, ♀, ♂. [Lectotype: ♀, India: Bihar: Pusa (BMNH), designated by Pulawski, 1975:310, examined. Synonymized with *Tachysphex erythrophorus* by Pulawski, 1975:310.]

Tachysphex No. 18.—de Beaumont, 1940b:178 [Egypt; part, other specimens = *Tachysphex gujaraticus*]. [Corrected to *Tachysphex pectoralis* by Pulawski, 1971:126.]

Tachysphex argentatus.—Gussakovskij, 1952:242 [♀ only, corrected to *Tachysphex pectoralis* by Pulawski, 1971:126].

Tachysphex pectoralis Pulawski, 1964:101, ♀, ♂. [Holotype: ♀, Egypt: Abu Rawash NW Cairo (CAS), examined. Synonymized with *Tachysphex erythrophorus* by Pulawski, 1975:310.]; 1971:126 [revision, bibliography].



FIGURES 171-173.—*Tachysphex erythrophorus* Dalla Torre: 171, female clypeus; 172, male clypeus; 173, volsella.

DIAGNOSIS.—*Tachysphex erythrophorus* is similar to *gujaraticus*. See that species (page 20) for recognition features.

DESCRIPTION.—Gena unusually narrow as seen from above. Scutal punctures averaging less than one diameter apart. Mesopleuron dull, granulose. Episternal sulcus incomplete. Mesothoracic venter characteristic (Figure 174); anterior (oblique) part longer than posterior (horizontal) part. Propodeal dorsum microsculptured; side microsculptured, with vestigial ridges in some specimens. Hindcoxal dorsum: inner margin not carinate, not expanded basally.

Setae (figures in parentheses refer to setal length expressed as fractions of basal mandibular width): sinuous or curved on gena and thorax; suberect adjacent to hypostomal carina; appressed on vertex and scutal disk (0.2–0.3); totally concealing mesopleural integument in fresh specimens (Figure 174); oriented posterad on propodeal dorsum (0.5–0.6); appressed or nearly so on midfemoral venter.

Head black, but the following are reddish: mandible (except apical third), clypeal lip, clypeal bevel (all black in some males), and scapal venter. Pronotal lobe yellowish. Gaster red or (some males) apical segments brown. Terga silvery fasciate apically (I–IV in female, I–V or I–VI in male). Wings hyaline.

♀.—Clypeus (Figure 171): bevel shorter than basomedian area; lip arcuate in some specimens, in others shallowly incised laterally or with rudimentary median notch. Vertex width $1.4\text{--}1.7 \times$ length. Dorsal length of flagellomere I $2.2\text{--}2.7 \times$ apical width. Forefemoral venter microsculptured. Outer surface of foretibia with two spines, punctures in apical half sparser than on remaining surface. Tarsi of *pompiliformis* type. Forebasitarsus with seven to nine rake spines. Venter of apical tarsomeres with several thin, erect setae. Tergum V sparsely punctate (with only a few punctures in many specimens), apical depression impunctate. Pygidial plate smooth, shiny, with fine, scattered punctures. Length 7.0–10.5 mm.

Thorax in many specimens all or partly red. Legs all red or forecoxa black.

♂.—Clypeus (Figure 172): bevel shorter than basomedian area; lip arcuate or sinuate; distance between corners $1.1\text{--}1.3 \times$ distance between corner and orbit. Vertex width $1.6\text{--}2.1 \times$ length. Dorsal length of flagellomere I $1.5\text{--}2.1 \times$ apical width. Forefemoral notch with acetose bottom. Outer margin of forebasitarsus with three to six preapical spines, apical spine of tarsomere II markedly longer than tarsomere III. Apical tarsomeres with no spines on venter or lateral margins. Sterna densely, evenly punctate and setose. Hindmargin of sternum VIII varying from almost evenly emarginate to tridentate (as in West African males), but mostly convex mesally. Volsella: Figure 173. Length 5.5–8.5 mm.

Thorax black, but mesothorax apicoventrally and metasternum red in many specimens. Frontal setae silvery. Legs all red or fore- and midfemora black.

GEOGRAPHIC DISTRIBUTION.—Mali and Togo to Egypt, Tajikistan, Turkmenistan, Pakistan, and India.

RECORDS (localities given in Pulawski, 1971, are not

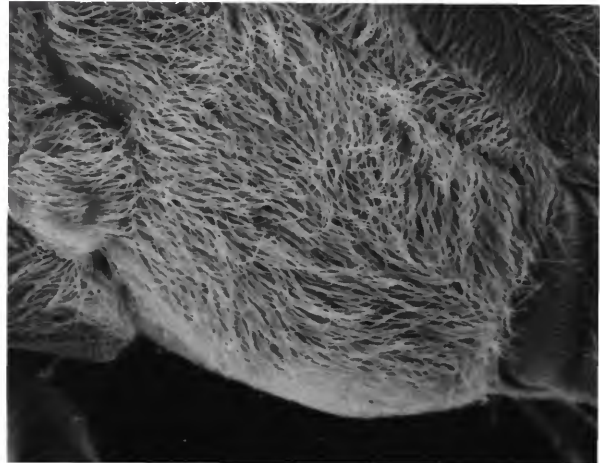


FIGURE 174.—*Tachysphex erythrophorus* Dalla Torre: female mesothorax in lateral view.

repeated).—INDIA: BIHAR: Pusa (1♀, BMNH, lectotype of *latissimus*). GUJARAT: Deesa (5♀, 2♂, BMNH). MAHARASHTRA: Pune (1♀, OXFORD, holotype of *erythrophorus*).

MALI: Gao (1♀, BMNH).

PAKISTAN: BALUCHISTAN: Quetta (1♀, CAS). Punjab: BAHAWALPUR (3♀, 2♂, CAS), Lal Suhandra National Park, 34 km E Bahawalpur (1♀, CAS), Muzaffar Garh, 35 km SW Multan (1♂, CAS), Rawalpindi (5♀, 1♂, CAS). SIND: Kirthar National Park, 150 km NE Karachi, $25^{\circ}10'\text{--}26^{\circ}05'\text{N}$, $67^{\circ}10'\text{--}67^{\circ}55'\text{E}$ (3♀, 2♂, CAS), Malir River bed, 5 km ESE Karachi International Airport (12♂, CAS).

TOGO: 8 km N Sotoboua (1♂, CAS), 5 km W Sokodé (3♀, 4♂, CAS), 12 km S Sokodé (6♀, 4♂, CAS).

25. *Tachysphex puncticeps* Cameron

FIGURES 175–180

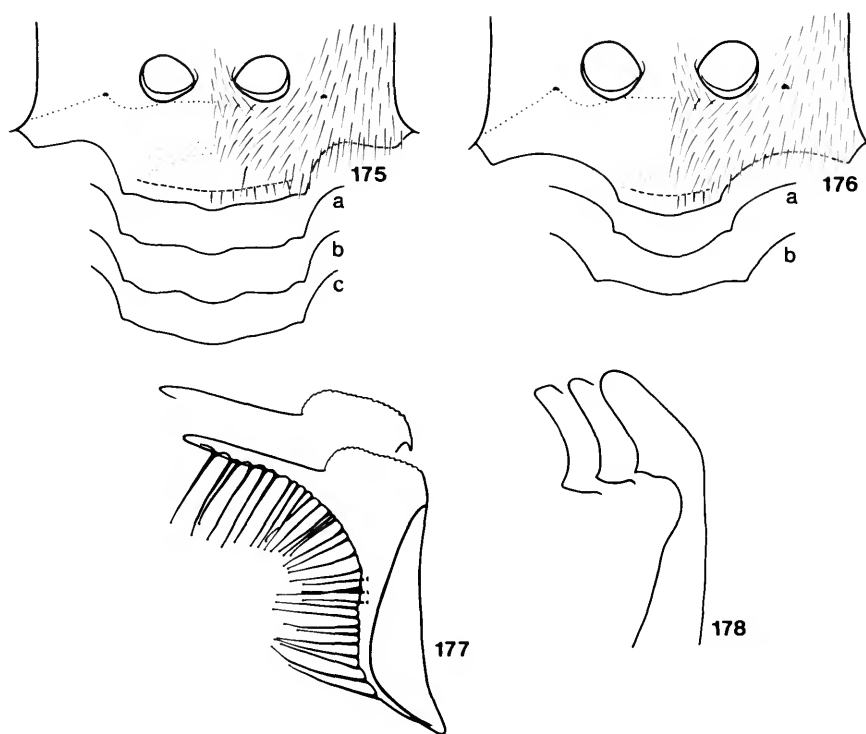
Tachysphex puncticeps Cameron, 1903:127, ♀. [Holotype: ♀, India: West Bengal: Barrackpore, 20 km N Calcutta (OXFORD), examined].—Pulawski, 1975:311; 1977:215 [Australia; revision, full bibliography].—Bohart and Menke, 1976:276 [listed].—Tsuneki, 1983:62 [Philippines; redescription], 67, 68 [in key].

Tachysphex varihirta Cameron, 1903:128, ♂ [incorrect original termination]. [Holotype: ♂, India: Bengal, Barrackpore (OXFORD), examined. Synonymized with *Tachysphex puncticeps* by Pulawski, 1975:311.]

Tachysphex rugidorsatus R. Turner, 1915:556, ♀. [Lectotype: ♀, Australia: Tasmania: Eaglehawk Neck (BMNH), designated by Pulawski, 1975:311, examined. Synonymized with *Tachysphex puncticeps* by Pulawski, 1975:311.]

Tachysphex mindorensis Williams, 1928:92, ♂, ♀. [Holotype: ♂, Philippines: Mindoro Island: San Jose (BISH), examined. Synonymized with *Tachysphex puncticeps* by Pulawski, 1975:311.]—Tsuneki, 1971h:14 [Taiwan]; 1976:54 [Philippines; redescription]; 1977a:6 [Taiwan]; 1982a:28 [Taiwan].—Haneda, 1972:4 [Taiwan].

DIAGNOSIS.—*Tachysphex puncticeps* is one of many species in which the mesopleuron is shiny and punctate; the setae are



FIGURES 175-178.—*Tachysphex puncticeps* Cameron: 175, clypeus of a female from Taiwan; a, clypeal free margin of a specimen from Philippines; b, clypeal free margin of a specimen from Malaysia; c, clypeal free margin of a specimen from Thailand; 176, clypeus of a male from Thailand; a, clypeal free margin of a specimen from Malaysia; b, clypeal free margin of a specimen from Philippines (holotype of *Tachysphex mindorensis* Williams); 177, volsella, with outline showing individual variation; 178, penis valve (inner side), with outlines showing individual variation.

erect on the vertex, nearly erect on the scutum and midfemoral venter (as in Figures 32, 33), and inclined obliquely anterad on the propodeal dorsum; the gaster, femora, and tibiae are black; and the female tarsi are of the *pompiliformis* type. It differs from other such species in having short and nearly appressed scutal setae: setal length is less than one midocellar diameter (Figures 179, 180). The shape of the penis valve is also diagnostic (Figure 178): ventral margin with angulate projection, apicoventral portion not dentate. *Tachysphex sri* is similar, but in *puncticeps* the clypeal bevel is well defined (rather than rudimentary or absent); in the male, the bottom of the forefemoral notch is asetose and the penis valve has small apicoventral teeth but no ventral projection.

DESCRIPTION.—Scutal punctures less than one diameter apart (a few discal punctures one diameter apart in some specimens). Mesopleural punctures averaging one to two diameters apart below scrobe. Episternal sulcus complete in most specimens, but effaced anteroventrally in some Australian individuals. Propodeal dorsum rugose and with a few, irregular ridges; side ridged. Hindcoxal dorsum: inner margin carinate, carina minimally expanded basally. Apical tarsomeres with no

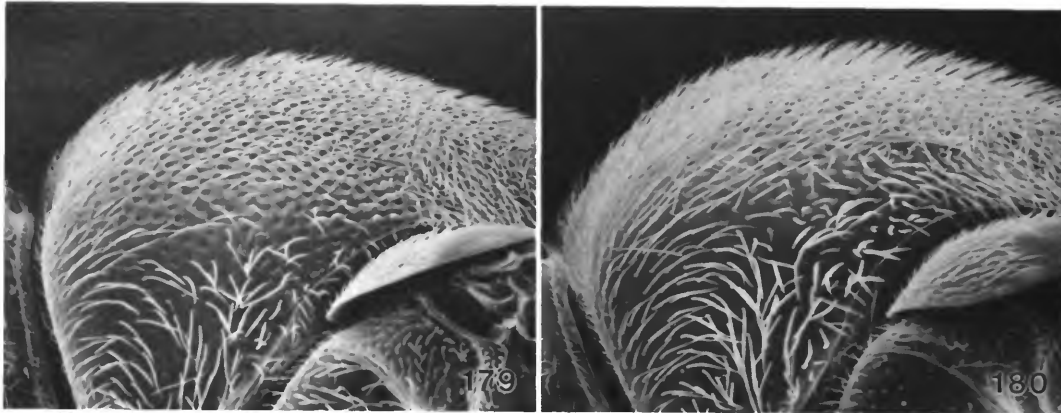
spines on venter or lateral margins.

Setae (setal length, in parentheses, is expressed as fraction of basal mandibular width): erect on vertex (0.2), nearly erect between mandibular base and occipital carina and on mid femoral venter (0.1-0.2), nearly appressed on scutum (0.1-0.15) (Figures 179, 180), inclined obliquely anterad on propodeal dorsum.

Body black, mandible dark red mesally. Terga I-III silvery fasciate apically. Wings slightly infumate.

♀.—Clypeus (Figure 175): bevel shorter than basomedian area; lip arcuate, not incised laterally. Vertex width 1.1-1.3 × length. Dorsal length of flagellomere I 1.9-2.4 × apical width. Outer surface of foretibia with one spine. Forebasitarsus with six or seven rake spines. Pygidial plate either alutaceous and impunctate or unsculptured except finely sculptured apically. Length 6.5-8.0 mm.

♂.—Clypeus (Figure 176): bevel shorter than basomedian area; lip arcuate or slightly sinuate; distance between corners 0.7-0.8 × distance between corner and orbit. Vertex width 1.2-1.4 × length. Dorsal length of flagellomere I 1.0-1.4 × apical width. Forefemoral notch glabrous. Outer margin of



FIGURES 179, 180.—*Tachysphex puncticeps* Cameron, scutum in profile showing vestiture: 179, female; 180, male.

forebasitarsus with no spines in Asian specimens, with none to four preapical spines in those from Australia and New Guinea; spine length in most specimens not exceeding basitarsus width. Tergum VII (except laterally and apically) impunctate, shiny, almost unsculptured. Sterna densely, evenly punctate and setose. Volsella: Figure 177. Penis valve: Figure 178. Length 5.5–7.0 mm.

Frontal setae silvery.

GEOGRAPHIC DISTRIBUTION.—Northeast India (West Bengal), southeast Asia north to Thailand and Laos, Philippines, Taiwan, New Guinea, and Australia.

RECORDS (localities given in Pulawski, 1977, are not repeated).—PAPUA NEW GUINEA: NATIONAL CAPITAL DISTRICT: Lake Iaraguma, 20 km NW Port Moresby (3♀, CAS), Port Moresby (1♂, CAS).

THAILAND: CHANTABURI PROVINCE: Prew (1♂, BISH). CHIANG MAI PROVINCE: Fang (1♂, BISH). KANCHANABURI PROVINCE: Kanchanaburi (1♀, 1♂, CAS). LOEI PROVINCE: Wang Saphung (2♀, CAS). RAYONG PROVINCE: Ban Phe (1♀, 1♂, CAS), Ko Samet Island (19♀, 23♂, CAS).

VIETNAM: Danang (1♀, BISH).

26. *Tachysphex bituberculatus* Cameron

FIGURE 181

Tachysphex bituberculatus Cameron, 1905a:223, ♀ [Holotype: ♀, India: Assam: Khasia Hills (OXFORD), examined.].—Nec Weber, 1948:203 and Yoshimoto, 1960:331 [= *Tachysphex morosus*].—Bohart and Menke, 1976:272 [listed].

DIAGNOSIS.—*Tachysphex bituberculatus* is one of many species in which the mesopleuron is shiny and punctate; the setae are erect on the vertex and nearly so on the scutum and midfemoral venter (as in Figures 32, 33, 116), and inclined obliquely anterad on the propodeal dorsum; the gaster, femora, and tibiae are black; and the female tarsi are of the *pompiliformis* type. At this time, *bituberculatus* cannot be

properly interpreted because the male and the amount of variation are unknown. The female can be distinguished from most species by the combination of: clypeal bevel well defined but shorter than basomedian area and mesopleural setae slightly sinuous, relatively long (length about $0.5 \times$ basal mandibular width). Subsidiary recognition features are: clypeal lip obtusely prominent mesally, frons dull (conspicuously microsculptured between punctures), mesopleural punctures well defined (even posteriorly), and wing yellowish. *Tachysphex agnus* Pulawski is most similar and may be a synonym. The thoracic sculpture of *bituberculatus* is a little coarser, the clypeal lip slightly more prominent mesally, the episternal sulcus is complete (incomplete in *agnus*), and the wings are yellowish instead of hyaline to slightly infumate, but all these differences may be geographic rather than specific. *Tachysphex agnus* is known from Algeria, Tunisia, Israel, and Turkey, and a new record is Morocco: near Agadir (1♀, CAS).

DESCRIPTION.—Mesothoracic punctures well defined. Scutal punctures averaging less than one diameter apart, but many discal punctures up to about two diameters apart. Mesopleural punctures averaging less than one diameter apart. Episternal



FIGURE 181.—*Tachysphex bituberculatus* Cameron, clypeus of holotype female.

sulcus complete. Propodeal dorsum coarsely, irregularly rugose, side ridged. Hindcoxal dorsum: inner margin carinate, carina slightly expanded basally and evanescent posteriorly. Apical tarsomeres without spines on venter or lateral margins.

Setae (setal length, in parentheses, is expressed as fraction of basal mandibular width): erect on vertex (0.4); nearly erect between mandibular base and occipital carina; slightly inclined posterad on scutum mesally (0.3 on anterior third) and midfemoral venter (0.4); inclined obliquely anterad on propodeal dorsum; sinuous on mesopleuron and propodeum.

Body black, including mandibles and tarsi. Terga I-III silvery fasciate apically, tergum IV with vestigial, broadly interrupted fascia. Wings yellowish.

♀.—Clypeus (Figure 181): bevel shorter than basomedian area except mesally; lip arcuate, obtusely pointed mesally, not incised laterally. Vertex width $1.4 \times$ length. Dorsal length of flagellomere I $2.4 \times$ apical width. Forefemoral venter densely, uniformly punctate, punctures well defined. Foretibia densely, uniformly punctate and setose throughout, outer surface with a row of long, suberect setae. Forebasitarsus with eight rake spines. Pygidial plate alutaceous, with a few sparse, fine punctures. Length 10.5 mm.

♂.—Unknown.

GEOGRAPHIC DISTRIBUTION.—Known only from the type locality in India.

MATERIAL EXAMINED.—INDIA: ASSAM: Khasia Hills (1♀, OXFORD, holotype of *bituberculatus*).

27. *Tachysphex instructus* Nurse

FIGURES 182-184

Tachysphex striolatus Cameron, 1908:305, ♀. [Lectotype: ♀, India: Gujarat: Deesa (BMNH), present designation, examined.].—Nec *Tachysphex striolatus* Cameron, 1903.

Tachysphex instructus Nurse, 1909:514. [New name for *Tachysphex striolatus* Cameron, 1908.].—Bohart and Menke, 1976:274 [listed].

DIAGNOSIS.—*Tachysphex instructus* is another species in which the mesopleuron is shiny and punctate; the setae are erect on the vertex, nearly erect on the scutum and midfemoral venter (as in Figures 32, 33, 116), and inclined obliquely anterad on

the propodeal dorsum; the gaster, femora, and tibiae are black; and the female tarsi are of the *pompiliformis* type. The female of *instructus* differs from other such species in having a narrower clypeal lobe (Figures 182, 183): distance between corners about $1.2 \times$ distance between corner and orbit rather than 1.5-1.8 in other species; and longitudinally ridged propodeal dorsum (Figure 184); the presence of an impunctate clypeal bevel is a subsidiary recognition character. The male and the variation range are unknown.

DESCRIPTION.—Thoracic punctures well defined (interspaces unsculptured or nearly so), averaging more than one diameter apart on scutal disk, but less than that on mesopleuron and mesothoracic venter. Episternal sulcus incomplete. Propodeal dorsum conspicuously ridged longitudinally (Figure 184), ridges somewhat irregular. Hindcoxal dorsum: inner margin carinate basally, carina not expanded basally. Apical tarsomeres with no spines on venter or lateral margins.

Setae (setal length, in parentheses, is expressed as fraction of basal mandibular width): erect on vertex (0.3) and midfemoral venter (0.1-0.2), nearly erect between mandibular base and occipital carina; slightly inclined posterad on scutum mesally (0.3 on anterior third); inclined obliquely anterad on propodeal dorsum.

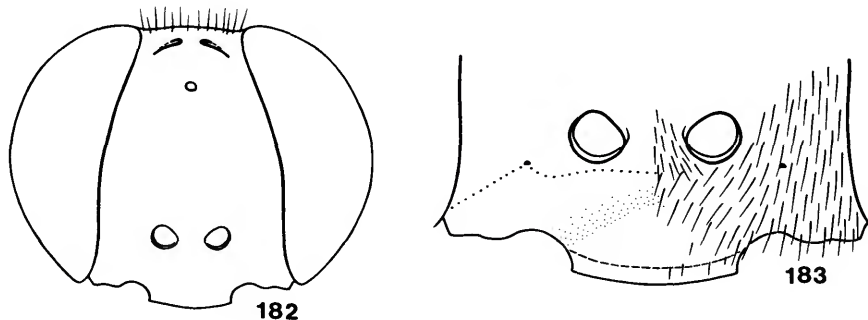
Body black, mandible narrowly yellowish mesally, and tarsi brown (except basally). Terga I-IV silvery fasciate apically. Wings hyaline.

♀.—Clypeus (Figures 182, 183): bevel shiny, longer mesally than basomedian area; lip arcuate, not incised laterally. Vertex width $1.2-1.3 \times$ length. Dorsal length of flagellomere I $2.4 \times$ apical width. Forefemoral venter with minute punctures that are several diameters apart. Foretibia densely, uniformly punctate and setose throughout, outer surface with two spines. Forebasitarsus with six rake spines. Pygidial plate alutaceous, with a few minute, sparse punctures. Length 6.0-6.5 mm.

♂.—Unknown.

GEOGRAPHIC DISTRIBUTION.—Known only from the type locality in India.

RECORDS.—INDIA: GUJARAT: Deesa (2♀, BMNH, lectotype and paralectotype of *striolatus* Cameron, 1908 = *instructus* Nurse).



FIGURES 182, 183.—*Tachysphex instructus* Nurse, holotype female: 182, head frontally; 183, clypeus.

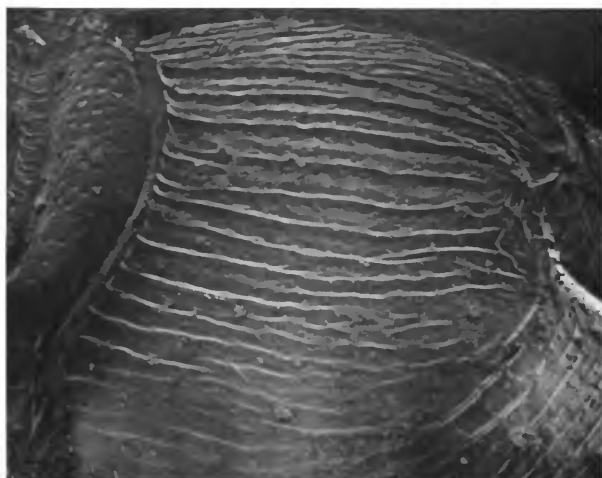


FIGURE 184.—*Tachysphex instructus* Nurse, holotype female: propodeal dorsum (scanning electron micrograph, uncoated).

28. *Tachysphex actites* Pulawski, new species

FIGURES 185-188

NAME DERIVATION.—*Aktites* (here spelled *actites*) is a Greek word meaning shore or coast dweller, with reference to the habitat where the type series was collected.

DIAGNOSIS.—*Tachysphex actites* has a unique combination of setal patterns on the scutum and propodeal dorsum: most scutal setae are oriented posterad, but the midscutal setae are contrastingly oriented posterolaterad (as in Figure 109); on the propodeal dorsum, the median setae are oriented anterolaterad,

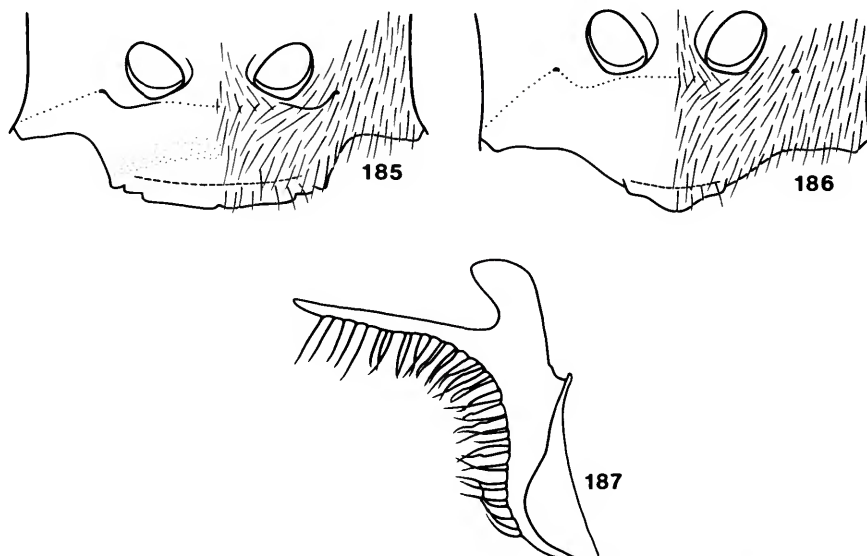
whereas the lateral setae are oriented posterad (and join apicomesally in some specimens). In the other *Tachysphex*, no more than one of these patterns is present. The female has an unusually short foretarsal rake (Figure 188): apical spines of basitarsus $1.0-1.2 \times$ apical width of basitarsus, shorter than tarsomere II. In the other species, including the Moroccan *brevipecten* de Beaumont (in which the rake is shortened), the apical spines are at least $1.6 \times$ width of basitarsus and at least as long as foretarsomere II.

DESCRIPTION.—Scutal punctures well defined, some of them less than one diameter apart while others up to about two diameters apart. Mesopleural punctures well defined, less than one diameter apart anteriorly and more than that posteriorly. Episternal sulcus effaced or evanescent anteroventrally. Propodeal dorsum rugose, with short ridges basally in many specimens; side ridged. Hindcoxal dorsum: inner margin carinate basally, carina not expanded. Apical tarsomeres without spines on venter or lateral margins.

Setae of vertex, scutum, and midfemoral venter suberect, less than one midocellar diameter long; those adjacent to hypostomal carina suberect, about one midocellar diameter long; not obscuring integument on mesopleuron; most scutal setae oriented posterad, but midscutal setae contrastingly oriented posterolaterad of each side of midline; on propodeal dorsum, median setae oriented anterolaterad, lateral setae oriented posterad (joining apicomesally in some specimens).

Body black, mandible at most dark reddish mesally. Frontal vestiture silvery. Terga I-IV (I-III in many females) silvery fasciate apically. Wings slightly infumate, veins dark brown.

♀.—Clypeus (Figure 185): bevel shorter than basomedian area; lip arcuate, with two lateral incisions on each side, with



FIGURES 185-187.—*Tachysphex actites* Pulawski, new species: 185, female clypeus; 186, male clypeus; 187, volsella.

29. *Tachysphex auriceps* Cameron

FIGURES 189, 190

Tachysphex auriceps Cameron, 1889:145, ♀, ♂. [Lectotype: ♀, India: Maharashtra: Pune (OXFORD), present designation, examined.].—Bingham, 1897:194 (redescription, Bombay, Bangalore, incorrectly reported from Sri Lanka.).—nec Giner Marí, 1945:856 [= *Tachysphex panzeri*].—Bohart and Menke, 1976:272 [listed].

DIAGNOSIS.—The female of *auriceps* is unique in having an irregularly, coarsely sculptured pygidial plate (Figure 190). Subsidiary recognition features are: tarsi of the *brullii* type, frontal vestiture gold, gaster red basally, and legs largely red.

DESCRIPTION (based on lectotype female).—Scutal punctures less than one diameter apart. Mesopleural punctures less than one diameter apart anteriorly, but a few to several diameters apart posteriorly beneath scrobe. Episternal sulcus complete. Propodeal dorsum irregularly rugose and ridged, side ridged. Hindcoxal dorsum: inner margin not carinate.

Setae appressed on vertex and scutum; suberect adjacent to hypostomal carina (longest setae about 0.2 basal mandibular width); oriented posterad on propodeal dorsum.

Head and thorax black. Legs red except coxae and trochanters black. Gastral terga I and II red, remainder black. Cephalic and thoracic setae golden. Terga I-III silvery fasciate apically. Wings yellow.

♀.—Clypeus (Figure 189): bevel about as long as basomedian area; lip arcuate, incised laterally. Vertex width about 0.95 × length. Dorsal length of flagellomere I 2.3 × apical width. Punctures of forefemoral venter several diameters apart. Foretibia: outer surface with row of spines, punctures along spines several diameters apart. Forebasitarsus with 20 rake spines. Hindtarsomere IV as wide as long, obtusely emarginate; apicoventral margin shallowly concave. Apical tarsomeres: venter with central cluster of small spines, apicoventral margin produced into lobe; each lateral margin of tarsi I and II with one spine. Pygidial plate coarsely, irregularly sculptured (Figure 190). Length 11.5 mm.

♂.—The male described by Cameron could not be located



FIGURES 188.—*Tachysphex actites* Pulawski, new species: female forebasitarsus showing rake spines.

rudimentary median notch in some specimens. Vertex width 1.1–1.3 × length. Dorsal length of flagellomere I 1.4 × apical width. Outer surface of foretibia with a few thin, inconspicuous bristles. Forebasitarsus with seven or eight rake spines (Figure 188); two apical spines 1.0–1.2 × basitarsus width, not exceeding apex of tarsomere II. Pygidial plate punctate, unsculptured between punctures. Length 7.0–8.0 mm.

♂.—Inner mandibular margin with tooth. Clypeus (Figure 186) with constriction between lip and bevel; bevel inconspicuous, nearly linear; lip markedly sinuate, with angulate corner; distance between corners 0.9 × distance between corner and orbit. Vertex width 1.1–1.3 × length. Dorsal length of flagellomere I about 1.25 × apical width, equal to 0.65–0.7 of II. Forefemoral notch moderately large, with finely setose bottom. Outer margin of forebasitarsus with no preapical spines. Venter of tarsomeres V without spines. Sterna densely, evenly punctate and setose. Volsella: Figure 187. Length 5.2–6.8 mm.

GEOGRAPHIC DISTRIBUTION.—Known from only one locality in Thailand.

RECORDS.—*Holotype*: ♀, Thailand: RAYONG PROVINCE: Ko Samet Island, 5–7 May 1989, W.J. Pulawski (CAS).

Paratypes: Same data as holotype (1♀, 1♂, BMNH; 24♀, 18♂, CAS; 1♀, 1♂, USNM).

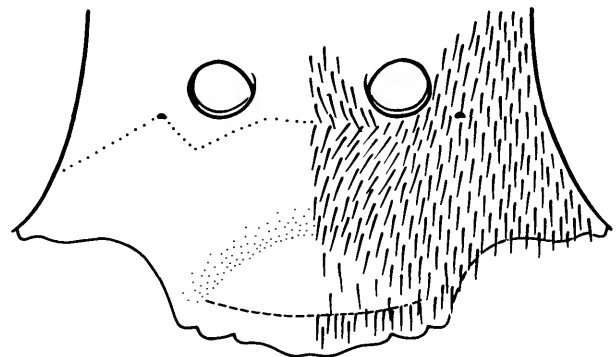


FIGURE 189.—*Tachysphex auriceps* Cameron, clypeus of holotype female.

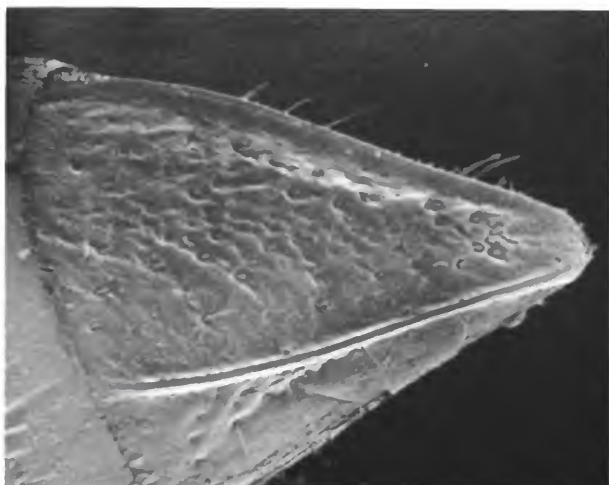


FIGURE 190.—*Tachysphex auriceps* Cameron, pygidial plate of holotype female (scanning electron micrograph, uncoated).

and may be lost. It may belong to a different species than the female.

GEOGRAPHIC DISTRIBUTION.—Known with certainty from the type locality only. Bingham's records from India and Sri Lanka almost certainly refer to other species. I have examined the specimen determined as *auriceps* by Giner Marí (1945): it is a male of *panzeri*.

MATERIAL EXAMINED.—INDIA: MAHARASHTRA: Pune (lectotype of *auriceps*).

30. *Tachysphex lagunaensis* Tsuneki

FIGURES 191–196

Tachysphex lagunaensis Tsuneki, 1983:58, ♀, ♂ [Holotype: ♂, Philippines: Luzon, Laguna Province: Pagsanjan (lost, see below), not examined], 68, 69 [in key].

STATUS OF HOLOTYPE AND INTERPRETATION OF SPECIES.—The type series of *lagunaensis*, including the holotype, was apparently lost in transshipment from K. Tsuneki to the USNM. At present, no specimen can be located either in Tsuneki's collection (his letter of 17 November 1989) or in the latter institution. However, the specimens considered here fully agree with the original description.

DIAGNOSIS.—The female of *lagunaensis* has a unique combination: the tarsi and claws of the *brullii* type, the clypeal lip with two lateral incisions on each side, and the scutum longitudinally crenulate along the hindmargin. The clypeus is similar in *actites*, but in *lagunaensis* the foretarsal rake is dense, long (forebasitarsus with 14–18 rake spines, apical spines more than twice apical width of basitarsus). In *actites*, the forebasitarsus has 7 or 8 rake spines, and the apical spines are 1.0–1.2 × width of basitarsus).

The male can be recognized by the following combination: setae of propodeal dorsum oriented posterolaterad (except oriented anterad mesally), clypeal lip with angulate corners, and scutum longitudinally crenulate adjacent to hindmargin.

DESCRIPTION.—Punctures fine, averaging several diameters apart on scutal disk and on mesopleuron below scrobe; interspaces shiny, mostly unsculptured. Mesopleuron conspicuously crenulate along hindmargin. Episternal sulcus complete. Propodeal dorsum coarsely, irregularly ridged or coarsely rugose; side ridged. Hindcoxal dorsum: inner margin not dentate, at most insignificantly swollen basally. Apical tarsomeres with no spines on venter or lateral margins.

Setae (setal length, given in parentheses, is expressed as fraction of basal mandibular width): straight, curved posterad apically on head and thorax; erect on vertex (0.5), nearly erect adjacent to hypostomal carina (0.5); oriented posterad on scutum (about 0.4 anteriorly); oriented posterolaterad on propodeal dorsum, except oriented anterad mesally.

Body black or apical tarsomeres brown in some males. Terga I–III or (some males) I–IV silvery fasciate apically. Wings almost hyaline. Frontal and clypeal setae silvery.

♀.—Clypeus (Figures 191, 193): bevel ill defined, markedly shorter than basomedian area; lip almost straight, with two lateral incisions on each side. Vertex width 1.3 × length. Dorsal length of flagellomere I 2.0 × apical width. Scutum longitudinally crenulate along hindmargin. Forefemoral venter with minute punctures that are several diameters apart. Foretibia with three conspicuous bristles on outer surface. Tarsi of *brullii* type, forebasitarsus with 14 (Thai female) or 18 (Laotian female) rake spines. Hindtarsomere IV as long as wide, apical emargination rectangular; apicoventral margin weakly concave. Tarsomeres V elongate; venter covered with erect setae, apicoventral margin produced into lobe. Claws elongate. Pygidial plate impunctate mesally, mostly unsculptured between punctures. Length 8.0–9.0 mm.

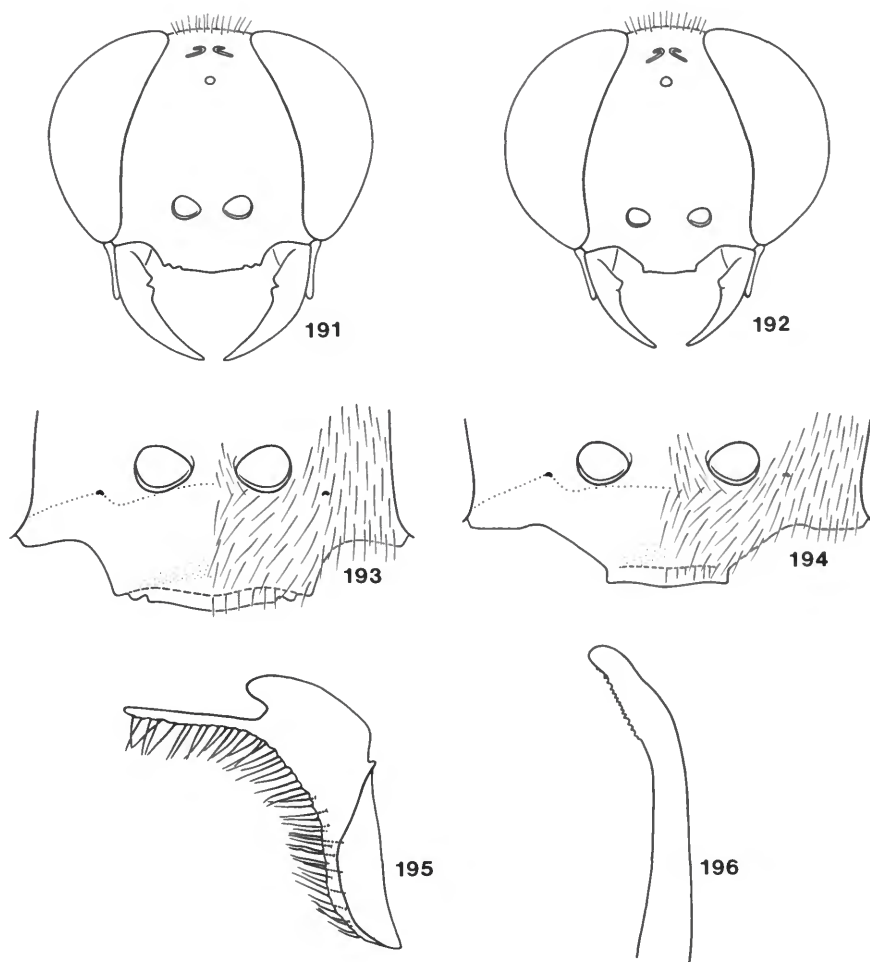
♂.—Clypeus (Figure 192, 194): bevel ill defined, shorter than basomedian area; lip straight to weakly arcuate, with prominent corners; distance between corners 0.8 × distance between corner and orbit. Vertex width 1.2–1.4 × length. Dorsal length of flagellomere I 1.6–1.9 × apical width. Forefemoral notch finely pruinose. Outer margin of forebasitarsus with no preapical spines. Sterna densely, evenly punctate and setose. Volsella: Figure 195. Penis valve: Figure 196. Length 5.0–6.2 mm.

GEOGRAPHIC DISTRIBUTION.—Philippines (Luzon) to Laos and Thailand.

RECORDS.—PHILIPPINES (Tsuneki, 1983): Luzon: LAGUNA PROVINCE: Pagsanjan. BENGUET PROVINCE: Naguilian near Baguio. Negros: Tatay beach.

LAOS: VIENTIANE PROVINCE: Ban Van Eu (1♀, BISH).

THAILAND: KANCHANABURI PROVINCE: Lam Ta Pen River shore, 5 km NW Lat Ya (1♀, 11♂, CAS).



FIGURES 191-196.—*Tachysphex lagunaensis* Tsuneki: 191, female head frontally; 192, male head frontally; 193, female clypeus; 194, male clypeus; 195, volsella; 196, penis valve (inner side).

31. *Tachysphex conclusus* Nurse

FIGURE 197

Tachysphex conclusus Nurse, 1903:517, ♀, ♂. [Lectotype: ♂, India: Gujarat: Deesa (BMNH), present designation].—Bohart and Menke, 1976:273 [listed].

DIAGNOSIS.—*Tachysphex conclusus* is one of the many species in which the labrum is convex and protruding beyond the clypeal free margin and the mouthparts are elongate (as in Figures 147-151). The female is characterized by an all black or partly reddish clypeus, the clypeal lip weakly sinuous or entire laterally, the propodeal side evenly microsculptured, and tergum V evenly microsculptured throughout (including the apical depression). Females of *noar* and many extralimital *panzeri* are identical, so that *conclusus* can be distinguished only by geographical distribution: it occurs in the Gujarat and Rajasthan States of India, whereas *noar* is known only from Sri

Lanka. The male of *conclusus* can be recognized only by the shape of the volsella, which is similar (although not identical) to that of *diadelus* (compare Figures 158 and 197).

DESCRIPTION.—Clypeal middle section conspicuously convex. Labrum convex, protruding beyond clypeal free margin; galea longer than wide, densely punctate (except anteriorly). Punctures minute, about one diameter apart on scutum and mesothoracic venter; mesopleuron dull, microsculptured, impunctate. Episternal sulcus effaced anteroventrally. Propodeal dorsum and side evenly microsculptured, side not ridged. Hindcoxal dorsum: inner margin ecarinate. Apical tarsomeres without spines on venter or lateral margins, with a few thin, erect setae on venter.

Setae appressed on frons, vertex, scutum, mesopleuron, and midfemoral venter; subappressed between mandibular base and occipital carina; most setae of propodeal dorsum inclined obliquely anterad, but lateral setae inclined obliquely posterad

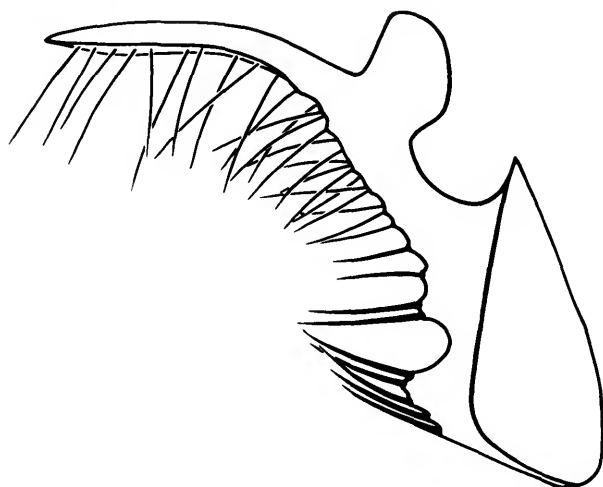


FIGURE 197.—*Tachysphex conclusus* Nurse: volsella.

and joining apicomesally. Mesopleural setae not concealing integument, the latter easily visible.

Head and thorax black, mandible yellowish red (except apically), clypeal bevel reddish in some females. Gaster and legs: see below. Wings hyaline or slightly infumate.

♀.—Clypeus: bevel about as long as basomedian area; lip arcuate, its free margin emarginate mesally, simple or minimally sinuate laterally (not incised). Vertex width 0.7–0.8 × length. Dorsal length of flagellomere I 2.6–3.0 × apical width. Foretibia densely, uniformly punctate and setose throughout, outer surface with one spine near midlength and one subapically. Forebasitarsus with eight or nine rake spines. Tergum V uniformly micropunctate throughout (including apical depression). Pygidial plate shallowly punctate, interspaces microsculptured. Length 9.0–9.5 mm.

Gaster red basally and apically, black preapically (black covering segments III–V in darkest specimens, terga IV and V in lightest). Femora black, tibiae black to largely red; tarsi brown to red. Terga I–IV silvery fasciate apically (fascia of tergum IV interrupted).

♂.—Clypeus: bevel not sharply delimited dorsally, about as long as basomedian area, delimited laterally by oblique carina that emerges from lip corner; lip arcuate, not emarginate or with rudimentary emargination mesally, angulate laterally; distance between corners 0.9–1.1 × distance between corner and orbit. Vertex width 0.7–0.9 × length. Dorsal length of flagellomere I 2.0–2.1 × apical width. Forefemoral notch setose, setae appressed. Outer margin of forebasitarsus with three to five preapical spines, length of apical spine 2.0–2.6 × apical basitarsus width; apical spine of foretarsomere II longer than tarsomere III. Sterna densely, evenly punctate, densely setose. Volsella: Figure 197. Length 7.0–8.8 mm.

Gastral segments I and II red, remainder black (also tergum

III all or partly red in some specimens). Femora and tibiae black or foretibiae reddish brown on inner surface; tarsi brown. Frontal setae golden. Terga I–III silvery fasciate apically.

GEOGRAPHIC DISTRIBUTION.—Known from two localities in northwestern India.

RECORDS.—INDIA (lectotype and paralectotypes): GUJARAT: Deesa (3♀, 5♂, BMNH; 1♀, 1♂, CAS). RAJASTHAN: Mount Abu (1♂, BMNH).

32. *Tachysphex minutus* Nurse

FIGURES 198–200

Tachysphex minutus Nurse, 1909:516, ♀, ♂.—Pulawski, 1975:311 [Lectotype: ♂, India: Gujarat: Deesa (BMNH), with diagnostic characters; reexamined in 1989.].—Bohart and Menke, 1976:275 [listed].

Tachysphex lilliputianus R. Turner, 1917b:198, ♂. [Holotype: ♂, India: Bihar: Pusa (BMNH), reexamined in 1989. Synonymized with *Tachysphex minutus* by Pulawski, 1975:311.]

Atelosphex lugubris Arnold, 1924:72, ♀. [Holotype: ♀, Zimbabwe: Sawmills (SAM), examined. New synonym. Transferred to *Tachysphex* by Bohart and Menke, 1976:274.].—Arnold, 1951:157 [Ghana].

Tachysphex rugosus Gussakovskij, 1952:245, ♀, ♂. [Lectotype: ♂, Tajikistan: Mikoyanabad, now Kabadian (ZIN), designated by Pulawski, 1971:244, examined. New synonym.].—Pulawski, 1971:243 [revision]; 1974b:715 [prey: grasshopper *Omocestus petraeus* (Brisout)].—de Beaumont, Bytinski-Salz, and Pulawski, 1973:9 [Israel].—Bohart and Menke, 1976:276 [listed].

Tachysphex sp.—Pulawski, 1958:181 [Bulgaria, corrected to *Tachysphex rugosus* by Pulawski, 1971:243].

Tachysphex rhodius de Beaumont, 1960a:19, ♀, ♂. [Holotype: ♀, Greece: Rhodes Island: Kamiros (RMNH), examined. Synonymized with *Tachysphex rugosus* by Pulawski, 1971:243.]; 1965:53 [Greece].—Pulawski, 1967:408 [Turkey].

Tachysphex aff. *rhodius*: Pulawski, 1967:408 [corrected to *Tachysphex rugosus* by Pulawski, 1971:243].

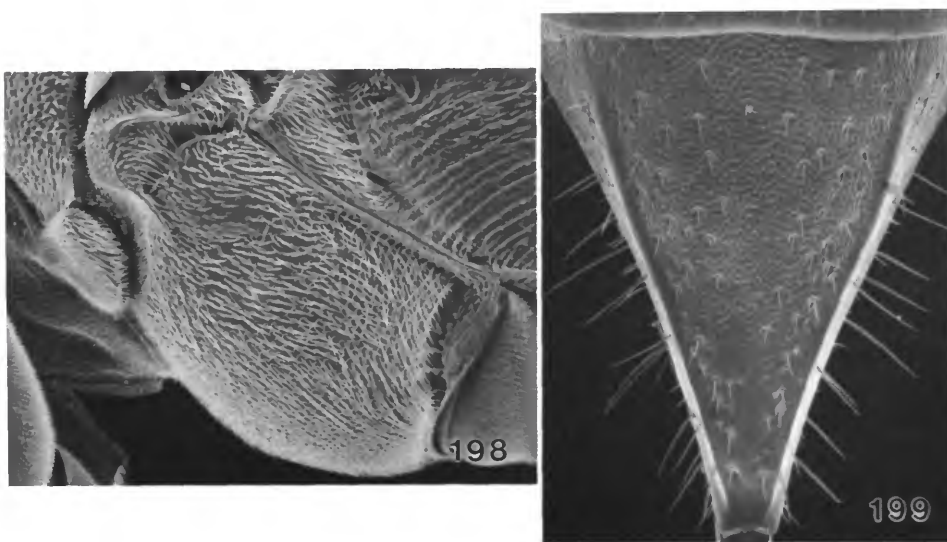
Tachysphex quadrifurci Pulawski, 1971:246, ♀, ♂. [Holotype: ♂, Turkmenistan: Ashkhabad (CAS), examined. New synonym.].—Bohart and Menke, 1976:276 [listed].

Tachysphex lugubris.—Bohart and Menke, 1976:274 [new combination, listed].

SYNONYMY.—I now regard *quadrifurci* and *rugosus* as synonyms of *minutus* based on study of additional material, especially from India and Pakistan, as well as reexamination of specimens studied previously (Pulawski, 1971).

DIAGNOSIS.—*Tachysphex minutus* is very similar to *sympleuron* (see page 60), but differs in having well-defined mesopleural punctures (interspaces shiny in most specimens), and the male forefemoral notch is glabrous. In *sympleuron*, the mesopleuron is dull, punctatorugose beneath the scrobe, and the male forefemoral notch is setose. In addition, the gena of many *minutus* is thin in dorsal view (including specimens from Indian subcontinent), but thick in *sympleuron* (Figure 142). For differences between *minutus* and the related Palearctic species see Pulawski (1971, key to species) and also the "Diagnosis" of *sympleuron*.

DESCRIPTION.—Frons punctate or punctatorugose (punctures less than one diameter apart). Gena thin in dorsal view in populations from desert areas (Tunisia, Syria, Transcaspia, Pakistan, India), but thick in specimens from Turkey and



FIGURES 198, 199.—*Tachysphex minutus* Nurse: 198, mesopleuron, lateral view; 199, pygidial plate.

Europe, thus resembling *sympleuron* (see Figure 142); somewhat intermediate in Israeli specimens; and variable in West African specimens. Malar space present. Basal half of scape concave ventrally (as in Figure 143). Scutum shiny, punctures averaging more than one diameter apart to less than one diameter. Mesopleuron punctate, most punctures less than one diameter apart below scrober; interspaces shiny in most specimens. Episternal sulcus absent (Figure 198). Metapleural sulcus, below upper metapleural pit, evanescent to absent in most specimens, but well defined in some specimens from Bulgaria and Hungary. Propodeal dorsum longitudinally ridged

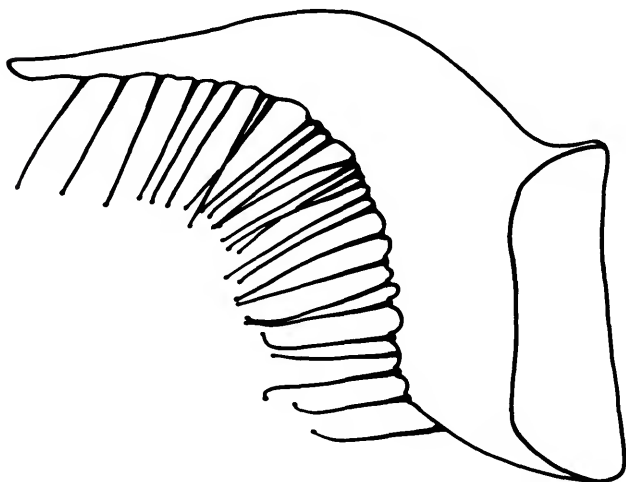


FIGURE 200.—*Tachysphex minutus* Nurse: volsella.

to irregularly rugose mesally and rugose laterally, side ridged. Hindcoxal dorsum: inner margin carinate basally, carina low to slightly expanded, absent in some males. Apical tarsomeres with no spines on venter or lateral margins. Punctures of tergum II one diameter apart or less (but not compressed against each other), interspaces shiny.

Setae appressed to nearly erect on vertex (setal length about one midocellar diameter); appressed or nearly so on scutum; inclined between mandible and occipital carina; and oriented anterad on propodeal dorsum (except laterally where they are oriented posterolaterad, and except basally where they are oriented posterad).

Head and thorax black, mandibles yellowish red mesally; scape translucent apicoventrally, remaining venter black or yellowish red. Gaster black in most specimens, but segments I and II red in some specimens from Greece and Turkey. Legs black in most specimens, but in some tibiae brown, reddish, or yellowish on outer surface. Terga I–III silvery fasciate apically in most specimens, but I–IV in some West African females and I–V in some West African males. Wings weakly infumate to hyaline, with yellowish tinge in a female from Karachi area, Pakistan.

♀.—Clypeus (as in Figure 140): bevel shorter than basomedian area; lip arcuate, not incised laterally. Vertex width 1.5–1.8 × length. Dorsal length of flagellomere I 2.3–2.7 × apical width. Foretibia densely, uniformly punctate and setose throughout, without spines on outer surface. Forebasitarsus with six or seven rake spines. Pygidial plate microscopically reticulate (except apically) and with sparse punctures (Figure 199). Length 5.5–8.5 mm.

♂.—Clypeus (as in Figure 141): bevel slightly shorter than basomedian area; lip weakly arcuate, not incised laterally, with

well-defined corner; distance between corners 1.3–1.4 × distance between corner and orbit. Vertex width 2.0–3.0 × length. Dorsal length of flagellomere I 1.6–2.1 × apical width. Forefemoral notch glabrous. Outer margin of forebasitarsus with one to four preapical spines (number of spines may be different on each leg); in most cases, at least one spine longer than apical width of basitarsus. Sterna densely, evenly punctate and setose. Volsella: Figure 200. Length 4.0–6.2 mm.

GEOGRAPHIC DISTRIBUTION.—Africa (Namibia, Zimbabwe, Ivory Coast, Ghana, Tunisia, northeastern Egypt: Suez area), Sicily and southeastern Europe (Hungary, Romania, Bulgaria, Yugoslavia, Greece, Crimea), Azerbaijan and Turkey to Israel, Transcaspia (Uzbekistan, Tajikistan, and Turkmenistan), Pakistan, and India north of the Tropic of Cancer.

RECORDS (localities given in Pulawski, 1971, under *rugosus* or *quadrifurci* are not repeated here).—**IVORY COAST:** 20 km W Boundiali (1♀, CAS), 56 km N Niakaramandougou (1♂, CAS), 40 km S Toumodi (8♀, 10♂, CAS), 50 km S Yamassoukro (1♂, CAS).

GHANA: Accra (1♀, 5♂, CAS), Legon, 12 km NNE Accra (5♂, CAS), 30 km S Kintampo (3♂, CAS), Kawampe, 8°30'N, 1°35'W, 45 km N Kintampo (1♂, CAS).

INDIA: BIHAR: Pusa (1♂, BMNH, holotype of *lilliputianus*). GUJARAT: Deesa (4♀, 1♂, BMNH, including holotype of *minutus*; 1♀, 6♂, CAS).

ITALY: SICILIA: Gela (1♂, CAS).

NAMIBIA: KARIBIB DISTRICT: 23 km N Karibib (1♀, CAS). OTJIWARONGO DISTRICT: 3 km NE Kalkfeld (1♀, CAS). WINDHOEK DISTRICT: Aris, 25 km S Windhoek (1♂, CAS).

PAKISTAN: SIND: 30 km ENE Karachi on Karachi-Hyderabad road (1♀, CAS), Kirthar National Park, 150 km NE Karachi, 25°10'–26°05'N, 67°10'–67°55'E (2♂, CAS), Malir River, 5 km ESE Karachi Airport (6♂, CAS).

TUNISIA: Djerba Island (1♂, CAS).

ZIMBABWE: Sawmills (1♀, SAM, holotype of *lugubris*).

33. *Tachysphex fulvicornis* R. Turner

Tachysphex fulvicornis R. Turner, 1918:363, ♀. [Holotype: ♀, India: Bengal: Chapra (BMNH), examined.].—Pulawski, 1975:312.—Bohart and Menke, 1976:273 [listed].

Tachysphex imperfectus de Beaumont, 1940:178, ♀. [Lectotype: Egypt: Cairo area: Gebel Asfar (originally in A. Mochi coll., Cairo, now USNM), present designation, examined [de Beaumont, 1947a:210, illegally designated holotype from non-type material: ♀, Algeria: Biskra (OXFORD)]. Synonymized with *Tachysphex fulvicornis* by Pulawski, 1975:312.].—Pulawski, 1971:248 [revision, full bibliography].—de Beaumont, Bytinski-Salz, and Pulawski, 1973:9 [Israel].

DIAGNOSIS.—Like *minutus*, *sympleuron*, and the other species listed on page 61, *fulvicornis* lacks the episternal sulcus. It can be recognized by its punctatorugose frons in combination with an excessively dense punctation of tergum II (with almost no interspaces). In addition, female flagellomeres I–III are brown to red, at least partly (the type of coloration shared only with *convexus*).

DESCRIPTION.—Frons punctatorugose. Gena thick in dorsal view. Malar space present. Basal half of scape concave ventrally. Scutum punctate, punctures less than one diameter apart except many discal punctures about one diameter apart in some males; interspaces shiny. Mesopleuron punctate (somewhat rugose along hindmargin), punctures less than one diameter apart, interspaces opaque. Episternal sulcus absent. Metapleural sulcus absent or ill defined. Propodeal dorsum longitudinally ridged except rugose laterally; side ridged. Hindcoxal dorsum: inner margin not carinate. Apical tarsomeres with no spines on venter or lateral margins. Punctuation of tergum II excessively dense, practically with no interspaces.

Setae appressed (female) or suberect (male) on vertex (setal length about one midocellar diameter); appressed or nearly so on scutum; inclined between mandible and occipital carina; and oriented anterad on propodeal dorsum (except laterally where they are oriented posterolaterad and except basally where they are oriented posterad).

Head and thorax black, but mandible red mesally; in the female, also clypeal bevel and lip are reddish, and scape, pedicel, and flagellomeres I–III red or brown (all or partly). Gaster and legs black in most specimens, but femora largely, tibia partly, and gaster red in a female from Biskra, Algeria (de Beaumont, 1947a). Terga I–III silvery fasciate apically. Wings infumate.

♀.—Clypeus: bevel shorter than basomedian area; lip arcuate, not incised laterally. Vertex width 1.7–2.1 × length. Dorsal length of flagellomere I 2.5–3.2 × apical width. Foretibia densely, uniformly punctate and setose throughout, with no spines on outer surface. Forebasitarsus with seven rake spines. Pygidial plate markedly microsculptured, sparsely punctate, unsculptured at very apex in many specimens. Length 7.0–9.0 mm.

♂.—Clypeus: bevel shorter than basomedian area; lip evenly arcuate or (some specimens) shortly, obtusely pointed mesally; distance between corners 1.3 × distance between corner and orbit. Vertex width 2.1–2.6 × length. Dorsal length of flagellomere I 1.9–2.3 × apical width. Forefemoral notch glabrous. Outer margin of forebasitarsus with two to four preapical spines, of which at least one is longer than apical width of basitarsus. Venter of tarsomeres V with no spines. Sterna densely, evenly punctate and setose. Length 4.5–6.0 mm. Volsella as in *minutus* (see Figure 200).

GEOGRAPHIC DISTRIBUTION.—North Africa (Morocco to Egypt), Israel, Sudan, Saudi Arabia, Yemen, and India (Bengal: Chapra).

MATERIAL EXAMINED.—Same as in Pulawski (1971, 1975), also lectotype of *Tachysphex imperfectus* de Beaumont.

34. *Tachysphex rugicauda* Pulawski, new species

FIGURES 201, 202

NAME DERIVATION.—*Rugicauda* is a combination of two Latin words: *ruga*, a ridge; and *cauda*, a tail; with reference to

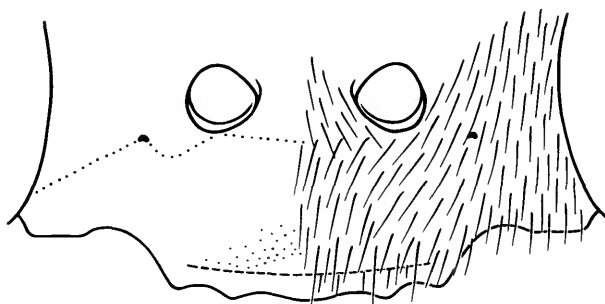


FIGURE 201.—*Tachysphex rugicauda* Pulawski, new species: female clypeus.

the unusual pygidial plate of the female.

DIAGNOSIS.—The female of *rugicauda* is unique in having the pygidial plate longitudinally ridged on its apical half (Figure 202).

DESCRIPTION.—Scutal punctures well defined, averaging less than one diameter apart (a few interspaces larger than punctures). Mesopleuron dull, with punctures compressed against each other and not well defined. Episternal sulcus incomplete. Propodeal dorsum finely, irregularly rugose, side dull, with microscopic, evanescent ridges and punctures. Hindcoxal dorsum: inner margin not carinate, at most slightly angulate basally.

Setae appressed on vertex and scutum; nearly erect at junction of occipital and hypostomal carinae (length about 0.3 of basal mandibular width); largely concealing sculpture of mesopleuron; setae of propodeal dorsum oriented anteromesally.

Head and thorax black, mandible reddish (except apically). Gaster red except apical half of pygidial plate black. Femora and tibiae black except knees reddish, tibiae reddish also distally; tarsi reddish (except basally). Terga I–III silvery



FIGURE 202.—*Tachysphex rugicauda* Pulawski, new species: female pygidial plate, holotype (scanning electron micrograph, uncoated).

fasciate apically. Wings with yellowish tinge.

♀.—Clypeus (Figure 201): lobe unusually broad; distance between lip corners about 2.0 × distance between corner and orbit; bevel about one half length of basomedian area; free margin of lip obtusely, slightly waved, not incised laterally; free margin of lateral section shallower than average in the genus. Vertex width 0.8 × length. Dorsal length of flagellomere I 1.9–2.1 × apical width. Foretibia densely, uniformly punctate and setose throughout, outer surface with several spines. Forebasitarsus with seven or eight rake spines. Apical tarsomeres: venter with one subbasal and one subapical spine. Tergum V sparsely punctate (punctures many diameters apart), apical depression impunctate, glabrous. Pygidial plate unusually broad, with broadly rounded apex, shiny and sparsely punctate basally, dull and longitudinally ridged on apical half (Figure 202); the two areas separated by shallow, transverse sulcus. Length 8.4–8.5 mm.

♂.—Unknown.

RELATIONSHIPS.—The specialized female pygidial plate (unusually broad, divided into two variously sculptured areas) is shared with *argentatus* Gussakovskij, *cockerellae* Rohwer, *desertorum* F. Morawitz, *julliani* Kohl, *vulneratus* R. Turner, and others, that were placed in the *julliani* group by de Beaumont (1936a, 1947a) and Pulawski (1971, 1988). Also *testaceipes* is a member of this lineage.

GEOGRAPHIC DISTRIBUTION.—Known only from Tamil Nadu State of India.

MATERIAL EXAMINED.—*Holotype*: ♀, India: TAMIL NADU: Nilgiri Hills, Moyar Camp, 2900 ft, May 1954, P.S. Nathan (Oregon State University, on permanent deposit to CAS).

Paratype: INDIA: TAMIL NADU: “Tranquebar,” “Mus. Western.” (1♀, ZMK).

35. *Tachysphex vulneratus* R. Turner

FIGURES 203–210

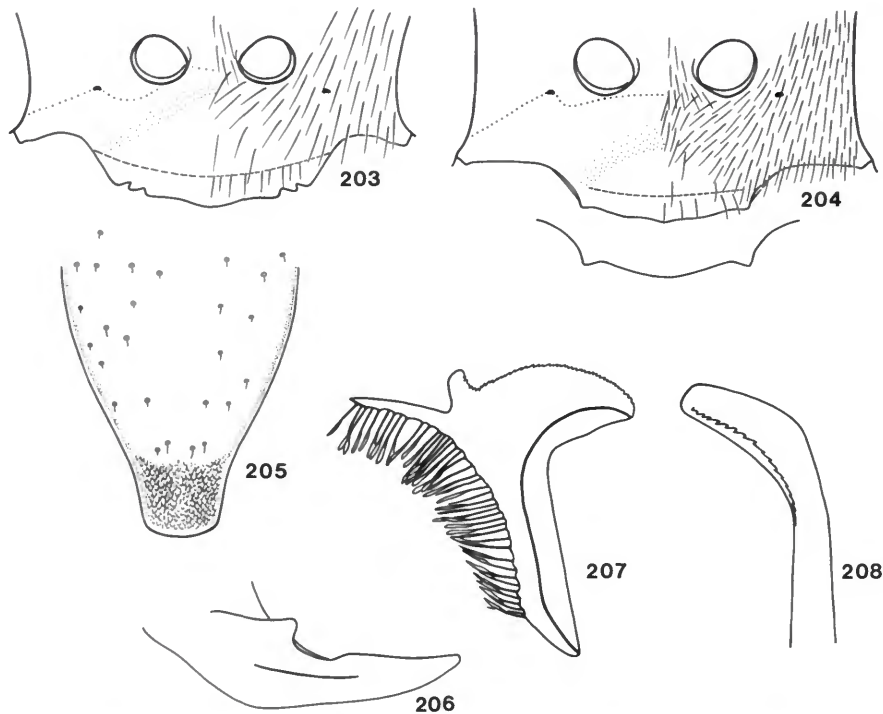
Tachysphex vulneratus R. Turner, 1917a:325, ♀, ♂. [Lectotype: ♀, East Zambia: Niamadzi River near Nawalia (BMNH), designated by Pulawski, 1975:31, examined.].—Arnold, 1923:155 [Zimbabwe; revision].—Bohart and Menke, 1976:277 [listed].

Tachysphex karrooensis Arnold, 1923:158, ♀, ♂. [Lectotype: ♀, South Africa: Willowmore (originally Bulawayo, now SAM), examined, present designation. New synonym.].—Bohart and Menke, 1976:274 [listed].

Tachysphex foucauldi de Beaumont, 1952a:190, ♂. [Holotype: ♂, Algeria: Hoggar: Tinhamour (LAUSANNE), examined. New synonym. Treated as subspecies of *Tachysphex vulneratus* by Pulawski, 1975:312; 1956:197 [Chad: Tibesti: Tao; description of ♀].—Pulawski, 1971:379 [revision].

Tachysphex vulneratus foucauldi.—Pulawski, 1975:312 [new status].—Bohart and Menke, 1976:277 [listed].

SYNONYMY.—Having studied a limited number of *foucauldi* and *vulneratus*, Pulawski (1975) concluded that they were subspecies. A study of additional material indicates that the supposed subspecific differences are not constant. Consequently, I no longer recognize subspecies in *vulneratus* and regard the two names as synonyms.



FIGURES 203–208.—*Tachysphex vulneratus* R. Turner: 203, female clypeus; 204, male clypeus, with outline showing individual variation; 205, female pygidial plate; 206, male mandible; 207, voisella; 208, penis valve (inner side).

LECTOTYPE SELECTION.—Arnold (1923) mentioned a single type in the original discussion of *karooensis*, but he labeled a female and a male as types. Because of this inconsistency, I hereby designate the female as the lectotype.

DIAGNOSIS.—The female of *vulneratus* has a unique combination: the pygidial plate is shiny between punctures but contrastingly microsculptured apically, broadly rounded apically (Figures 205, 209); and the clypeal lip has two lateral incisions on each side (Figure 203).

The male has an unusual mandible: the trimmal carina is deeply emarginate, with a large subbasal tooth (Figure 206). The mandible is similar in *cubanus* Pulawski (Cuba, Jamaica), *denisi* de Beaumont (western Palearctic), *dominicanus* Pulawski (Cuba, Hispaniola), and *haematopus* (Sri Lanka). In *vulneratus*, however, the foretarsus has a well-developed rake and sterna IV–VI are largely impunctate and glabrous (also apical depressions of sterna II and III are impunctate and glabrous). In the other species, the foretarsus has no rake and sterna are densely punctate and setose throughout. Additional recognition features of *vulneratus* are: vertex width markedly less than length, gaster black (red apically in South African specimens) and legs largely red.

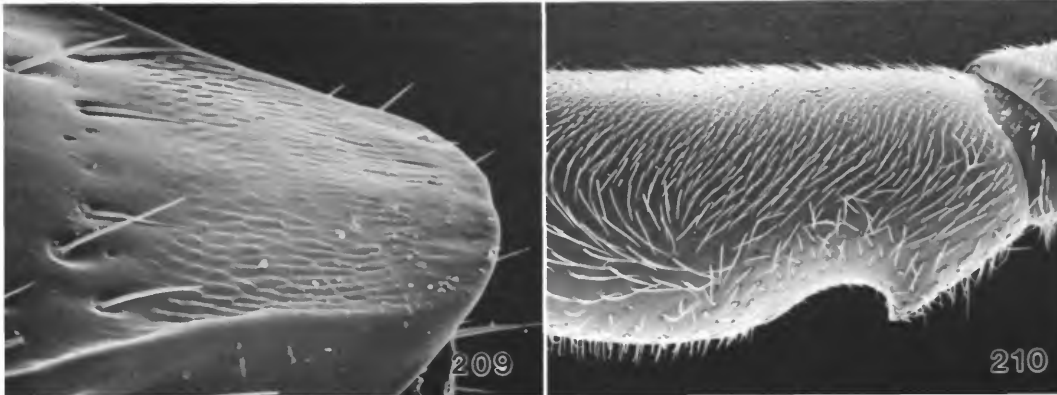
DESCRIPTION.—Scutum punctate, disk punctures averaging from less than one to about two or three diameters apart; mesopleural sculpture variable: integument of most specimens with well-defined punctures (which average less than one

diameter apart), but punctures compressed against each other in specimens from Ivory Coast, Ghana, and Togo (integument thus appearing regularly areolate). Episternal sulcus evanescent anteroventrally or incomplete. Propodeal dorsum irregularly longitudinally ridged to rugose, side ridged (ridges absent in smallest specimens). Hindcoxa: inner margin not expanded basally. Stenum I with median carina that is well defined apically.

Setae varying on vertex and scutum: nearly appressed in most specimens, but erect on vertex and nearly so on scutum in individuals from Namibia and South Africa; those adjacent to hypostomal carina erect, about $0.3 \times$ basal mandibular width; not obscuring integument on mesopleuron; most setae of propodeal dorsum inclined anterad, but lateral setae inclined posterad and joining apicomesally.

Head and thorax black, but mandible yellowish red mesally and pronotal lobe in most specimens yellowish. Gaster red apically in most specimens, but all black in specimens from Asia, Burkina Faso, and Chad. Femora red (except forefemur black basally) to largely black (only femoral apex red); tibiae and tarsi red. Wings hyaline, tegula and humeral plate light brown.

♀.—Clypeus (Figure 203): bevel longer or shorter than basomedian area; lip sinuate or arcuate, with two lateral incisions on each side. Vertex width $0.7\text{--}0.8 \times$ length. Dorsal length of flagellomere I $2.4\text{--}2.7 \times$ apical width. Forefemoral



FIGURES 209, 210.—*Tachysphex vulneratus* R. Turner: 209, apex of female pygidial plate, oblique view; 210, base of male forefemur.

venter, in most specimens, with punctures that are 1–2 diameters apart (several diameters apart in females from Burkina Faso and Chad). Foretibia densely, uniformly punctate and setose throughout or (females from Burkina Faso and Chad) outer surface glabrous; outer surface with spines. Forebasitarsus with nine or ten rake spines. Venter of apical tarsomeres with one preapical spine and a few basal spines. Tergum V sparsely (most specimens) to densely punctate except apical depression unsculptured. Pygidial plate broad, somewhat constricted preapically, with broadly rounded apex; surface mostly unsculptured except sparsely punctate, but the constricted portion evenly alutaceous, impunctate (Figures 205, 209); microsculpture evanescent in some specimens. Length 8.5–10.5 mm.

♂.—Clypeus (Figure 204): bevel shorter than basomedian area in most specimens, as long as basomedian area in some; free margin of lip arcuate, with prominent corner; distance between corners 1.2–1.3 × distance between corner and orbit. Mandible (Figure 206): trimmal carina with big subbasal tooth, conspicuously emarginate distad of tooth. Vertex width 0.5–0.7 × length. Dorsal length of flagellomere I variable: 2.0 × apical width in Thai, 1.2–1.7 × in Indian, 1.7–1.9 × in West African, and 1.5–1.9 × in South African specimens. Forefemoral notch (Figure 210) with pubescent bottom. Outer margin of forebasitarsus with three to six preapical spines, most or all of which are longer than basitarsus width; apical spine of foretarsomere II longer than foretarsomere III. Apical tarsomeres with no ventral or lateral spines or (some specimens) with one preapical spine on venter. Punctures of tergum VII basomedially several diameters apart. Sterna III–VI largely asetose. Volsella: Figure 207. Penis valve: Figure 208. Length 6.1–10.8 mm.

Tibiae and tarsi red, femora all black (except apically) to all red. Gastral terga I–IV or I–V silvery fasciate apically. Frontal and clypeal vestiture golden.

GEOGRAPHIC DISTRIBUTION.—Africa north to Tropic of Cancer, India to Thailand.

RECORDS.—ALGERIA: HOGGAR: Tinhamour (1♂, LAU-

SANNE, holotype of *foucauldi*).

BURKINA FASO: Pala and Soumouso near Bobo Dioulasso (1♀, 1♂, CAS).

CHAD: TIBESTI: Tao (1♀, BMNH).

GHANA: Kawampe, 8°30'N, 1°35'W, 45 km N Kintampo (1♀, 19♂, CAS), 30 km S Kintampo (3♂, CAS), 55 km N Tamale (1♂, CAS), Techiman (18♂, CAS).

INDIA: RAJASTHAN: Mount Abu (1♂, CAS). KARNATAKA: near Yelburga (1♂, ZMK). MAHARASHTRA: Krishnagiri Upawan National Park, 9–12 air km NNW Bombay International Airport (6♂, CAS).

IVORY COAST: 50 km N Bouaké (1♂, CAS), 20 km W Boundiali (13♂, CAS), Ferkessedougou (1♂, CAS), 56 km N Niakaramandougou (4♂, CAS), 30 km S Odienné (3♂, CAS), 40 km S Toumodi (1♂, CAS), 50 km S Yamassoukro (1♂, CAS).

NAMIBIA: REHOBOTH DISTRICT: 15 km N Kalkrand (2♀, 2♂, CAS), 9 km S Rehoboth (2♂, CAS). SWAKOPMUND DISTRICT: Swakop River mouth (1♀, 1♂, CAS), Swakop River, 10 km E Swakopmund (1♂, CAS). WINDHOEK DISTRICT: Aris, 25 km S Windhoek (3♀, 1♂, CAS), 2 km S Aris (1♂, CAS).

SOUTH AFRICA: CAPE PROVINCE: Capetown (1♂, CAS), Outdshoorn (1♂, CAS), Stellenbosch (1♂, CAS), Wellington (5♀, 13♂, CAS), Willowmore (Arnold, 1923). TRANSVAAL: Ellisras (1♂, CAS).

THAILAND: KANCHANABURI: Kanchanaburi (1♂, CAS); Lam Ta Pen River bank, 5 km NW Lat Ya (4♂, CAS). LOEI: Loei (1♂, CAS).

TOGO: Amaoudé, 17 km N Sokodé (3♂, CAS), 14 km S Atakpamé (3♂, CAS), 5 km W Sokodé (10♀, 3♂, CAS), 12 km S Sokodé (3♂, CAS), 10 km N Wahala (= 30 km S Atakpamé) (1♀, CAS).

ZAMBIA: Niamadzi River near Nawalia (1♀, BMNH, holotype of *vulneratus*), mid and upper Luangwa Valley (Turner, 1917a).

ZIMBABWE: Bulawayo (Arnold, 1923), Hillside (Arnold, 1923).

36. *Tachysphex testaceipes* Bingham

FIGURES 211-219

Tachysphex testaceipes Bingham, 1897:193, ♂. [Lectotype: ♂, Burma: Tenasserim: Thaunguin Valley (BMNH), present designation, examined.].—Giner Marf, 1945:856 (India).—Bohart and Menke, 1976:277 [listed].

DIAGNOSIS.—*Tachysphex testaceipes* is characterized by the setae erect and sinuous on scape, vertex, and thorax, but short, appressed, on tergum I. In the female, the pygidial plate is unusually broad (Figure 216), and in the male the foretarsal rake is well developed, and sterna are partly asetose. *Tachysphex indicus* is similar, but in *testaceipes* the hindwing vein cu-a is vertical (and not inclined), the forebasitarsus is not expanded apically, and male tergum VII is densely punctate mesally and sparsely punctate laterally (Figure 219). The conspicuously microareolate thoracic integument of *testaceipes* (Figure 215) is a subsidiary recognition feature, and the male genitalia are unusual and distinctive (Figures 213, 214, 217).

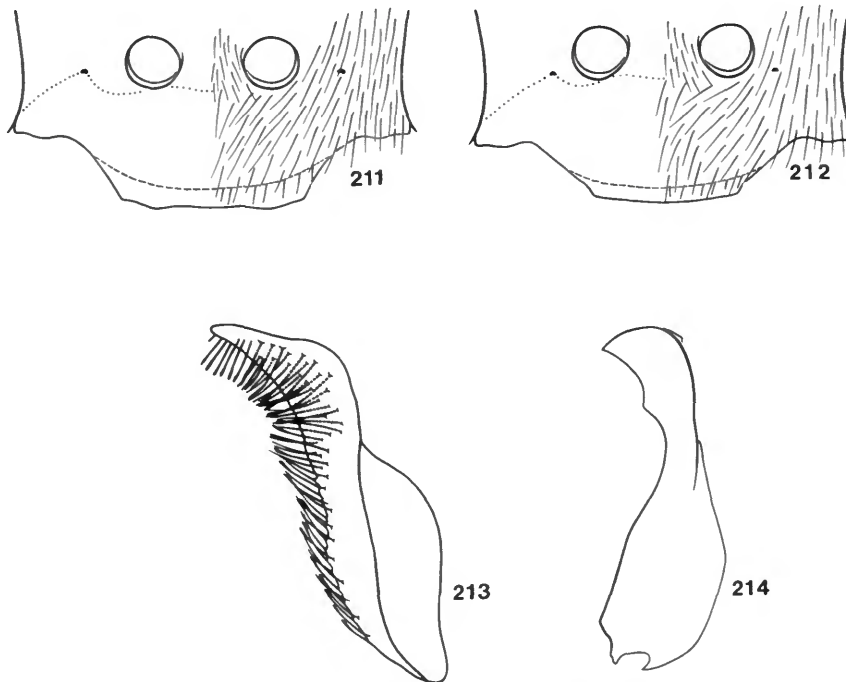
DESCRIPTION.—Head and thorax dull, conspicuously microsculptured (Figure 215), thorax with ill-defined punctures that are more than one diameter apart on scutal disk and mesopleuron; in female averaging several diameters apart on mesothoracic venter. Episternal sulcus complete. Propodeal dorsum microsculptured, irregularly rugose; side ridged or (many males) irregularly microsculptured. Hindcoxal dorsum: inner margin carinate basally, carina not expanded.

Setae erect on vertex, scape, along hypostomal carina, and on scutum (setal length, on vertex, $0.7-0.9 \times$ basal mandibular width); mesopleural setae somewhat sinuous; propodeal setae oriented apicomersed, but almost vertical basomedially.

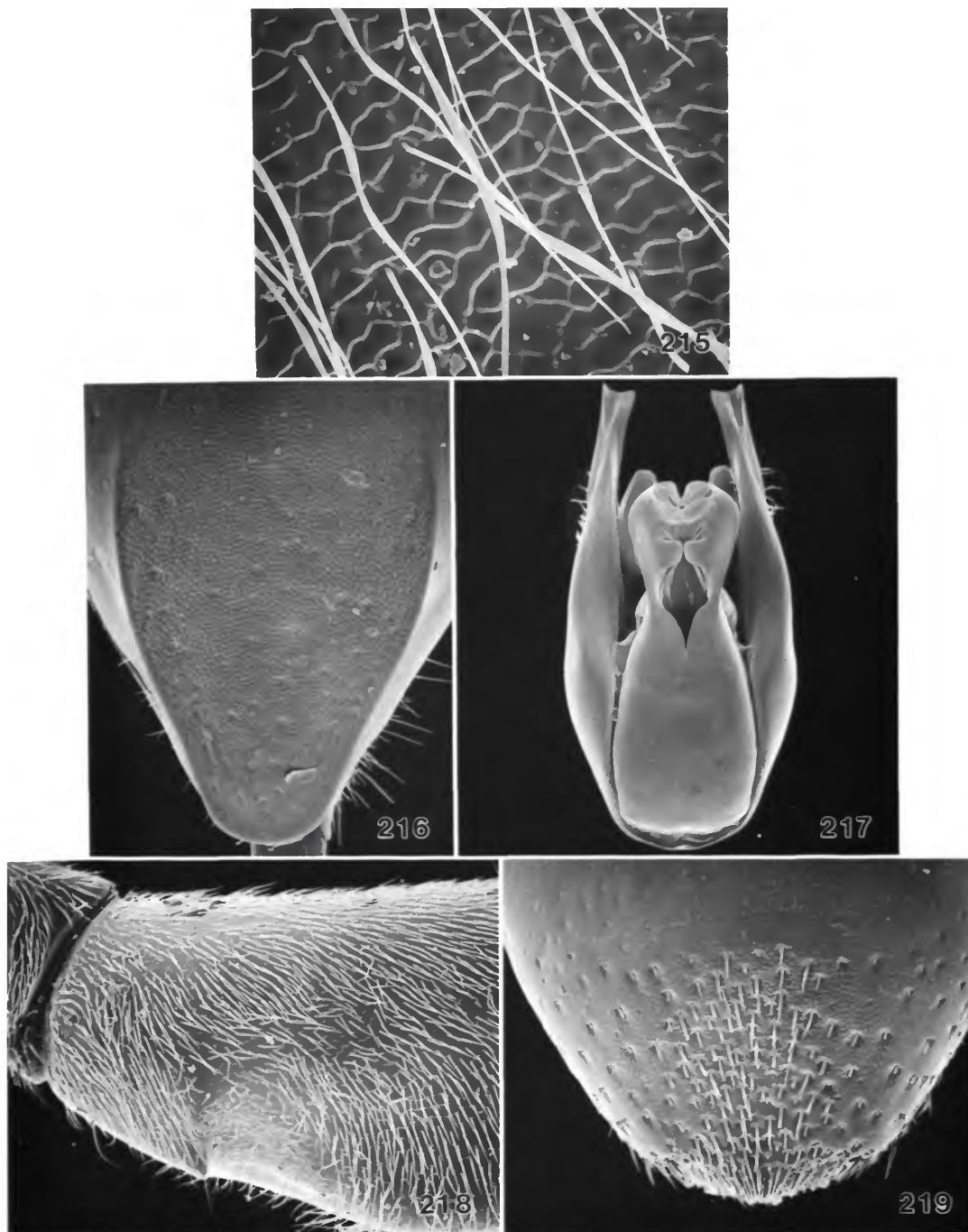
Body black, female pygidial plate and tergum VII of many males reddish; tarsi red brown (all or mesally). Terga I-V silvery fasciate apically. Wings hyaline.

♀.—Clypeus (Figure 211): flat, bevel absent; lip arcuate, not incised laterally. Vertex width $2.0 \times$ length. Dorsal length of flagellomere I $2.0 \times$ apical width. Forefemoral venter finely punctate, punctures more than one diameter apart. Foretibia densely, uniformly punctate and setose throughout, outer surface with spines. Forebasitarsus with seven or eight rake spines. Apical tarsomeres: venter with two basomedian spines and one long, preapical seta. Apical depression of tergum V impunctate, glabrous. Pygidial plate unusually broad, uniformly microareolate except apically (Figure 216). Length 9.5 mm.

♂.—Clypeus (Figure 212): bevel not differentiated; lip weakly arcuate, corners well defined, but not prominent; distance between corners $1.5-1.7 \times$ distance between corner and orbit. Vertex width $1.7-1.8 \times$ length. Dorsal length of flagellomere I $1.8-1.9 \times$ apical width. Forefemoral notch shallow, pubescent (Figure 218). Outer margin of forebasitarsus with five or six preapical spines, all or most spines more than twice basitarsus width. Apical tarsomeres with one thin spine on venter and no spines on lateral margins. Tergum VII



FIGURES 211-214.—*Tachysphex testaceipes* Bingham: 211, female clypeus; 212, male clypeus; 213, volsella; 214, penis valve (inner side).



FIGURES 215-219.—*Tachysphex testaceipes* Bingham: 215, mesopleural sculpture; 216, female pygidial plate; 217, male genitalia dorsally; 218, base of male forefemur; 219, male tergum VII.

with large punctures that are dense mesally and sparse laterally (Figure 219). Sterna III-VI largely glabrous, setose apically and laterally. Length 7.0-8.0 mm. Genitalia unusually large, penis valve markedly thickened basally (Figure 217), with no

apicoventral teeth (Figure 214), volsella setose along the ventral margin (as usual in the genus), but also on a large portion of the inside surface (Figure 213).

Frontal setae silvery.

RELATIONSHIPS.—The unusually broad pygidial plate of the female, clearly an apomorphy, indicates that *testaceipes* is related to species in the *julliani* group of de Beaumont (1936a, 1947a) and Pulawski (1971, 1988), such as *argentatus* Gussakovskij, *cockerellae* Rohwer, *desertorum* F. Morawitz, *julliani* Kohl, and *vulneratus* R. Turner.

GEOGRAPHIC DISTRIBUTION.—Burma and Thailand; record from India needs verification.

RECORDS.—BURMA: TENASSERIM: Thaunguin Valley (1 ♂, BMNH, lectotype of *testaceipes*), Yunzalin Valley (1 ♂, BMNH).

INDIA: MAHARASHTRA: Khandala near Bombay (Giner Marí, 1945; the identification may have been incorrect but the

voucher specimen cannot be found in MNCN).

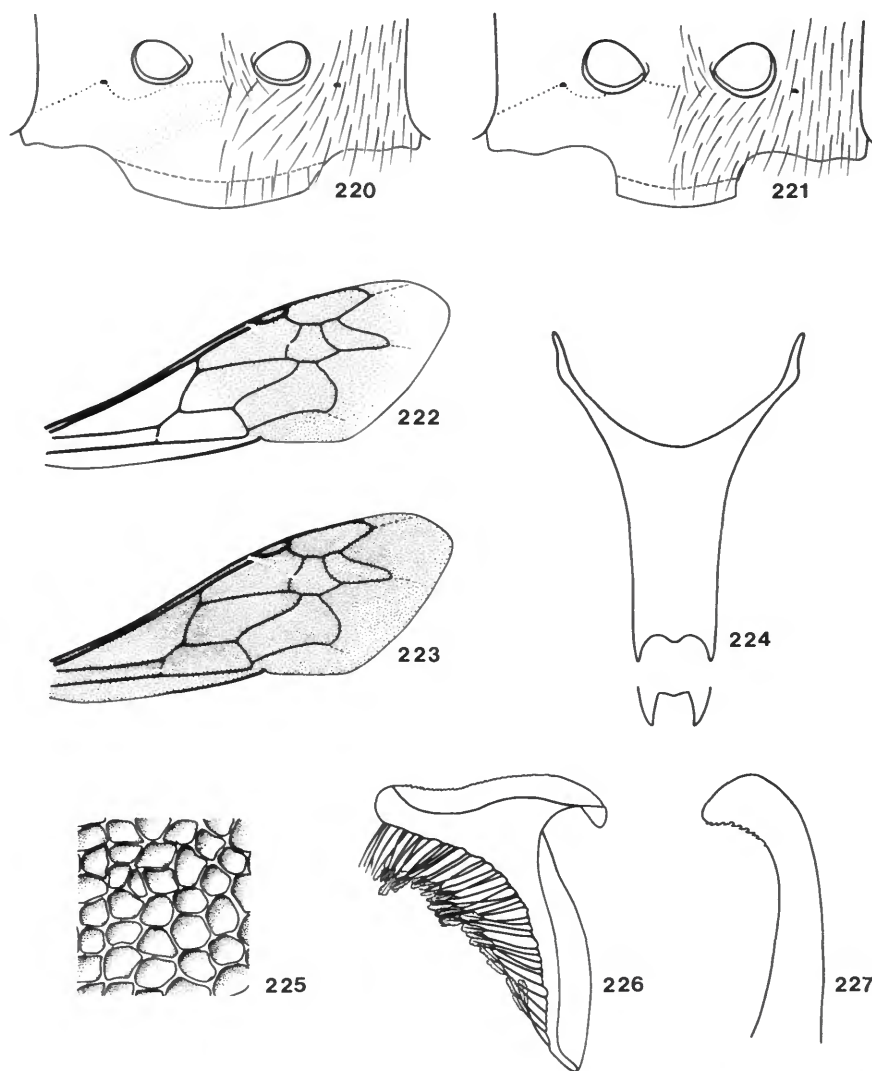
LAOS: VIETIANE PROVINCE: Tha Ngone (2♀, BISH, CAS).

THAILAND: TAK PROVINCE: Sam Ngao at Bhumiphol Dam (2♂, CAS; 1♀, 2♂, ZMK).

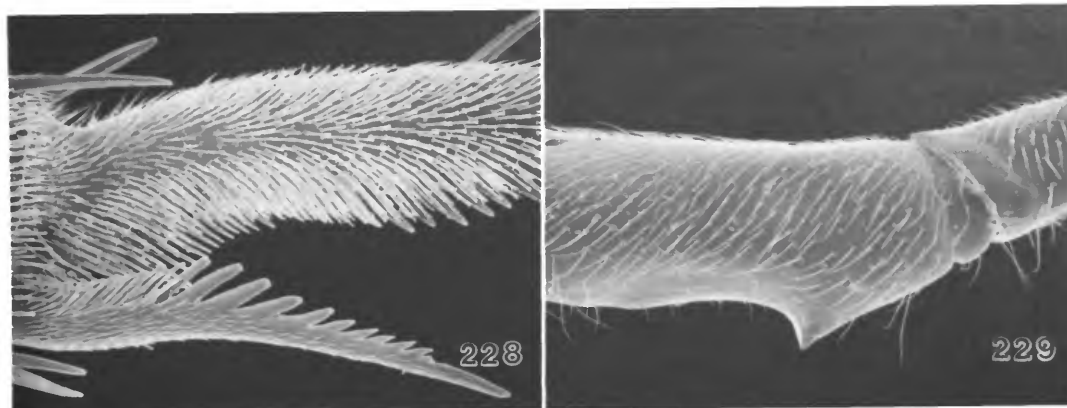
37. *Tachysphex schmiedeknechti* Kohl

FIGURES 220–229

Tachysphex Schmiedeknechti Kohl, 1883:170, ♀ [incorrect original capitalization. Syntypes: Greece: Attica: Egina, also spelled Aegina, now Aiyina (NHMW), examined.].—Gussakovskij, 1952:240.—Pulawski, 1971:389 [revision, full bibliography]; 1975:312.—Miartseva, 1972:112 [nest parasite]; 1976:77 [nesting habits].—Gayubo and Mingo, 1988:82 [Spain: Córdoba Province].



FIGURES 220–227.—*Tachysphex schmiedeknechti* Kohl: 220, female clypeus; 221, male clypeus; 222, forewing of a female from Egypt; 223, forewing of a male from Morocco; 224, male sternum VIII, with outline showing individual variation; 225, scutal sculpture; 226, volsella; 227, penis valve (inner side).



FIGURES 228, 229.—*Tachysphex schmiedeknechti* Kohl: 228, inner hindtibial spur; 229, base of male forefemur.

Tachysphex psilopus Kohl, 1884:371, ♂. [Holotype or syntypes: ♂, Egypt: Sinai Peninsula: Tor (NHMW), examined. Synonymized with *Tachysphex schmiedeknechti* by de Beaumont, 1940:171.]—Bingham, 1898:104 (Yemen).

Tachysphex heliophilus Nurse, 1909:515, ♀, ♂. [Lectotype: ♀, India: Gujarat: Deesa (BMNH), designated by Pulawski, 1975:312, examined. Synonymized with *Tachysphex schmiedeknechti* by Pulawski, 1975:312.]

Tachysphex ornatipennis Gussakovskij, 1933:283, ♂. [Holotype: ♂, former Persian province Seistan, now part of Iran and Afghanistan: no specific locality (ZIN), examined. Synonymized with *Tachysphex schmiedeknechti* by Pulawski, 1971:389.]

Tachysphex fasciipennis Gussakovskij, 1933:283, ♂. [Holotype: ♂, Turkmenistan: Farab (ZIN), examined. Synonymized with *Tachysphex schmiedeknechti* by Pulawski, 1971:389.]

Tachysphex calopteryx Gussakovskij, 1933:284, ♀. [Holotype: ♀, Turkmenistan or Uzbekistan: sands Kara-Dzhuzgun in Aralian part of Kara Kum Desert (ZIN), examined. Synonymized with *Tachysphex schmiedeknechti* by Gussakovskij, 1952:240.]

Tachysphex schmiedeknechti satanas Pulawski, 1971:393, ♀, ♂. [Holotype: ♀, Syria: Ramadan near Damascus (A. Mochi coll., Rome), examined. New synonym.]

SYNONYMY.—Pulawski (1971) described as *schmiedeknechti satanas* Syrian specimens with all black wings and all black male gasters. Since then, I have observed other types of variation in gastral color (see below) and found all black wings in Moroccan specimens that have a red gaster. I see no need now for formal recognition of various color forms and consequently I regard *satanas* as a synonym of *schmiedeknechti*.

DIAGNOSIS.—*Tachysphex schmiedeknechti* can be recognized by the conspicuously reticulate sculpture of its scutum and mesopleuron (Figure 225), as well as widely spaced rays of the inner hindtibial spur (Figure 228). A similar reticulate mesopleuron is found in *mediterraneus*, while *micans* (Radoszkowski) (Morocco to Iran) and some *pulcher* Pulawski (Turkey to Tajikistan) have a similar hindtibial spur. The combination of the two characters, however, is unique to *schmiedeknechti*. A dark transverse band on the forewing found in most specimens is a subsidiary recognition feature (forewing all infumate in occasional specimens).

DESCRIPTION.—Scutum and mesopleuron characteristically reticulate (Figure 225). Episternal sulcus effaced anteroventrally. Propodeal dorsum rugose, irregularly ridged longitudinally near base. Hindcoxal dorsum: inner margin carinate basally, carina not expanded. Inner spur of hindtibia with thick, widely spaced rays (Figure 228). Apical tarsomeres with several long, erect spines on venter, with no spines on lateral margins.

Setae (figures in parentheses refer to basal mandibular width): erect, sinuous on vertex (0.4–0.7) and along hypostomal carina (0.7–0.8); sinuous, suberect on frons and scape; evenly curved, oriented posterad on scutum except suberect, sinuous anteriorly; sinuous, oriented posterad on propodeal dorsum except oriented anterad anteromesally; nearly erect on midfemoral venter; suberect on tergum I basolaterally.

Head and thorax black. Legs black (tarsal apex reddish), hindtibia partly red in some males; hindfemur (all or partly) and hindtibia red in males from Ghana, also midtibia in some specimens. Gaster all black in most females and some Syrian males described as *schmiedeknechti satanas* by Pulawski (1971), terga I–III red in Ghanaian females and most males. Terga I–III silvery fasciate apically in female, nonfasciate in male. Forewing in most specimens with dark, transverse band (Figure 222) that is faint in some females, conspicuously yellow between band and base in Ghanaian specimens; all wings markedly infumate in some specimens from Morocco and Syria (Figure 223).

♀.—Clypeus (Figure 220): middle section irregularly punctate (large punctures intermixed with small), bevel not differentiated from basomedian area; lip arcuate, not incised laterally. Vertex width 1.0–1.2 × length. Dorsal length of flagellomere I 2.5–3.2 × apical width. Punctures of forefemoral venter several diameters apart. Foretibia densely, uniformly punctate and setose throughout or punctures and setae sparse on outer surface; outer surface with one or two spines. Forebasitarsus with seven or eight rake spines. Pygidial plate unsculptured except for a few sparse punctures, slightly constricted near

apex. Length 8.0–11.0 mm.

♂.—Clypeus (Figure 221): middle section irregularly punctate (large punctures intermixed with small ones), bevel not differentiated from basomedian area; lip evenly arcuate; lip corner nonprominent; distance between corners 0.9–1.0 × distance between corner and orbit. Vertex width 0.8–1.0 × length. Dorsal length of flagellomere I 2.4–3.0 × apical width. Forefemoral notch glabrous, its basal margin pointed, apical margin ill defined (Figure 229). Outer margin of forebasitarsus with four to seven preapical spines. Sterna asetose (only with erect setae that delimit apical depressions); apical margin of sternum VIII in most specimens with median expansion (Figure 224). Volsella: Figure 226. Penis valve: Figure 227. Length 6.0–10.0 mm.

Frontal setae golden in large specimens, silvery (all or partly) in small ones.

GEOGRAPHIC DISTRIBUTION.—North Africa south to Ghana and Togo, Spain, Greece, Cyprus, southern Turkey, Syria, Yemen, Transcaspia (Kazakhstan, Uzbekistan, Turkmenistan, and Tajikistan), Iran, northwest India.

RECORDS (the localities listed in Pulawski, 1971, are not repeated).—BURKINA FASO: Pala near Bobo Dioulasso (1 ♂, CAS).

GREECE: IONIAN ISLANDS: Zakynthos (1 ♂, CAS). PELOPONNESE: Messenia: Finikous (1 ♂, CAS).

GHANA: Kawampe, 8°30'N, 1°35'W, 45 km N Kintampo (1 ♀, 6 ♂, CAS).

INDIA: GUJARAT: Deesa (1 ♀, BMNH, lectotype of *heliophilus*).

NIGER: Say (1 ♂, CAS).

TOGO: 5 km W Sokodé (1 ♀, CAS).

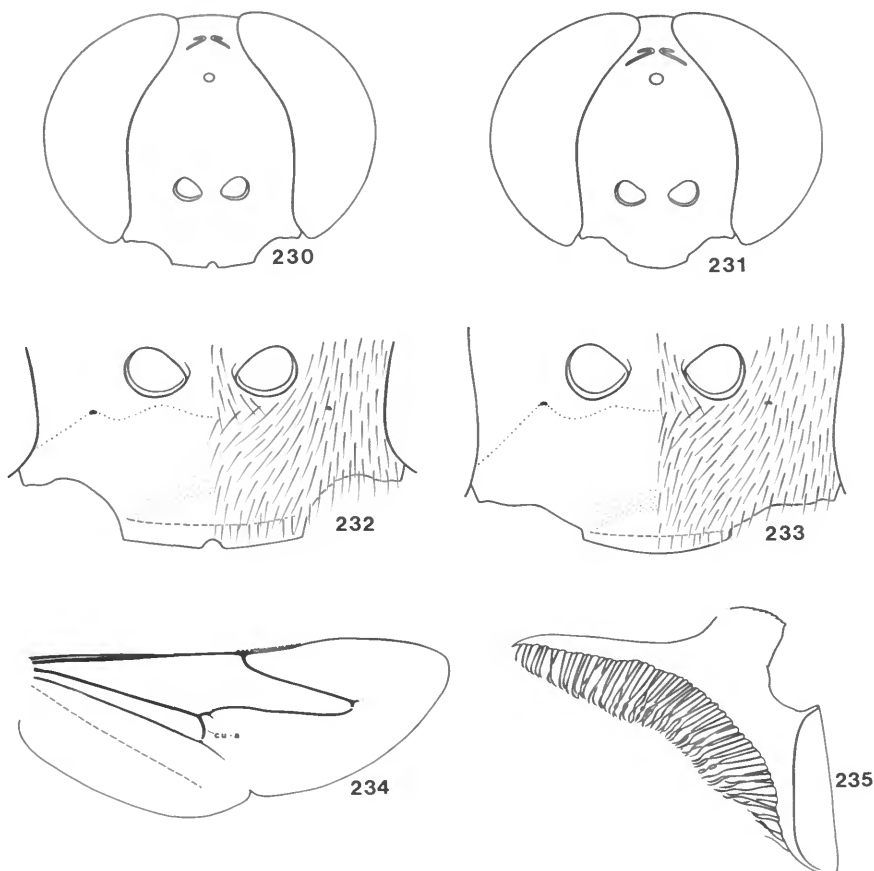
YEMEN: Aden (Bingham, 1898).

38. *Tachysphex erythropus* (Spinola)

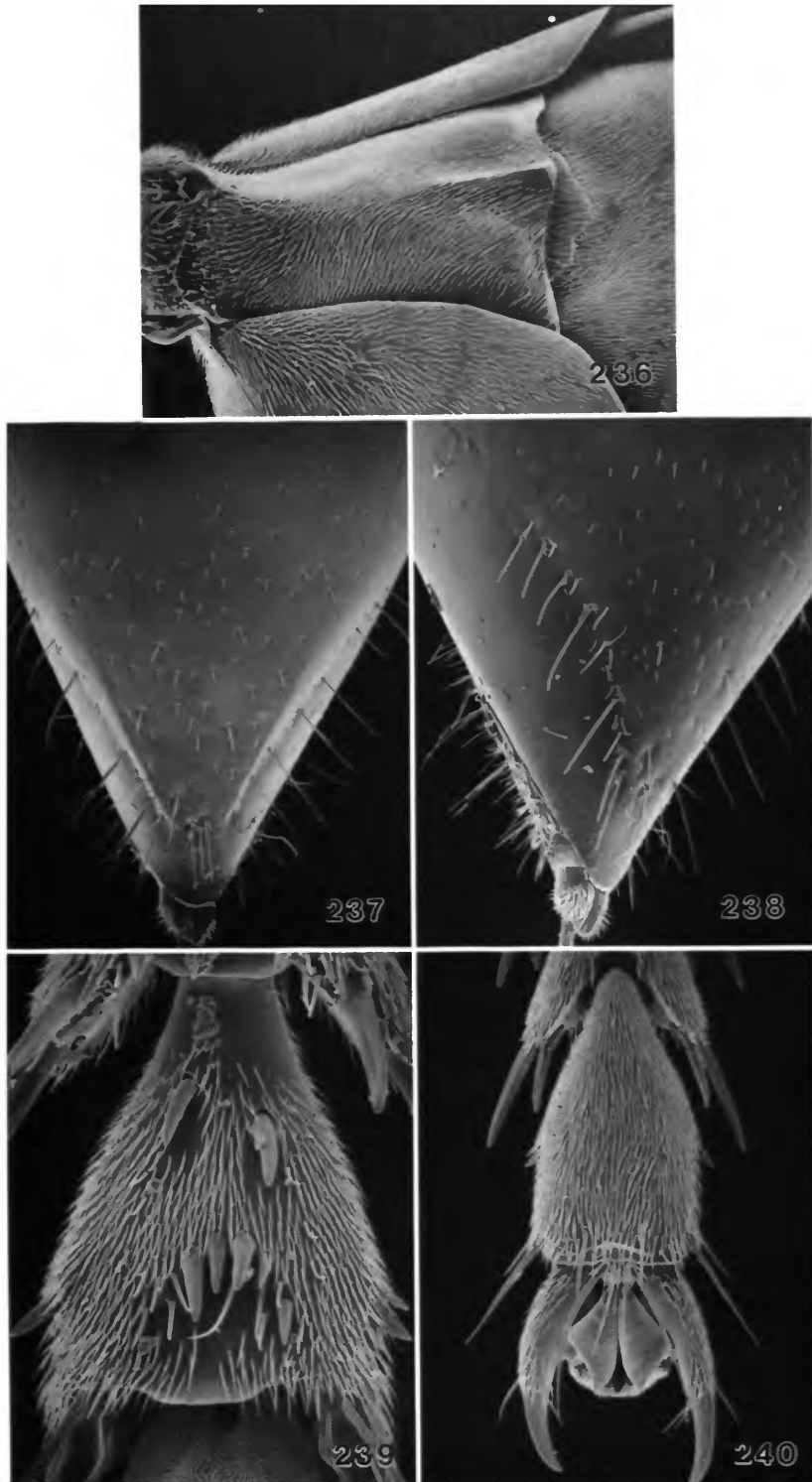
FIGURES 230–243

Lyrops erythropus Spinola, 1839:479, "♀" = ♂. [Holotype: ♂, Egypt: no specific locality (TORINO), examined by de Beaumont, 1952b:47. Transferred to *Tachysphex* by Kohl, 1883:175.]

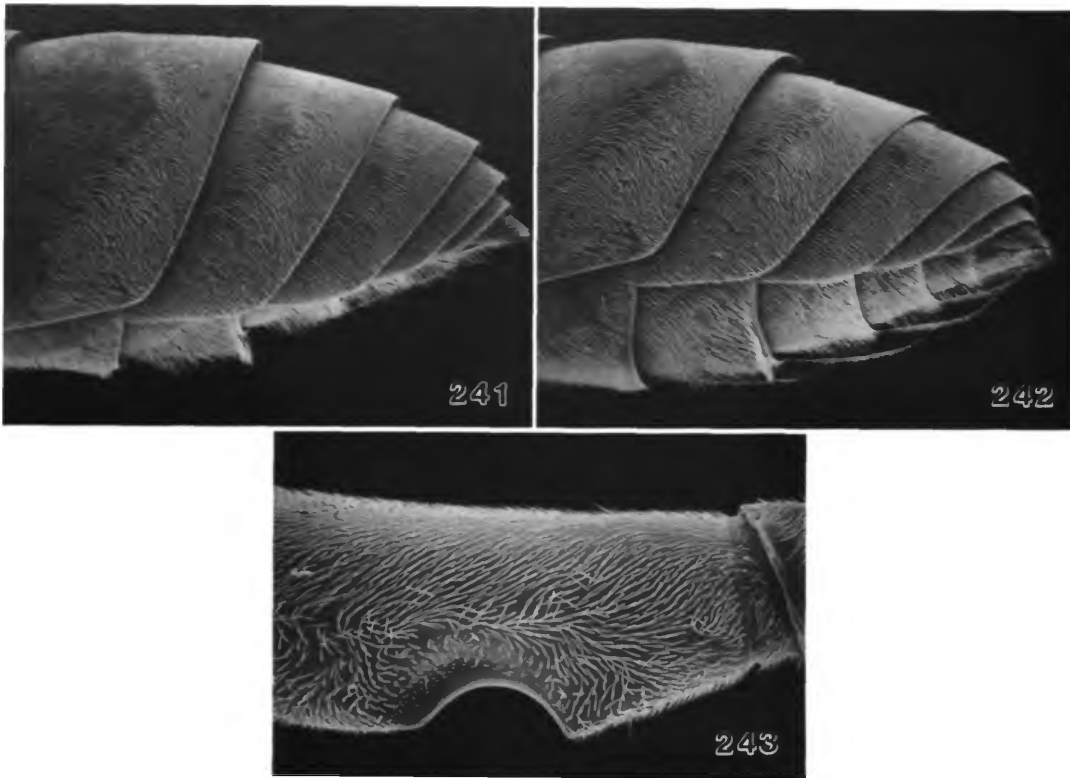
Tachysphex erythropus.—Kohl, 1883:175 [new combination].—Pulawski, 1971:408 [revision, full bibliography]; 1975:313.



FIGURES 230–235.—*Tachysphex erythropus* (Spinola): 230, female head frontally; 231, male head frontally; 232, female clypeus; 233, male clypeus; 234, hindwing; 235, volsella.



FIGURES 236–240.—*Tachysphex erythropus* (Spinola): 236, base of gastral venter, obliquely from below; 237, female pygidial plate, dorsal view; 238, female pygidial plate, oblique lateral view; 239, female hindtarsomere V ventrally; 240, same, dorsally.



FIGURES 241–243.—*Tachysphex erythropus* (Spinola): 241, male gaster in profile; 242, male gaster obliquely from below; 243, base of male forefemur.

Tachytes Maracandica Radoszkowski, 1877:26, ♂. [Incorrect original capitalization and termination. Lectotype: ♂, Uzbekistan: Durman-kul (MOSCOW), designated by Pulawski, 1971:411, examined. Synonymized with *Tachysphex erythropus* by Pulawski, 1971:408, 411.]

Tachytes flavogeniculatus Taschenberg, 1880:778, ♂. [Lectotype: ♂, Ethiopia: no specific locality (HALLE), present designation. New synonym. Transferred to *Tachysphex* by Kohl, 1885:402.]

Tachysphex flavogeniculatus.—Kohl, 1885:402 [new combination, listed].—Dalla Torre, 1897:679 [listed].—Arnold, 1923:175 [listed].—Bohart and Menke, 1976:273 [listed].

Tachysphex heliopolites Morice, 1897:306, ♂, ♀ [♂ = *Tachysphex albocinctus*]. [Lectotype: ♀, Egypt: Zeitoun near Cairo (OXFORD), designated by Pulawski, 1971:411, examined. Synonymized with *Tachysphex erythropus* by de Beaumont, 1947a:172.]

Tachysphex inventus Nurse, 1903:516, ♂. [Lectotype: ♂, India: Gujarat: Deesa (BMNH), designated by Pulawski, 1975:313, examined. Synonymized with *Tachysphex erythropus* by Pulawski, 1975:313.]

Tachysphex mantivora de Beaumont, 1940:169, ♀, ♂ [incorrect original termination]. [Lectotype: ♀, Greece: no specific locality (NHMW), designated by de Beaumont, 1947a:175, not examined. Synonymized with *Tachysphex erythropus* by de Beaumont, 1952b:47.]

SYNONYMY.—The two syntypes of *Tachytes flavogeniculatus* Taschenberg are strongly worn and have lost most of their thoracic pilosity, perhaps due to improper preservation method. The yellowish costal vein and tibial bases may be another artifact. The diagnostic characters of the species are nevertheless easily recognized.

DIAGNOSIS.—*Tachysphex erythropus* is characterized by the following: hindwing vein cu-a inclined, anterior end closer to wing base than posterior end (Figure 234); sternum I posteriorly with obtuse, longitudinal carina (Figure 236), and male sterna III–VI with conspicuous, appressed setae on apical depressions (Figures 241, 242). Other species are similar (see “Relationships” under *selectus*, page 74), but *erythropus* differs as follows: in the female, the pygidial plate is reduced, nonmargined laterally (Figures 237, 238) but delineated by a row of setigerous punctures; and in the male, the forefemoral notch is compressed to a narrow crest and has no basal tuft of erect setae (Figure 243), and most seta of sterna III–VI are not agglutinated.

DESCRIPTION.—Gena unusually narrow in dorsal view. Scutal punctures less than one diameter apart or discal punctures up to about two diameters apart. Mesopleuron dull, markedly microsculptured, with shallow, ill-defined punctures (in male, punctures many diameters apart adjacent to midcoxa). Episternal sulcus incomplete. Propodeal dorsum irregularly rugose, side ridged, but ridges partly evanescent in some specimens. Hindwing (Figure 234): crossvein cu-a inclined; jugal lobe enlarged, jugal excision absent. Hindcoxal dorsum: inner margin not carinate.

Setae: appressed on interocellar area and scape; erect on vertex (about one midocellar diameter long); suberect to erect

along hypostomal carina (about $0.4 \times$ basal mandibular width); forecoxal and most thoracic setae straight except angled apically, but scutal setae straight (and nearly appressed); oriented posterad (nearly erect) on propodeal dorsum, about $0.4 \times$ basal mandibular width.

Head, thorax, and gaster black, mandible red mesally. Color of legs sexually dimorphic (see below). Terga silvery fasciate apically: I-IV in female, I-III (most males) or I and II (some males). Wings hyaline.

♀.—Labrum emarginate mesally. Clypeus (Figures 230, 232): bevel markedly shorter than basomedian area; lip almost straight, emarginate mesally but not incised laterally (median notch invisible in worn specimens). Vertex width $0.9-1.0 \times$ length. Dorsal length of flagellomere I $1.8-2.1 \times$ apical width. Outer surface of foretibia with thin spines. Forebasitarsus with 14-16 spines divided into a basal and an apical group. Apical hindtarsomeres: lateral margins with one or two spines at midlength (Figure 240), venter with two basal and three subapical spines. Pygidial plate reduced (nonmargined), but delineated by row of setigerous punctures. Length 9-14 mm.

Forefemur black except red apically, mid- and hindfemora partly to largely red; tibiae and tarsi red.

♂.—Clypeus (Figures 231, 233): bevel markedly shorter than basomedian area; free margin of lip weakly arcuate, with weakly indicated lateral corner; distance between corners $1.2-1.4 \times$ distance between corner and orbit. Vertex width $0.3-0.6 \times$ length. Dorsal length of flagellomere I $1.6-2.0 \times$ apical width. Forefemoral notch moderately large, without basal tuft of erect setae, its bottom glabrous, compressed into narrow crest (Figure 243). Outer margin of forebasitarsus with

no preapical spines. Venter of apical tarsomeres with one preapical spine. Apical depression of sterna III-VI with subappressed setae (Figures 241, 242) that are agglutinated only on sternum III apicomesally; setae markedly longer than those on remaining surface. Volsella: Figure 235. Length 8.5-13.0 mm.

Femora black (except apically), tibiae and tarsi red (tibiae partly darkened in some specimens, starting with hindtibiae). Frontal and clypeal setae gold except silvery in smallest specimens.

GEOGRAPHIC DISTRIBUTION.—North Africa (Morocco to Egypt) to Sudan, Ethiopia, and Kenya; Iberian Peninsula and Eastern Mediterranean Basin (Greece, Bulgaria, Cyprus, Turkey, Israel); Arabian Peninsula, Azerbaijan and Transcaspia (Kazakhstan, Uzbekistan, Turkmenistan, and Tajikistan); Iran, India (Gujarat only).

RECORDS (localities in Pulawski, 1971, are not repeated here).—BULGARIA: Sandanski (4♀, 5♂, CAS).

ETHIOPIA: No specific locality (2♂, HALLE; lectotype and paralectotype of *flavogeniculatus*).

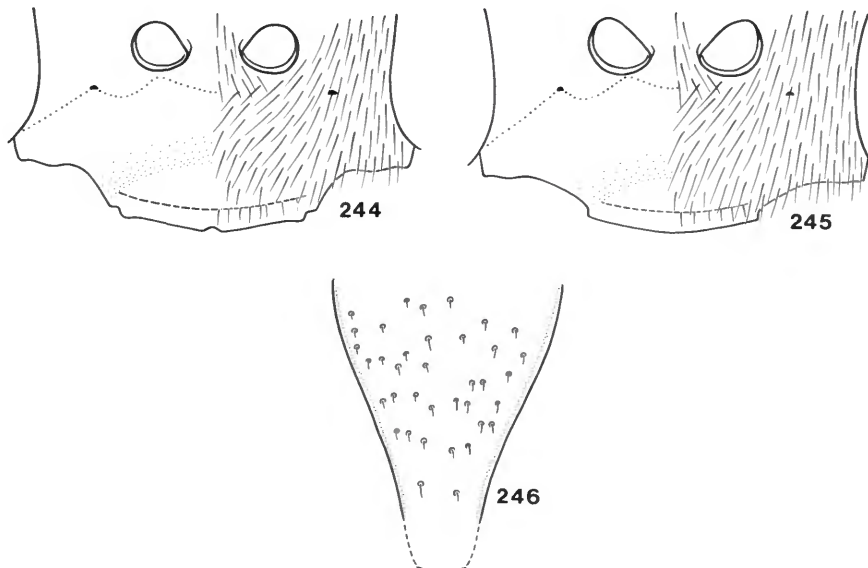
INDIA: GUJARAT: Deesa (1♂, BMNH, lectotype of *inventus*).

KENYA: Archer's Post on Ewaso Ng'iro River (1♀, 3♂, CAS).

39. *Tachysphex grandissimus* Gussakovskij

FIGURES 244-248

Tachysphex grandissimus Gussakovskij, 1933:282, ♀, ♂ [♂ = *Tachysphex sordidus*]; 1952:237.—Pulawski, 1971:420 [revision, bibliography], 422



FIGURES 244-246.—*Tachysphex grandissimus* Gussakovskij: 244, female clypeus; 245, male clypeus; 246, female pygidial plate.



FIGURES 247, 248.—*Tachysphex grandissimus* Gussakovskij, female: 247, apical hindtarsomere dorsally; 248, same, ventrally.

[Lectotype: ♀, Iran: Baluchistan: Bampur-Kaskin (ZIN), examined].—de Beaumont, Bytinski-Salz, and Pulawski, 1973:13 [Israel].—Bohart and Menke, 1976:274 [listed].

Tachysphex argyrius.—Gussakovskij, 1933:280, ♂ only [Iran; corrected to *Tachysphex grandissimus* by Gussakovskij, 1952:237].

DIAGNOSIS.—*Tachysphex grandissimus* resembles *erythropus*, *selectus*, and several extralimital species (see "Relationships" under *selectus*, page 00) in having hindwing vein cu-a inclined (anterior end closer to wing base than posterior end, as in Fig. 234); sternum I posteriorly with obtuse, longitudinal carina (as in Figure 236); and male sterna III–IV with conspicuous, appressed setae on apical depressions. The female is characterized by a dense vestiture that entirely conceals the integument on the mesopleuron and scutal forecorners, nearly completely on sides of propodeal dorsum. The female of *osiris* de Beaumont (Sahara) is similar, but in *grandissimus* the labrum is emarginate, clypeal lip incised laterally, scutal disk not hidden by vestiture, hindfemoral venter setose throughout (largely glabrous in *osiris*), and flagellum black (partly red in *osiris*).

The male can be recognized by the extremely dense scutal punctures, practically with no interspaces, sternum II setose throughout, and apical depressions of sterna III–V covered with appressed, dense, agglutinated setae.

DESCRIPTION.—Gena unusually narrow in dorsal view. Scutal and mesopleural punctures almost compressed against each other, with inconspicuous interspaces (a few scutal punctures about one diameter apart in female); punctures of mesothoracic venter about one diameter apart in female, several diameters apart mesally in male. Episternal sulcus effaced anteroventrally. Propodeal dorsum finely, irregularly reticulate, side finely ridged. Hindwing (as in Figure 234): crossvein cu-a

inclined; jugal lobe enlarged, jugal excision absent. Hindcoxal dorsum: inner margin carinate basally, carina not expanded.

Setae appressed on vertex, scutum, and midfemoral venter; suberect along hypostomal carina (setal length $0.4 \times$ basal mandibular width); sinuous, oriented posterad on propodeal dorsum except oriented anterad basomedially; completely concealing integument on female mesopleuron and scutal forecorners.

Head and thorax black (thorax partly and clypeus red in some females). Gaster and legs: see below. Terga I–IV (I–III in some males) silvery fasciate apically. Wings hyaline.

♀.—Labrum emarginate mesally. Clypeus (Figure 244): bevel shorter than basomedian area; lip arcuate, incised laterally. Vertex width $0.7 \times$ length. Dorsal length of flagellomere I $2.5\text{--}2.8 \times$ apical width. Foretibia densely, uniformly punctate and setose throughout, outer surface with spines. Forebasitarsus with nine or ten rake spines. Apical tarsomeres long (Figure 247), with several spines on venter but with no spines on lateral margins (Figure 248). Pygidial plate: lateral margin convex basally and concave distally, effaced near apex (Figure 246); surface with punctures that average several diameters apart, interspaces practically unsculptured. Length 14.5–18.0 mm.

Gastral segments I–II or I–III red, remaining black. Femora, tibiae, and tarsi red.

♂.—Clypeus (Figure 245): bevel shorter than basomedian area; lip arcuate; distance between corners $1.5\text{--}1.6 \times$ distance between corner and orbit. Vertex width $0.3\text{--}0.7 \times$ length. Dorsal length of flagellomere I $2.0\text{--}2.5 \times$ apical width. Forefemoral notch extending far onto femoral anterior face, its bottom compressed to an obtuse, longitudinal carina, with unsculptured area that is larger than midocellar diameter; basal

margin of notch, in Asian specimens, with a few, erect setae. Outer margin of forebasitarsus with one to five preapical spines. Venter of tarsomeres V with a few spines. Sternum II: setae as long on apical depression as on remaining surface; apical depressions of sterna III-V covered with appressed, dense setae (as if agglutinated together); setae nearly appressed, markedly longer than those on remaining surface. Volsella as in *erythropus* (see Figure 235). Length 11.0–13.5 mm.

Gaster black or (Asian specimens) segments I-II red. Femora all black or red apically, hindfemur all red in some specimens; tibiae and tarsi red or slightly darkened. Frontal setae silvery.

GEOGRAPHIC DISTRIBUTION.—Morocco to Egypt, Israel, Saudi Arabia, Transcaspia (Turkmenistan and Tajikistan), Iran, Pakistan, India (Gujarat only).

RECORDS (only Indian and Pakistani localities are re-

corded).—INDIA: Gujarat: Deesa (1♂, CAS).
PAKISTAN: Karachi (1♂, BMNH).

40. *Tachysphex albocinctus* (Lucas)

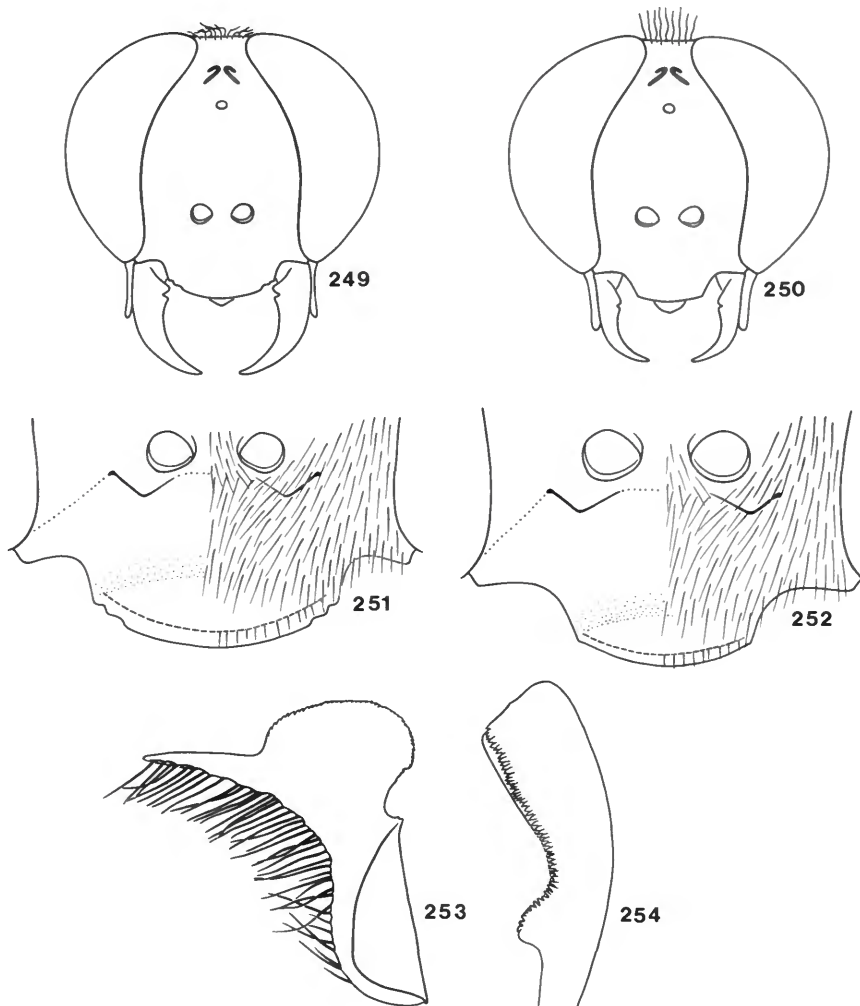
FIGURES 249–257

Tachytes albo cincta Lucas, 1849:250, ♀. [Incorrect original division and termination (spelled *albocincta* on line 20 and on plate 14). Holotype or syntypes: ♀. Algeria: La Calle (MNHN), not examined. Transferred to *Tachysphex* by de Beaumont, 1940:172.—Bingham, 1898:104 [Yemen].

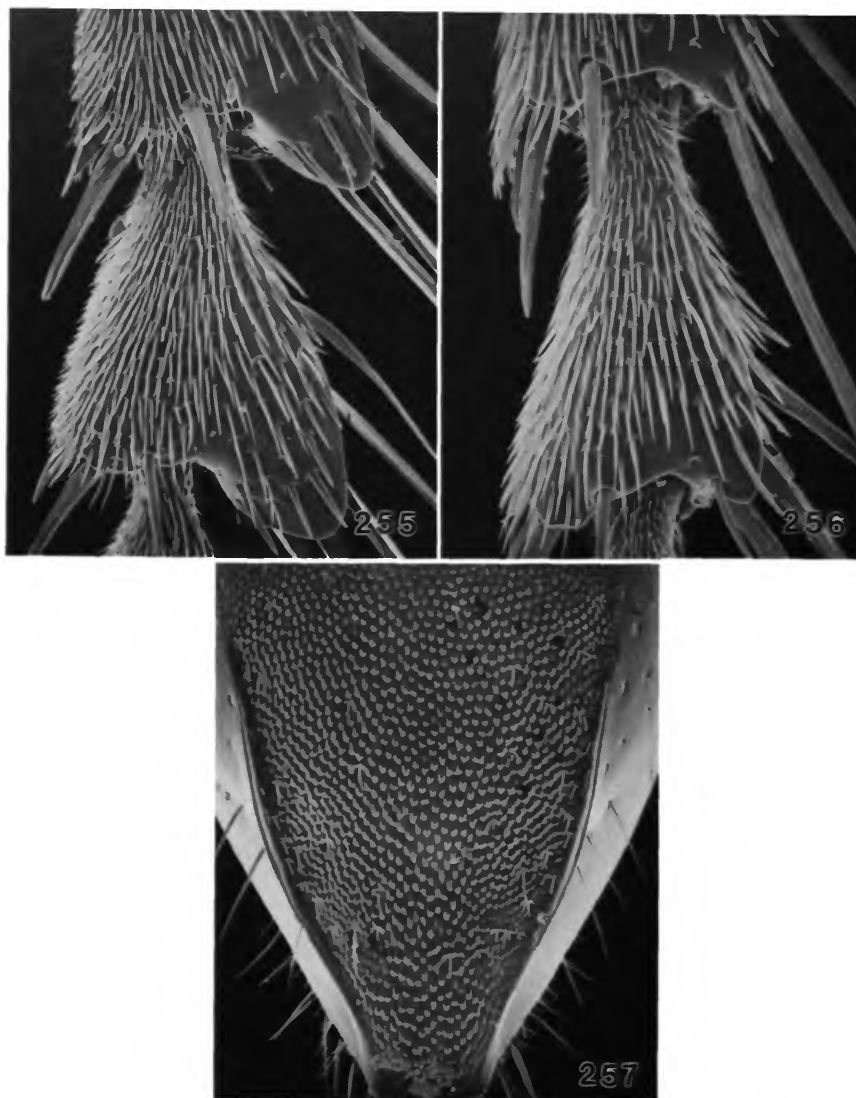
Tachytes ruficrus Dufour, 1853:378 [sex not indicated]. [Holotype or syntypes: Algeria: Pontéba, now Oumm ed Drou (MNHN), not examined. Synonymized with *Tachysphex albocinctus* by de Beaumont, 1940:172, after seeing types.]

Tachysphex syriacus Kohl, 1888:146, ♂. [Holotype or syntypes: ♂, Syria: no specific locality (NHMW), examined. Synonymized with *Tachysphex albocinctus* by de Beaumont, 1940:172, after seeing types.]

Tachysphex peculator Nurse, 1909:515, ♂. [Lectotype: ♂, India: Gujarat: Deesa



FIGURES 249–254.—*Tachysphex albocinctus* (Lucas): 249, female head frontally; 250, male head frontally; 251, female clypeus; 252, male clypeus; 253, volsella; 254, penis valve (inner side).



FIGURES 255–257.—*Tachysphex albocinctus* (Lucas): 255, apex of foretarsomere I and foretarsomere II of female; 256, apex of foretarsomere I and foretarsomere II of male; 257, female pygidial plate.

(BMNH), present designation, examined. Synonymized with *Tachysphex syriacus* by R. Turner, 1917b:198. Synonymy confirmed. Treated as subspecies of *Tachysphex albocinctus* by Pulawski, 1971:431.]

Tachysphex mantiraptor Ferton, 1912:360, ♀, ♂. [Syntypes: Algeria: La Calle (MNHN), not examined. Synonymized with *Tachysphex albocinctus* by de Beaumont, 1940:172, after seeing types.]

Tachysphex argyrius Gussakovskij, 1933:280, ♀, ♂ [♂ = *Tachysphex grandissimus*]. [Lectotype: ♀, Iran: S Bampur (ZIN), designated by Pulawski, 1971:432, examined. Synonymized with *Tachysphex albocinctus peculator* by Pulawski, 1971:431.]

Tachysphex dusmeti Giner Marí, 1934:142, ♀, ♂. [Syntypes: Spain: Valencia: Dehesa and Bétera (MNCN), not examined. Synonymized with *Tachysphex albocinctus* by de Beaumont, 1950:18, after seeing types.]

Tachysphex albocinctus.—de Beaumont, 1940:172 [new combination].—

Pulawski, 1971:427 [revision, full bibliography].—Gess, 1981:19 [nesting habitats, nest structure, prey].—Asís, Gayubo, and Tormos, 1987:15 [larva]; 1989:234 [male behavior, female nesting behavior].

Tachysphex albocinctus peculator.—Pulawski, 1971:431 [new status].—Bohart and Menke, 1976:272 [listed].

SYNONYMY.—Without seeing the type specimens, I used the name *peculator* for populations from Iran and Transcaspia (Pulawski, 1971:431). This interpretation was incorrect, and the two syntypes of *peculator* actually resemble the North African population in size (length 10.5–11 mm), length of clypeal lobe (anterior portion, in front of the imaginary line connecting mandibular acetabula, as long as posterior portion),

and length of clypeal bevel (which equals about 0.25 of basomedian area). I used these characters to distinguish *albocinctus peculator* from the nominotypical form.

DIAGNOSIS.—*Tachysphex albocinctus*, ranging from South Africa to India, is one of the few species of the genus in which setae of tergum I are long, sinuous, suberect (except posteriorly and on the laterotergite). The only others are: *brasilianus* Pulawski (Brazil), *laticauda* Gussakovskij (Lebanon to Uzbekistan), *maculipennis* Pulawski (Australia), *nubilipennis* de Beaumont (northwestern Egypt to Morocco), *pilosulus* R. Turner (Australia), *priesneri* de Beaumont (Morocco to Pakistan, deserts), and most *maidli* de Beaumont (Africa). The following combination of characters distinguishes *albocinctus* from *laticauda*, *maculipennis*, *nubilipennis*, and *pilosulus*: scutum with well-defined, subcontiguous punctures; gaster, femora, and tibiae black; wings hyaline to slightly infumate; female labrum entire; clypeal lip of most females with two small incisions on each side; and male sternum II densely micropunctate and pubescent throughout. Unlike *brasilianus* and *maculipennis*, the long, sinuous setae of tergum I extend to tergal midline (present only laterally in the other two). Unlike *priesneri*, *albocinctus* has the hindwing crossvein cu-a inclined (as in Figure 234), and unlike *maidli* and *priesneri* the forebasitarsus is expanded apically (Figures 255, 256) except nonexpanded in occasional males, the female pygidial plate is broad, characteristically microsculptured (Figure 257), and male sterna IV–VI are largely glabrous.

DESCRIPTION.—Vertex punctures varying from about one to several diameters apart. Scutal punctures averaging about one diameter apart in some specimens and tightly compressed against each other in others. Mesopleuron finely, somewhat irregularly rugose. Episternal sulcus incomplete. Propodeal dorsum microscopically, irregularly rugose; side dull, evenly microsculptured, and also (except anteriorly) finely, irregularly rugose; hindface intersecting dorsum at about right angle. Jugal lobe of hindwing broadened, jugal excision absent, crossvein cu-a inclined (as in Figure 234), media diverging beyond cu-a by a distance shorter than cu-a. Forebasitarsus slightly expanded apically on outer surface (Figures 255, 256), more so in female than in male (not expanded in occasional males). Hindcoxal dorsum: inner margin not carinate or carinate only basally. Apical tarsomeres with no spines on venter or lateral margins. Gastral sternum I without longitudinal carina, shallowly depressed apically.

Setae sinuous on frons, scapal venter, vertex, gena, scutum anteriorly, mesopleuron, propodeum (including hindface), and tergum I (except posteriorly and on laterotergite); erect on scapal venter, frons, and vertex; appressed (most specimens) or erect on midfemoral venter; oriented posterad on scutum except erect anteriorly; oriented posterad on propodeal dorsum. Setal length (expressed as fraction of basal mandibular width): on vertex about 0.5 in female and 0.8 in male, 0.8–1.0 along hypostomal carina, and up to 0.8 on tergum I. Mesopleural setae largely concealing integument in female.

Body black but tarsal apex or all tarsi reddish, also tibiae in some specimens. Wings hyaline, yellowish basally. Terga I–III or I–IV silvery fasciate apically.

♀.—Labrum not emarginate. Clypeus (Figures 249, 251): bevel convex, about 0.25–0.5 × length of basomedian area; lip arcuate, with two lateral incisions on each side except not incised in specimens from Iran and Transcaspia. Length of flagellomere I 2.2–3.1 × apical width. Vertex width 0.6–0.8 × length. Outer surface of foretibia with spines; outer margin of forebasitarsus straight. Length of hindtarsomere IV about 1.1 × apical width, apical emargination acute. Pygidial plate broad, densely, uniformly microareolate, and with large, sparse punctures (Figure 257). Length 11.0–15.0 mm.

♂.—Clypeus (Figures 250, 252): bevel convex, about 0.25–0.5 × length of basomedian area; lip arcuate, corner obtusely angulate, not prominent; distance between corners 1.5–1.6 × distance between corner and orbit. Length of flagellomere I 2.0–2.5 × apical width. Vertex width 0.7–1.3 × length. Forefemoral notch shallow, covered with erect microsetae. Outer margin of forebasitarsus with six to eight preapical spines, apical spine of tarsomeres I–III longer than following article. Punctures of tergum VII averaging several diameters apart (except apically and laterally). Sterna IV–VI largely glabrous. Volsella: Figure 253. Penis valve: Figure 254. Length 8.0–12.0 mm.

Frontal setae silvery in small specimens, black in large ones.

GEOGRAPHIC DISTRIBUTION.—Africa, southern Iberian Peninsula, Crete, southwestern Asia (Israel, Jordan, Syria, Yemen) to Transcaspia (Tajikistan, Turkmenistan, and Uzbekistan), Pakistan, and northwestern India.

RECORDS (India and Pakistan only).—INDIA: GUJARAT: Deesa (2♂, BMNH, lectotype and paralectotype of *peculator*).

PAKISTAN: BALUCHISTAN: Pasni Rek (1♂, BMNH).

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Text-reference system (author, year:page used within the text, with full citation in "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all Contributions Series and is strongly recommended in the Studies Series: "(Jones, 1910:122)" or "...Jones (1910:122)." If bibliographic footnotes are

required, use the short form (author, brief title, page) with the full citation in the bibliography.

Footnotes, when few in number, whether annotative or bibliographic, should be typed on separate sheets and inserted immediately after the text pages on which the references occur. Extensive notes must be gathered together and placed at the end of the text in a notes section.

Bibliography, depending upon use, is termed "Literature Cited," "References," or "Bibliography." Spell out titles of books, articles, journals, and monographic series. For book and article titles use sentence-style capitalization according to the rules of the language employed (exception: capitalize all major words in English). For journal and series titles, capitalize the initial word and all subsequent words except articles, conjunctions, and prepositions. Transliterate languages that use a non-Roman alphabet according to the Library of Congress system. Underline (for italics) titles of journals and series and titles of books that are not part of a series. Use the parentheses/colon system for volume (number):pagination: "10(2):5-9." For alignment and arrangement of elements, follow the format of recent publications in the series for which the manuscript is intended. Guidelines for preparing bibliography may be secured from Series Section, SI Press.

Legends for illustrations must be submitted at the end of the manuscript, with as many legends typed, double-spaced, to a page as convenient.

Illustrations must be submitted as original art (not copies) accompanying, but separate from, the manuscript. Guidelines for preparing art may be secured from the Series Section, SI Press. All types of illustrations (photographs, line drawings, maps, etc.) may be intermixed throughout the printed text. They should be termed **Figures** and should be numbered consecutively as they will appear in the monograph. If several illustrations are treated as components of a single composite figure, they should be designated by lowercase italic letters on the illustration; also, in the legend and in text references the italic letters (underlined in copy) should be used: "Figure 9b." Illustrations that are intended to follow the printed text may be termed **Plates**, and any components should be similarly lettered and referenced: "Plate 9b." Keys to any symbols within an illustration should appear on the art rather than in the legend.

Some points of style: Do not use periods after such abbreviations as "mm, ft, USNM, NNE." Spell out numbers "one" through "nine" in expository text, but use digits in all other cases if possible. Use of the metric system of measurement is preferable; where use of the English system is unavoidable, supply metric equivalents in parentheses. Use the decimal system for precise measurements and relationships, common fractions for approximations. Use day/month/year sequence for dates: "9 April 1976." For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc. Omit space between initials of a personal name: "J.B. Jones."

Arrange and paginate sequentially every sheet of manuscript in the following order: (1) title page, (2) abstract, (3) contents, (4) foreword and/or preface, (5) text, (6) appendices, (7) notes section, (8) glossary, (9) bibliography, (10) legends, (11) tables. Index copy may be submitted at page proof stage, but plans for an index should be indicated when the manuscript is submitted.

