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Revision of the genus *Euagathis* Szépligeti (Hymenoptera, Braconidae, Agathidinae) from Thailand, with description of three new species

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Abstract

The species of the genus *Euagathis* Szépligeti (Hymenoptera, Braconidae, Agathidinae) from Thailand are revised. Eight species are treated, three new species are described, i.e. *Euagathis breviantennata* **sp. n.**, *E. setosimaculata* **sp. n.** and *E. pallitarsis* **sp. n.** *Disophrys sogdiana* Fahringer, 1937, *D. chinensis* Fahringer, 1937, and *Euagathis sentosus* Chen & Yang, 1995, are new junior synonyms of *Euagathis chinensis* (Holm-gren, 1868). *Euagathis guangxiensis* (Chen & Yang, 2006) is a new combination. Lectotypes are designated for *Disophrys sogdiana* Fahringer, 1937, and *D. chinensis* Fahringer, 1937. A dichotomous illustrated key to species is presented; links to electronic interactive keys and to distribution maps are also included.

Keywords

Thailand, Insecta, identification key, taxonomy, systematics, new species, *Euagathis*, Braconidae

Introduction

Agathidinae is a moderately large subfamily of medium-sized to fairly large Braconidae with 1,154 described species worldwide and 316 in the Oriental Region (Yu et al. 2012), although there are an estimated 2,000–3,000 species awaiting description worldwide (Sharkey et al. 2006). The subfamily has a worldwide distribution, but its members are more common in subtropical and tropical regions than in temperate areas. The history of the classification of the Agathidinae was summarized by Sharkey (1992) and Sharkey et al. (2006) conducted phylogenetic analyses based on morphology and the D2–D3 regions of 28S rDNA. The Oriental fauna of Agathidinae was first revised by Bhat and Gupta (1977), who provided a detailed history of taxonomic research for the area. Keys to the Oriental genera of Agathidinae were published by Sharkey et al. (2009), van Achterberg and Long (2010) and Sharkey and Clutts (2011). The first key to the Oriental species of the genus *Euagathis* Szépligeti, 1900 was provided by Bhat and Gupta (1977). The Indo-Australian species of the genus *Euagathis* were revised by Simbolotti and van Achterberg (1990, Sulawesi; 1995, Sunda islands), van Achterberg and Chen (2002, China and Vietnam), van Achterberg (2004, Wallacea, Australian region), van Achterberg and Raychaudhuri (2004, India) and van Achterberg and Long (2010, Vietnam). Chen and Yang (2006) provided a key to the Chinese species of *Euagathis*. The genus *Euagathis* was shown in the phylogenetic analysis by Sharkey et al. (2006) to be firmly nested within the tribe Disophrini and closely related to the genus *Coccygidium* de Saussure, 1892.

Methods

As part of the TIGER (Thailand Inventory Group for Entomological Research) NSF-funded entomological inventory of Thailand, three Malaise traps (per locality) were used at 30 different localities throughout Thailand from 2006–2010, comprising approximately 90 Malaise trap years. The specimens dealt with here are primarily from these traps. Species concepts are based on morphological and molecular data from COI and 28S.

Morphological terms follow van Achterberg (1988) and van Achterberg and Long (2010). Distributional data are listed for all new species and a Google map with associated distributional data is included for all species.

Phylogenetic methods: Regions D2-D3 of 28S rDNA (roughly 560 base pairs) were sequenced using the primers 28SD2hymF (5'-AGAGAGAGTTCAAGAGTACGTG-3') and 28SD3hymR (5'-TAGTTCACCATCTTTCGGGTC-3'). Sequences were edited using Geneious Pro v4.7.5 (Drummond et al. 2009) and aligned using MAFFT (Katoh et al. 2006) through the GUIDANCE server (Penn et al. 2010) which was used to assess confidence scores for each column in the alignment. Columns with confidence scores < 93% (default) were removed prior to all phylogenetic analyses. COI sequences were generated with the primers LepF1 (5'-ATTCAACCAATCATAAAGATATTGG-3') and LepR1 (5'-TAAACTTCTGGATGTCCAAAAAATCA-3'). MAFFT was used to align the COI

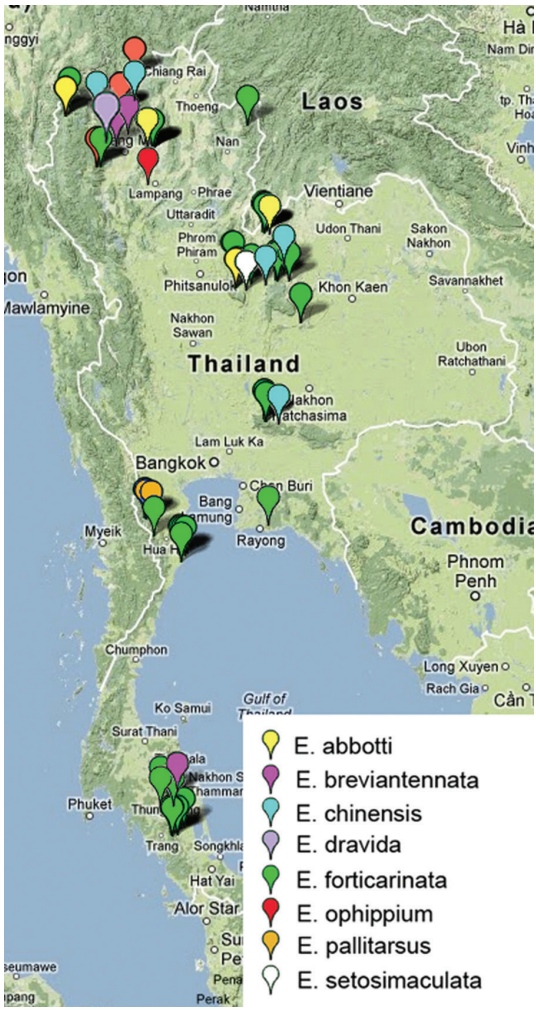


Figure 1. Map showing the collection sites in Thailand.

sequences and no regions of ambiguous alignment were detected. Three permutations of the molecular data were phylogenetically analyzed herein: (1) a 49-OTU 28S-only data set, (2) a 31-OTU COI-only data set and (3) a 30-OTU data set in which all OTUs contain both COI and 28S sequences. The data sets were analysed under Bayesian Inference (BI) with MrBayes (v3.2; Huelsenbeck and Ronquist 2001, Ronquist and Huelsenbeck 2003) under the GTR+I+G model of evolution (Rodriguez et al. 1990), partitioned by gene in the 2-gene data set, and conducted for 10 million generations. Additionally, the data sets were analyzed under maximum likelihood (ML) using Garli (v1.0; Zwickl 2006), using the default settings and the GTR+I+G model for best-tree searches and 100-replicate bootstrap analyses. Finally, 100 maximum parsimony (MP) bootstrap replicates were conducted on each data set using PAUP* (v4.0b10; Swofford 2001). Herein, we present the tree with the highest log-likelihood from each ML analysis, with nodal support values

obtained from each method. Rooting the analyses with *Disophrys* spp. (GenBank accession numbers: COI: KC899814-KC899816; 28S: HQ667969-HQ667971, JF506257, KC867209) was based on the close relationship between these two genera recovered from analyses of large agathidine data sets (Sharkey, unpublished).

Distribution data, pdf's of non-copyright references, images, notes, and host and type information can be found by searching TaxaBank (a combined specimen and taxonomic database; http://purl.org/taxabank. Codes beginning with an "H" and followed by numbers are unique identifiers used for specimens in the HIC (below), and in the specimen database TaxaBank (e.g., H 647).

Abbreviations used for specimen depositories

HIC	Hymenoptera Institute Collection, University of Kentucky, Department of Entomology, Lexington, Kentucky, USA.
NRMS	Naturhistoriska Riksmuseet, Stockholm, Sweden.
QSBG	Queen Sirikit Botanic Gardens, Chiang Mai, Thailand.
RMNH	Naturalis Biodiversity Center Collection [formerly Rijksmuseum van Natuurlijke Historie], Leiden, Netherlands.

Results

Species delimitation. Both morphological and molecular data, specifically COI and 28S, were used to determine species limits. Our original morphological species concepts were tested against the molecular data. Most of these morphological concepts were corroborated, including the rather subtle morphological differences between *E. abbotti* and *E. forticarinata,* which are distinguished with both COI (Fig. 2) and 28S (Fig. 3).

The COI ML tree (Fig. 2) shows two distinct lineages of *E. forticarinata* and one specimen (H004) that is an outlier from both of these clades. The sole specimen of the morphologically distinct species *E. setosimaculata* lies between the two clades. This strongly suggests that *E. forticarinata* may be comprised of more than one species. However we could discover no consistent morphological differences between the two lineages. The COI ML tree (Fig. 2) also shows considerable variation within *E. abbotti*, but again we could not discern morphological characters consistent with these lineages. The 28S ML tree (Fig. 3) is more conservative and provides different information for our purposes, it separates all of our morphologically based species concepts and all members within these species have identical sequences, with the following two exceptions. First, *E. ophippium* and *E. pallitarsis* are distinct morphologically but have identical 28S sequences; nonetheless based on the morphological data we chose to suggest species status for both. Second, the two *E. forticarinata* specimens, H004 and H743, are identical and distinct from the other *E. forticarinata* specimens. We do not have COI data for H743, however COI data for H004 is distinct and widely separated from all other *E. forticarinata* specimens (Fig. 2).

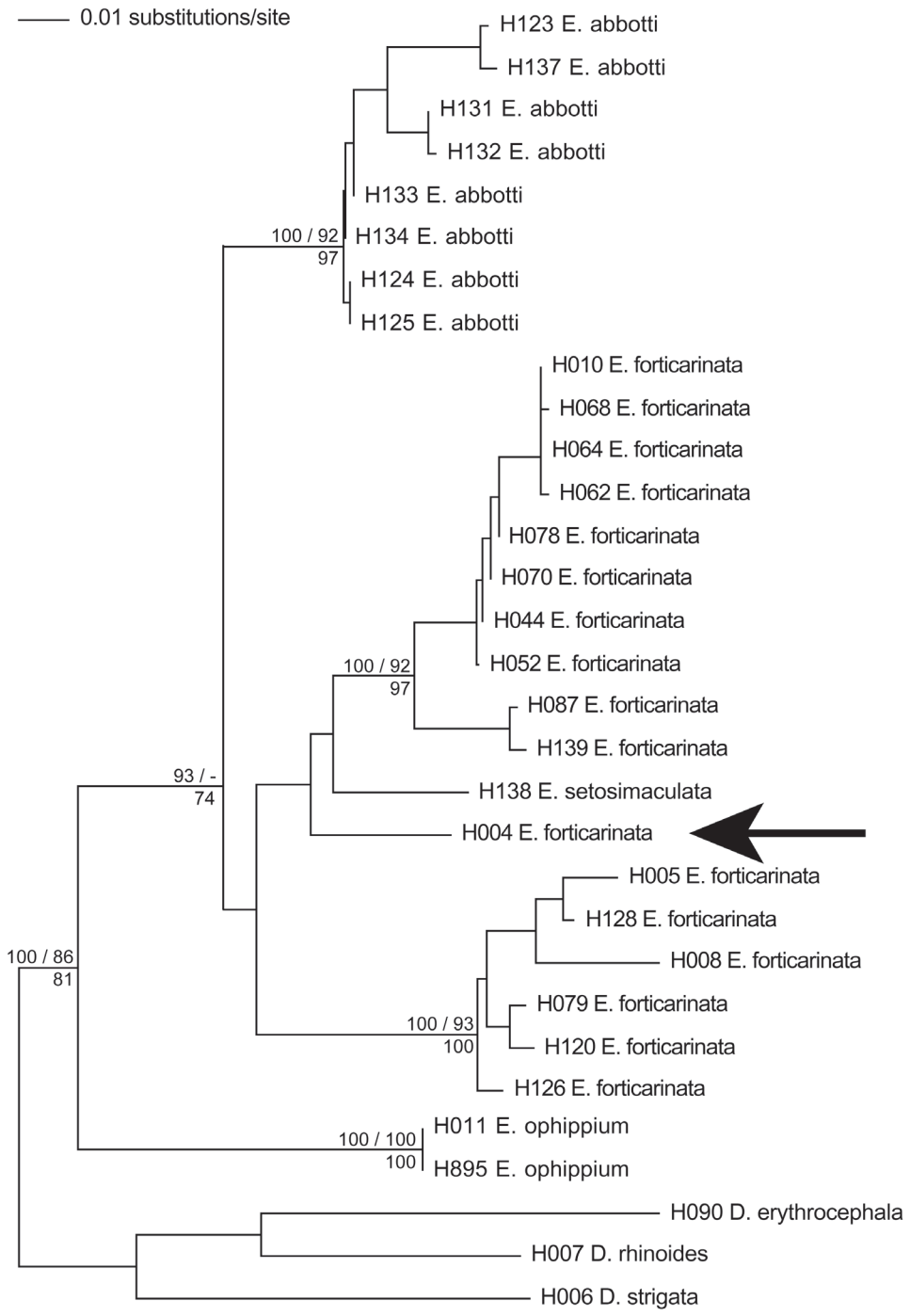


Figure 2. ML tree from the analysis of the COI-only data set with BI posterior probabilities (×100) and ML bootstrap values above the branches (left to right) and MP bootstrap values below the branches. Arrow points to a rogue exemplar of *E. forticarinata*.

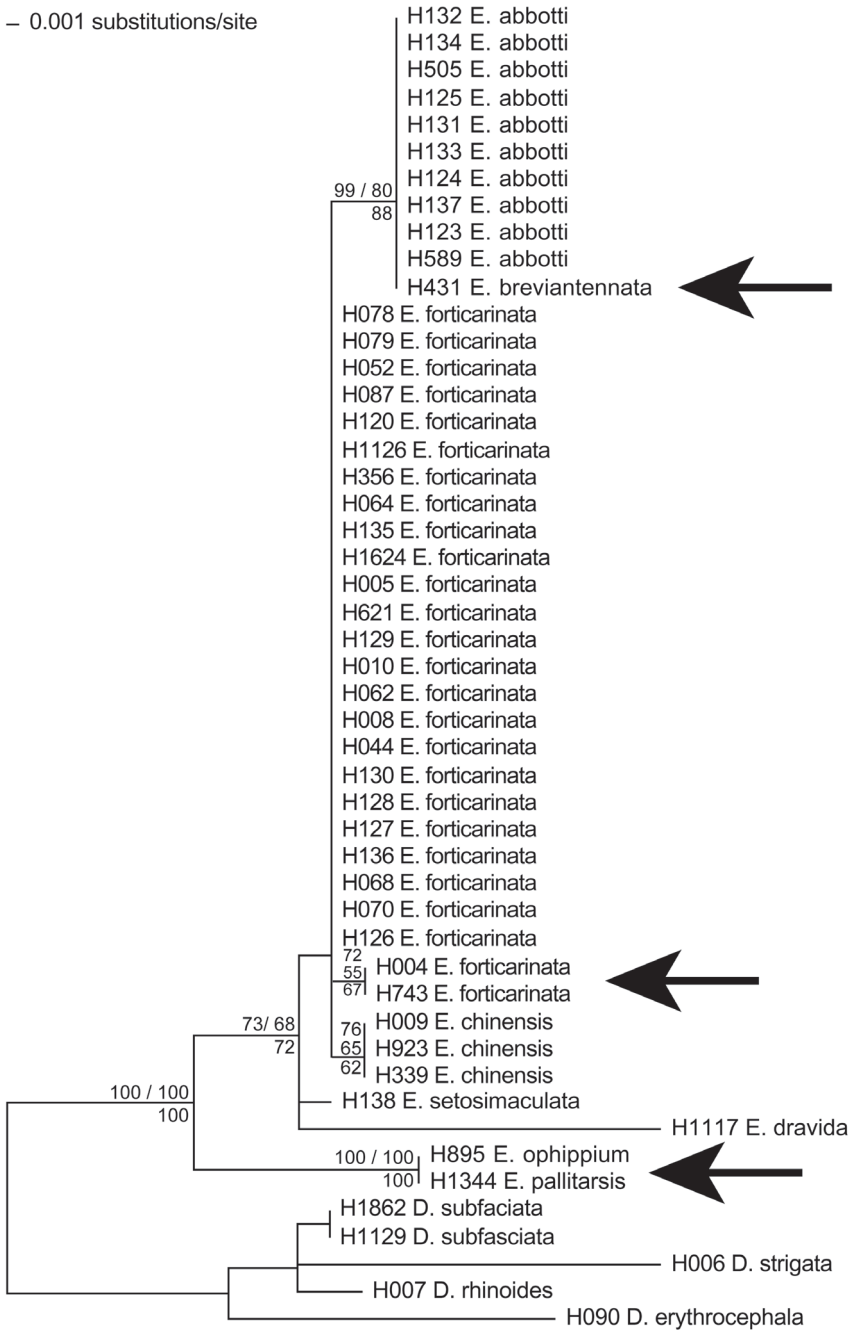


Figure 3. ML tree from the analysis of the 28S-only data set with BI posterior probabilities (×100) and ML bootstrap values above the branches (left to right) and MP bootstrap values below the branches. Top to bottom, arrows point to **a** sequence of *E. breviantennata* identical to those of *E. abbotti* **b** rogue exemplars of *E. forticarinata* that may indicate a new species and **c** sequences of *E. ophippium* and *E. pallitarsis* which are identical to one another.

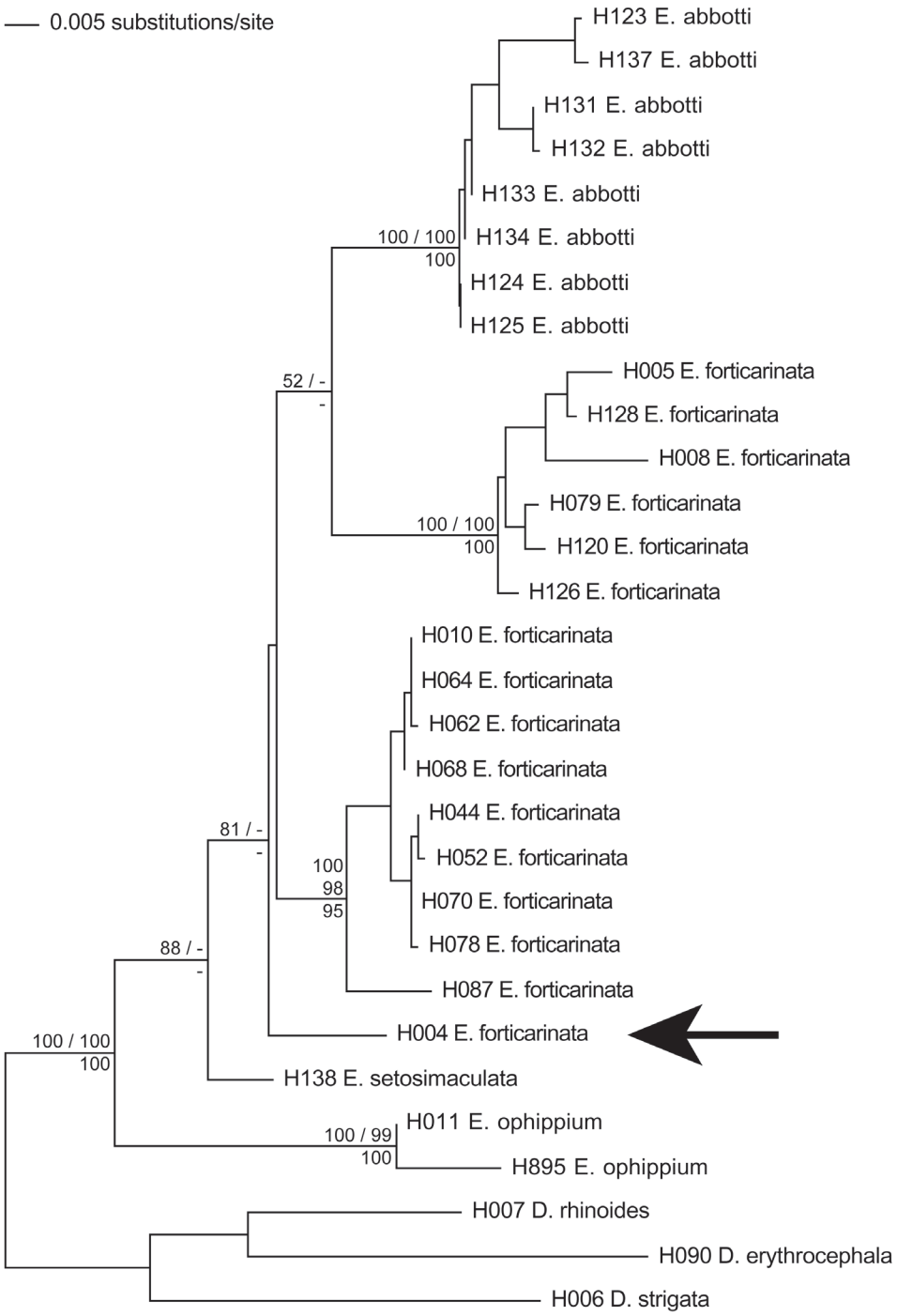


Figure 4. ML tree from the analysis of the COI+28S data set in which every taxon has both genes. BI posterior probabilities (×100) and ML bootstrap values are above the branches (left to right) and MP bootstrap values are below the branches. Arrow points to a rogue exemplar of *E. forticarinata*.

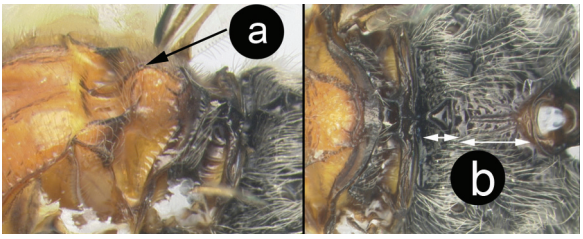
Unfortunately, both H004 and H743 are male specimens and they both appear identical to other melanic males of *E. forticarinata* (see Fig. 9k). It is our opinion that these two specimens probably represent a new species, but due to the lack of female specimens, the lack of diagnostic characters to distinguish the putative species from *E. forticarinata* and our rather small sample size, we have decided against proposing a new species. Figure 4 is a ML tree of the combined COI and 28S data. Since the 28S data are largely monotonous within species the topology mostly reflects that of the COI tree (Fig. 2).

Genus *Euagathis* Szépligeti, 1900

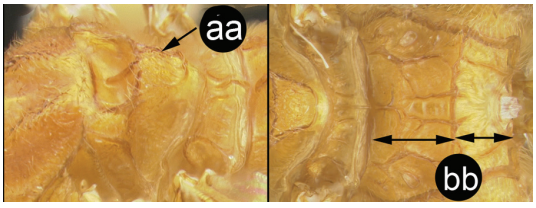
Key to species of the genus *Euagathis* Szépligeti from Thailand

(see also the interactive key here)

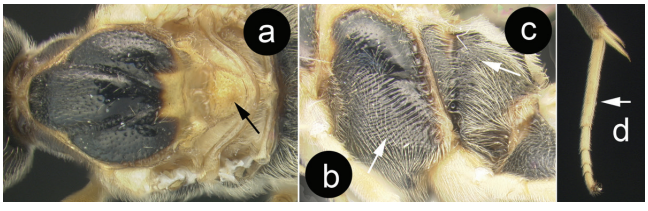
1 Scutellum strongly tuberculate, protruding and with long setae (a); anterior/dorsal face of propodeum much shorter than its posterior face (b) **2**



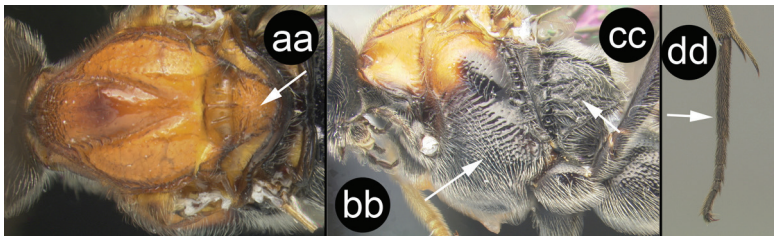
– Scutellum weakly to moderately convex and with short setae (aa); dorsal face of propodeum usually about as long as or longer than its posterior face (bb) (except shorter in *E. setosimaculata* sp. n. [Fig. 12g]) **3**



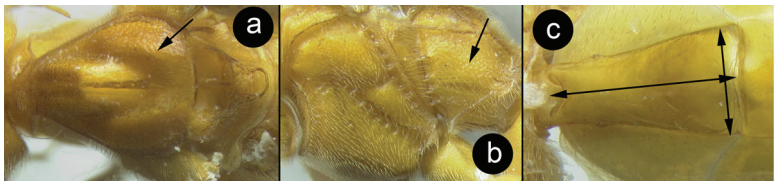
2 Scutellum pale yellow (a); area below precoxal sulcus densely punctate-rugose (b); metapleuron finely reticulate-punctate (c); hind tarsus ivory (d)..... ..... ***E. pallitarsis* sp. n.**



– Scutellum mostly reddish brown (aa); area below precoxal sulcus densely punctate (bb); metapleuron coarsely vermiculate-rugose (cc); hind tarsus black (dd) .....***E. ophippium*** **(Cameron, 1899)**

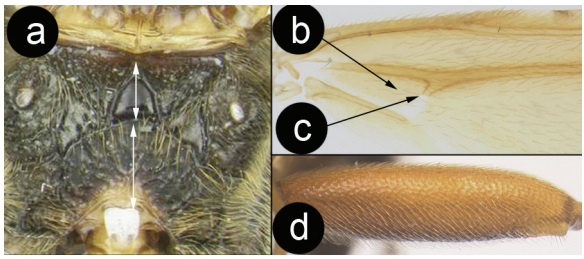


3 Lateral lobes of mesoscutum distinctly convex posteriorly and medially distinctly punctate (but sometimes sparsely and/or partly striate) (a); metapleuron usually densely punctate submedially (b); first metasomal tergite 1.7–2.1 times as long as apical width (c) **4**

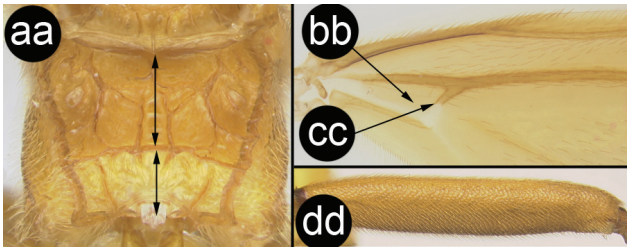


– Lateral lobes of mesoscutum weakly convex or flattened posteriorly and lobes submedially largely smooth (aa); metapleuron sparsely punctate medially (bb); first tergite 1.3–1.6 times as long as apical width (cc) .... ***E. chinensis*** **(Holmgren, 1868)**

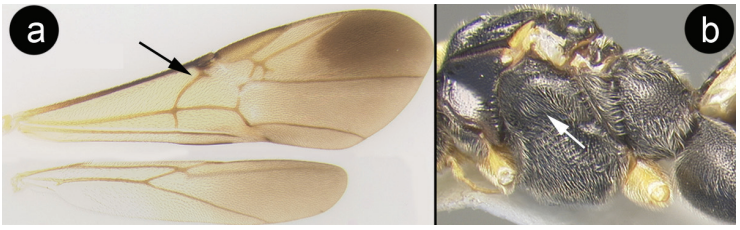
4 Dorsal face of propodeum much shorter than posterior face of propodeum (a); area near vein cu-a of hind wing distinctly setose (b); vein cu-a of hind wing about as long as wide (c); hind femur thick (d) .....***E. setosimaculata*** **sp. n.**



– Dorsal face of propodeum about as long as posterior face of propodeum (aa); area near vein cu-a of hind wing glabrous or sparsely setose (bb); vein cu-a of hind wing distinctly longer than wide (cc); hind femur slender (dd) **5**

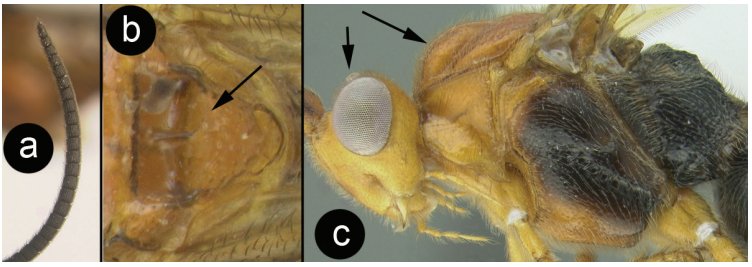


5 Stigmal spot of fore wing absent (a); mesopleuron of both sexes mostly black or dark reddish-brown (b) **6**

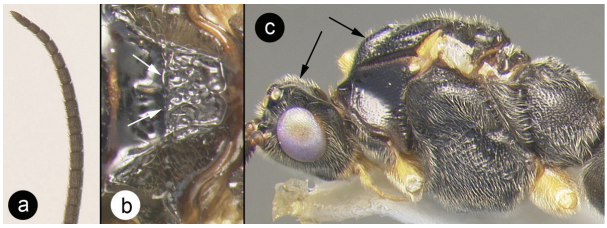


– Stigmal spot of fore wing medium-sized to large (aa); mesopleuron of female yellowish-brown (bb), male mesopleuron sometimes dark brown or black..... 7

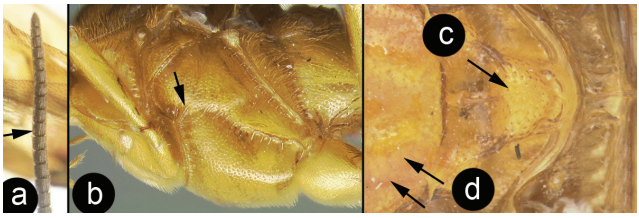
6 Antennal segments of female short (mostly as long as wide) and bristly (a); scutellum rounded anteriorly, without transverse carina anteriorly (b); head and mesoscutum reddish- or yellowish-brown (c) ... ***E. breviantennata*** **sp. n.**



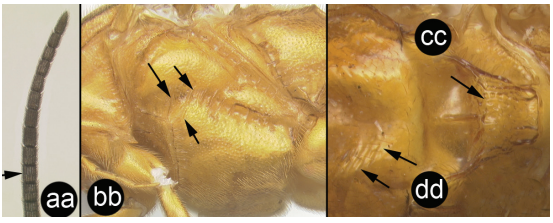
– Antennal segments of female mostly longer than wide and setose (aa); scutellum angulate anteriorly, with transverse carina anteriorly (bb); head and mesoscutum black (cc) ..... ***E. dravida*** **Bhat & Gupta, 1977**



7 Tenth antennal segment, from apex, of female 0.9–1.1 times as long as wide and sub-apical segments sub-moniliform (a) (male 1.3–1.4 times); anterior crenulae of precoxal sulcus short (b); anterior face of scutellum rounded dorsally (c); lateral lobes of mesoscutum without oblique rugae near medio-posterior area (d) ..... ***E. abbotti*** **(Ashmead, 1900)**



– Tenth antennal segment, from apex, of female 1.2–1.4 times as long as wide and sub-apical segments normal (aa) (male 1.5–1.6 times); anterior crenulae of precoxal sulcus often medium-sized or long (bb); anterior face of scutellum angulate dorsally and smooth except for median carina (cc); lateral lobes of mesoscutum often with fine oblique rugae near medio-posterior area of mesoscutum (dd) ..... ***E. forticarinata*** **(Cameron, 1899)**



Descriptions

Euagathis abbotti **(Ashmead, 1900)**
http://species-id.net/wiki/Euagathis_abbotti

Distribution. For a distribution map of Thai specimens and their associated data, see Appendix I. Brunei; Indonesia (Java, Sumatra); Laos; East Malaysia (Sabah); Thailand; Vietnam. Reported from Thailand by Simbolotti and van Achterberg (1995).

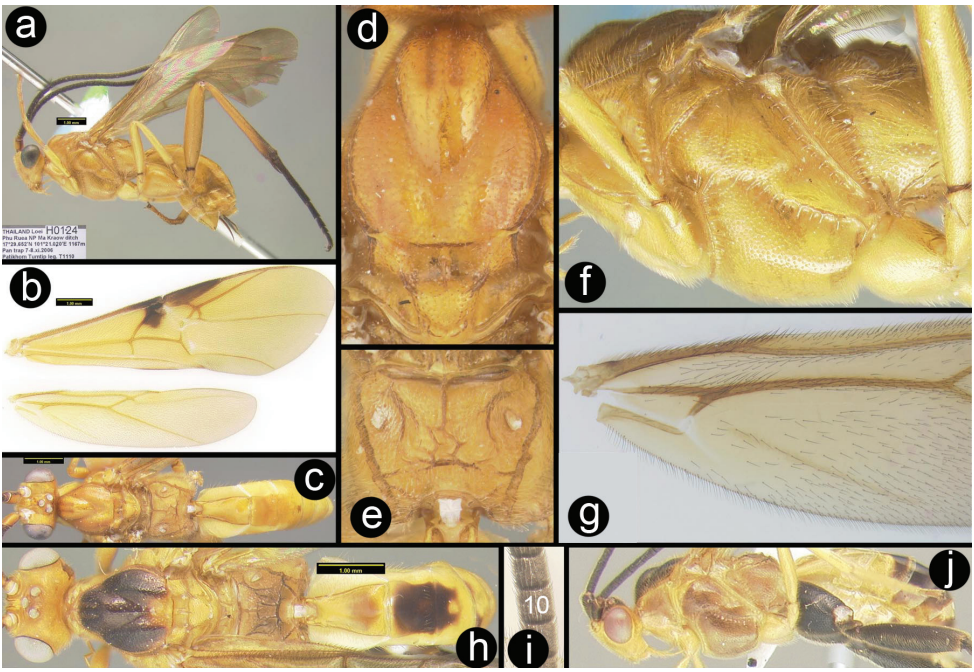


Figure 5. *Euagathis abbotti* (Ashmead), female. **A** lateral habitus **B** wings **C** dorsal habitus **D** dorsal mesothorax **E** propodeum **F** lateral mesosoma **G** base of hind wing **H** male, dorsal habitus **I** female, 10th flagellomere from apex **J** male, lateral habitus.

Molecular data. Genbank accession numbers: KC899817-KC899824 (COI); KC867210-KC867217, KC867219-KC867220 (28S).

Notes. The pterostigma, mesosoma, metasoma and hind leg of the male are usually largely dark brown or black.

***Euagathis breviantennata* van Achterberg & Sharkey, sp. n.**
http://zoobank.org/A2CAEB56-6BD6-4C9C-9C9E-03CE7463227E
http://species-id.net/wiki/Euagathis_breviantennata

Type material. Holotype, ♀ (QSBG), "**Thailand**: Chiang Mai, Doi Chiang Dao N. P., Headquarter, 19°24.278'N, 98°55.311'E, 491 m elev., Malaise trap, 14-21.viii.2007, S. Jugsu & A. Watwanich" (H928; T5672). Paratypes (3 ♀): 1 ♀ (RMNH), Thailand: "Chiang Mai, Doi Chiang Dao W. S., Pha Trang unit, 19°24.978'N, 98°54.886'E, 526 m elev., Malaise trap, 21-28.x.2007, Songkran & Apichart" (H340); 1 ♀ (HIC), "Chiang Mai Prob., Queen Sirikit Botanic. Garden, 18°52'50.7"N, 98°51'42.3"E, alt. 811 m elev., by Malaise trap, 9–16.vi.2009, semi-evergreen forest, K. Kaewjanta et al. QSBG-2009-125" (H694); 1 ♀ (QSBG), "Nakhon Si Thammarat, Namtok Yong N. P., behind lavatory, 8°10.397'N, 99°44.503'E, 95 m elev., Malaise trap, 26.v.-2.

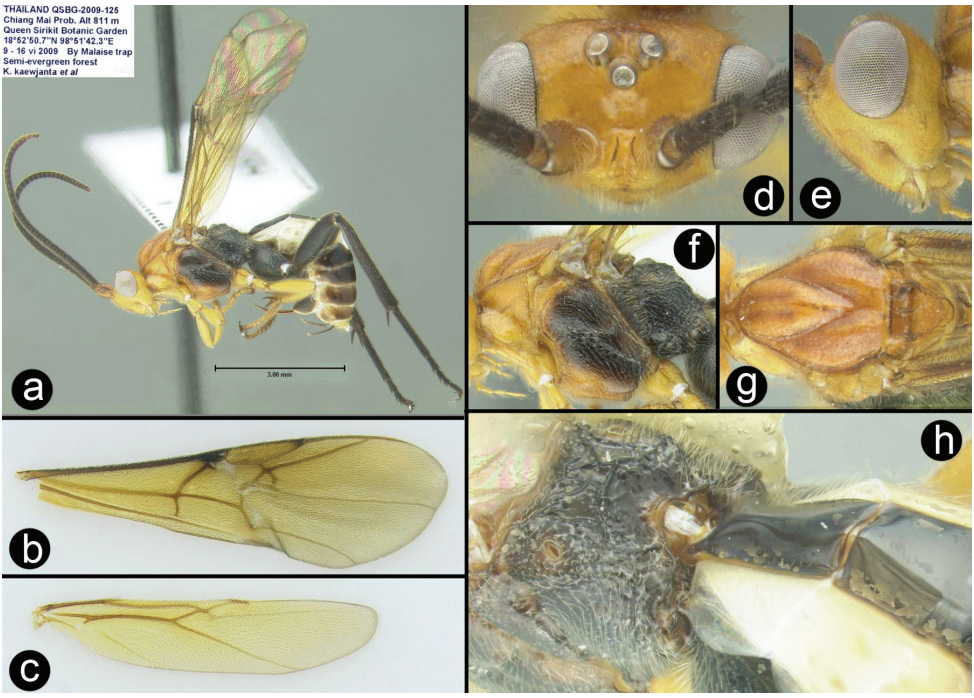


Figure 6. *Euagathis breviantennata* sp. n., female, paratype. **A** lateral habitus **B** fore wing **C** hind wing **D** dorsal head **E** lateral head **F** lateral mesosoma **G** dorsal thorax **H** postero-lateral propodeum and anterior metasoma.

vi.2009, U-prai K." (H431); 1 ♀ (HIC) Chiang Mai, Doi Chiangdao NP, Pha Tang substation,19.416°N, 98.915°E, 526 m elev., Malaise trap, 28.viii–4.ix.2007, S. Jugsu & A. Watwanich (H4107).

Diagnosis. This new species keys to *E. fuscinotum* Enderlein, 1920, from the Sunda area (Java, Sumatra, Borneo, West Malaysia) in the key by Simbolotti and van Achterberg (1995). Females of both species have the segments of the apical half of the antenna about as long as wide. *E. breviantennata* sp. n. differs by having the hind femur punctate-rugose ventrally (coarsely punctate in *E. fuscinotum*), third antennal segment of female about twice as long as wide (about 3 times), setae of middle tarsus about as long as width of tarsal segments (about half as long as width of segments), anterior crenulae of precoxal sulcus long (short to medium-sized), head normally triangular in anterior view and about 1.2 times wider than high (eyes strongly protruding, head about 1.4 times wider than high in female), apical half of fore wing with yellowish tinge (without yellowish tinge) and first tergite comparatively elongate and 1.7–2.2 times as long as wide apically (comparatively short and 1.4–1.9 times as long as wide apically).

Description. Holotype, ♀, length of body 8.2 mm, of fore wing 7.9 mm, of ovipositor sheath 0.8 mm.

Head. Antennal segments 45, length of third segment 1.3 times fourth segment, length of third, fourth and penultimate segments 2.2, 1.8 and 1.0 times their width,

respectively; apical antennal segment as long as penultimate segment; maxillary palp 0.6 times height of head; malar space 2.8 times as long as basal width of mandible; length of eye 2.1 times temple; temple directly narrowed posteriorly and slightly concave laterally; POL:OD:OOL= 6:5:9; face shiny with shallow medial groove dorsally, spaced punctulate and setose; frons, vertex and temple shiny and smooth (Fig. 6d); temple concave near lower level of eye.

Mesosoma. Length of mesosoma 1.4 times its height; pronotum smooth, but setose and punctulate dorsally and finely crenulate posteriorly; area near lateral carina of mesoscutum smooth; mesoscutum shiny, with spaced and rather coarse punctures and lateral lobes distinctly convex posteriorly (Fig. 6g); notauli complete, smooth or nearly so; scutellum convex and densely coarsely punctate, antero-dorsal margin rounded and without transverse carina; precoxal sulcus complete and anterior crenulae long (Fig. 6f); mesopleuron and metapleuron medially coarsely punctate with interspaces equal to diameter of punctures or wider; propodeum coarsely areolate, anterior face about as long as posterior face.

Wings. Fore wing: second submarginal cell pentagonal and with short ramellus (Fig. 6b); vein SR1 straight; r:3-SR:SR1 = 4:1:72; vein 2-R1 0.5 times as long as 1-R1; vein cu-a slightly antefurcal; no stigmal spot. Hind wing: vein M+CU 3.2 times as long as vein 1-M; area near vein cu-a glabrous.

Legs. Length of hind femur, tibia and basitarsus 4.9, 8.3 and 7.6 times their width, respectively; hind femur punctate-rugose ventrally; setae of middle tarsus about as long as width of tarsal segments; fore and middle tarsal segments moderately slender; length of outer and inner spur of middle tibia 0.6 and 0.8 times middle basitarsus, respectively; outer side of middle tibia without pegs, except for 1 apical peg; length of outer and inner spur of hind tibia 0.4 and 0.6 times hind basitarsus.

Metasoma. First tergite 1.9 times as long as wide apically, smooth, moderately elongate and apically widened (Fig. 6h); second metasomal suture absent; ovipositor sheath 0.1 times as long as fore wing, truncate apically and somewhat widened (Fig. 6a).

Colour. Black; head, scapus and pedicellus (both partly darkened), palpi, mesosoma (but mesopleuron (except anteriorly), metapleuron and propodeum black and mesosternum largely dark brown) and fore and middle legs, yellowish-brown; basal half of metasoma largely ivory ventrally and laterally, apical half of metasoma largely dark brown, but hypopygium with ivory patch medially; pterostigma and veins brown; wing membrane brownish with a yellowish tinge (Fig. 6b, c); apex of ovipositor sheath ivory.

Variation. Length of fore wing 5.9–7.9 mm; length of ovipositor sheath 0.11–0.12 times as long as fore wing; antennal segments of female 40(1), 44(1) or 45(1); first metasomal tergite 1.7–2.2 times as long as its apical width; mesosternum and mesopleuron ventrally largely dark brown or yellowish-brown.

Biology. Unknown.

Distribution. Only known from Thailand. For a distribution map, see Appendix I.

Molecular data. Genbank accession numbers: KC867218 (28S).

Etymology. From “brevis” (Latin for “short”) and “antenna” (Latin for “sailyard, feeler”) because of the short antenna of the female.

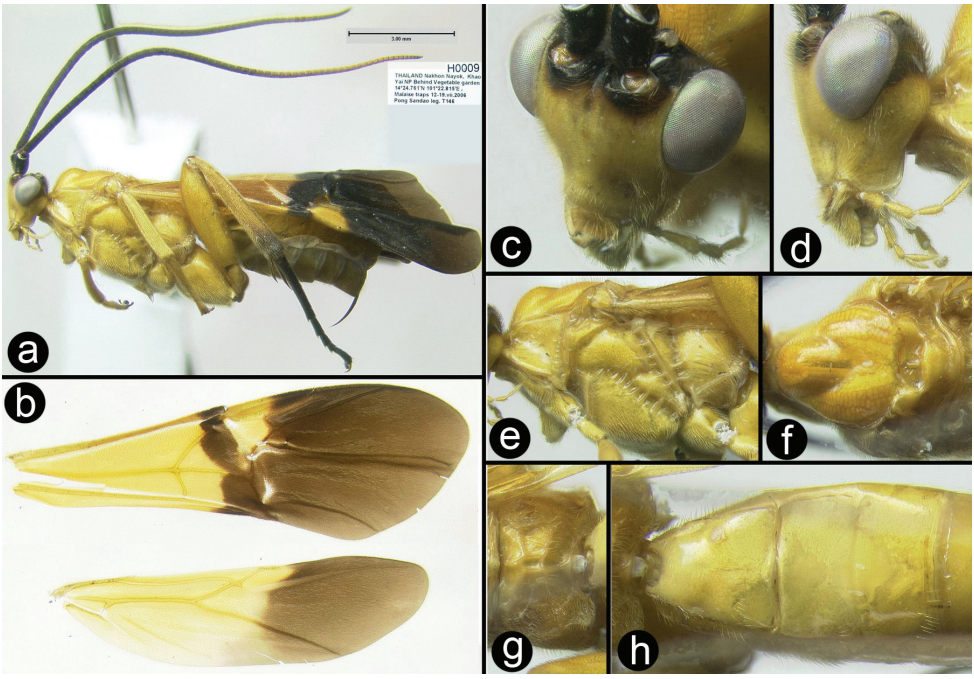


Figure 7. *Euagathis chinensis* (Holmgren), female. **A** lateral habitus **B** wings **C** antero-lateral head **D** lateral head **E** lateral mesosoma **F** dorsal thorax **G** dorsal propodeum **H** dorsal metasomal tergites 1–3.

***Euagathis chinensis* (Holmgren, 1868)**
http://species-id.net/wiki/Euagathis_chinensis

Distribution. For a distribution map of Thai specimens examined and their associated data, see Appendix I. China (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan Island, Hong Kong, Hunan, Jiangsu, Jiangxi, Qinghai, Sichuan, Taiwan, Yunnan, Zhejiang); India; Indonesia (Java, Sumatra); Japan; Laos; West Malaysia; Myanmar; Nepal; Pakistan; Singapore; Sri Lanka; Thailand; Vietnam. First reported from Thailand by Bhat and Gupta (1977).

Molecular data. Genbank accession numbers: KC867221-KC867223 (28S).

Notes. The following species belong to *E. chinensis* (Holmgren, 1868):

Disophrys sogdiana Fahringer, 1937: lectotype here designated (NRMS), "China, Kolthoff", "Provins Kiangsu", "Sept.", "Typ.", "*Disophrys sogdiana* sp. N., Type, det. Dr. Fahringer", "NHRS-HEVA, 000000041"; according to the original description there are 2 additional females from the same locality. The lectotype belongs to *Euagathis chinensis* (Holmgren, 1868) syn. n. It has the vein 1-R1 of fore wing and its setae dark brown (as most of the wing membrane), the second metasomal suture is absent, the stemmaticum and the vertex are black; apical 0.8 of hind tibia dorsally (but only ventral 0.3) and hind tarsus dark brown.

Disophrys chinensis Fahringer, 1937: lectotype here designated (NRMS), "China, Kolthoff", "Provins Kiangsu", "Sept.", "Typus", "*Disophrys chinensis* sp. N., Type, det.

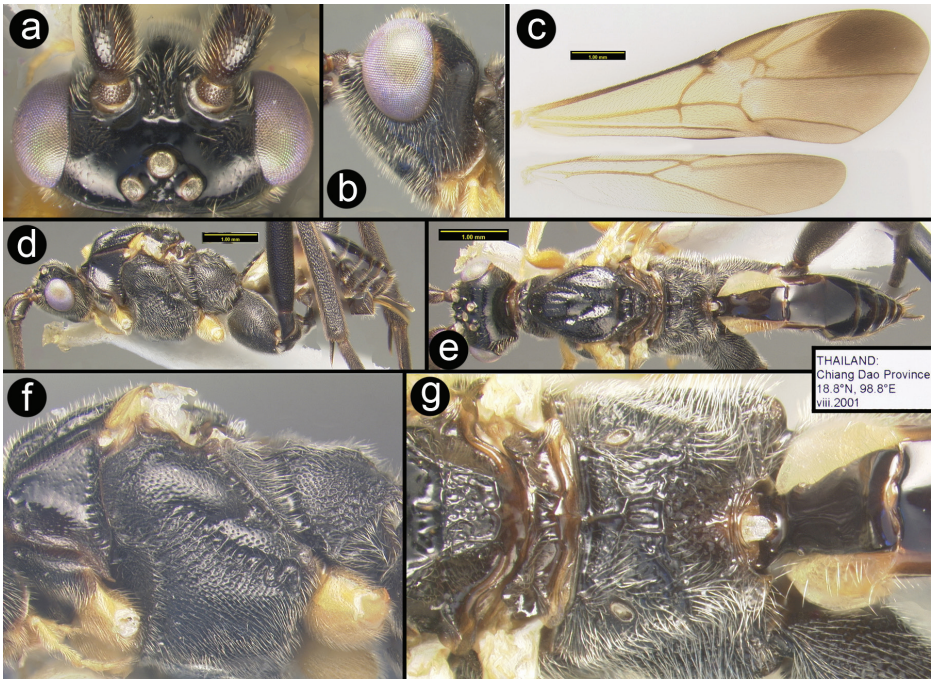


Figure 8. *Euagathis dravida* Bhat & Gupta, female. **A** Dorsal head **B** lateral head **C** wings **D** Lateral habitus **E** dorsal habitus **F** lateral mesosoma **G** dorsal scutellum and propodeum.

Dr. Fahringer", "NHRS-HEVA, 000000042"; according to the original description there are 2 additional females and a male from the same locality. The lectotype belongs to *Euagathis chinensis* (Holmgren, 1868) syn. n. It is very similar to *E. sogdiana*, but has a narrow band below the pterostigma and the basal half of the fore wing yellowish. The paralectotype male has the basal half of the fore wing partly darkened near vein cu-a.

Euagathis sentosus Chen & Yang, 1995, was purported to be a valid species because of the dark setae of vein 1-R1 of the fore wing and by having a shallow second metasomal suture (van Achterberg 2004), but the presence or absence of the second metasomal suture is variable in the series of *E. chinensis* from Thailand. In addition, *E. sogdiana, E. chinensis* (Fahringer) and the specimens from Thailand and Vietnam have the setae of vein 1-R1 dark brown. Therefore, *E. sentosus* is considered to be conspecific with *E. chinensis* (Holmgren) syn. n.

***Euagathis dravida* Bhat & Gupta, 1977**
http://species-id.net/wiki/Euagathis_dravida

Distribution. For a map showing the locality of the sole Thai specimen, see Appendix I. India; Vietnam. New for Thailand.

Molecular data. Genbank accession number 28S: DQ201905.

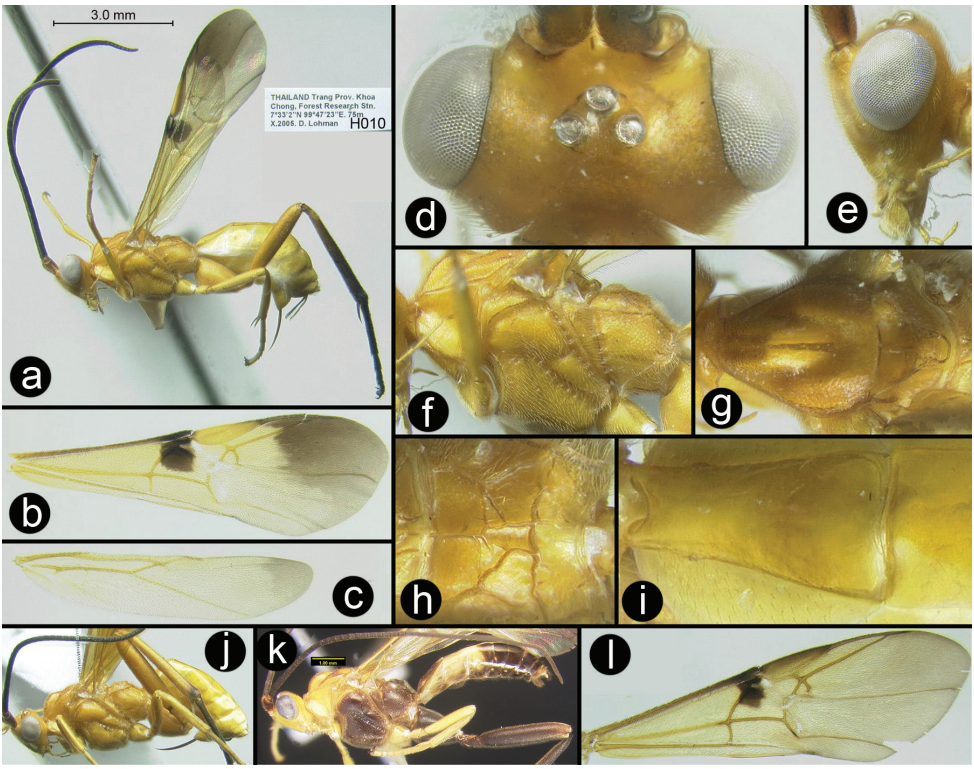


Figure 9. *Euagathis forticarinata* (Cameron). **A** female, lateral habitus **B** fore wing **C** hind wing **D** dorsal head **E** dorsal head **F** lateral mesosoma **G** dorsal thorax **H** propodeum **I** first metasomal tergite **J** female, lateral habitus showing variation, note color of hind tibia **K** male, lateral habitus **L** fore wing variation.

***Euagathis forticarinata* (Cameron, 1899)**
http://species-id.net/wiki/Euagathis_forticarinata

Distribution. For a distribution map of Thai specimens and their associated data, see Appendix I. China (Fujian, Guangdong, Guangxi, Guizhou, Hainan Island, Hong Kong, Hubei, Jiangxi, Macau, Sichuan, Taiwan, Yunnan, Zhejiang); India; Indonesia (Java, Sulawesi, Sumatra, West Lesser Sundas); West Malaysia; Nepal; Philippines (Luzon); Sri Lanka; Thailand; Vietnam.

Molecular data. Genbank accession numbers: KC899825-KC899841 (COI); KC867224-KC867249 (28S).

Notes. This is a variable species, females vary in sculpture of the mesosoma and the males both in colour and sculpture. Males may have the body yellow (as female) up to largely black (except head, anterior part of mesosoma, fore and middle legs; Fig. 9k); intermediates occur and melanic males are more common in Thailand than are yellow ones. The area below the precoxal sulcus varies from widely spaced punctate, densely punctate, punctate-rugulose to densely obliquely rugulose with dense puncta-

tion and the mesoscutum may be sparsely punctate to distinctly striate posteriorly; the apical half of the hind tibia may be largely dark brown or only apically dark brown. Especially small (5–6 mm) specimens may have a less densely sculptured mesopleuron, metapleuron and mesoscutum. See species delimitation section for comments on the limits of this species.

***Euagathis ophippium* (Cameron, 1899)**
http://species-id.net/wiki/Euagathis_ophippium

Distribution. For a distribution map of Thai specimens and their associated data, see Appendix I. China (Beijing, Fujian, Guangxi, Guizhou, Hunan, Jiangsu, Jilin, Shandong, Yunnan, Zhejiang); India; Japan; Korea; Nepal; Russia (Primor'ye Kray);Vietnam. New for Thailand.

Molecular data. Genbank accession numbers: KC899842 (COI); KC867250-KC867251 (28S).

***Euagathis pallitarsis* van Achterberg & Sharkey, sp. n.**
http://zoobank.org/32DC5893-4D11-4191-9EAC-AF4E211CC75E
http://species-id.net/wiki/Euagathis_pallitarsis

Type material. Holotype, ♀ (QSBG), "**Thailand**: Petchaburi, Kaeng Krachan N. P., km 3.3/helipad, 12°50.177'N, 99°20.688'E, 735 m elev., Malaise trap, 18-25.v.2009, Sirichai" (H1344; T4943). Paratypes (3 ♀): 1 ♀ (RMNH), "Thailand: Petchaburi, Kaeng Krachan N. P., Panernthang, 12°49.302'N, 99°22.263'E, Malaise trap, 18-25.i.2009, Sirichai" (H2441; T4408); 1 ♀ (HIC), id., but 4–11.iii.2009, Sirichai & Chusak (H756; T4734); 1 ♀ (HIC), id., but checkpoint 2 at Ban Krang, 12°47.896'N, 99°27.196'E, 336 m elev., sweep, 25.vi.2008, Sharkey (H738; T2853).

Diagnosis. This new species keys to *E. ophippium* (Cameron, 1899), from North India, Nepal, Thailand, Vietnam, Oriental and Palaearctic China, Korea, Japan and Far East Russia in the keys by van Achterberg and Chen (2002) and van Achterberg and Raychaudhuri (2004). Both species have a tuberculate scutellum and a wide second submarginal cell of the fore wing (vein r distinctly shorter than vein 3-SR). *E. pallitarsis* differs by having the hind tarsus and base of the hind tibia ivory (black in *E. ophippium*), the metapleuron finely reticulate-punctate (coarsely vermiculate-rugose), the scutellum pale yellow (largely reddish brown), the area below the precoxal sulcus densely punctate-rugose (densely punctate) and the propodeum with long golden or pale yellow setae (medium-sized silvery setae).

Gyrochus guangxiensis Chen & Yang, 2006, from Oriental China (Guangxi) has a similar tuberculate scutellum and is transferred to *Euagathis* (*E. guangxiensis* (Chen & Yang, 2006) comb. n.). *E. guangxiensis* differs by having the mesoscutum finely punctate (fairly coarsely punctate in *E. pallitarsis* sp. n.), the fore wing pale yellowish (brown), the

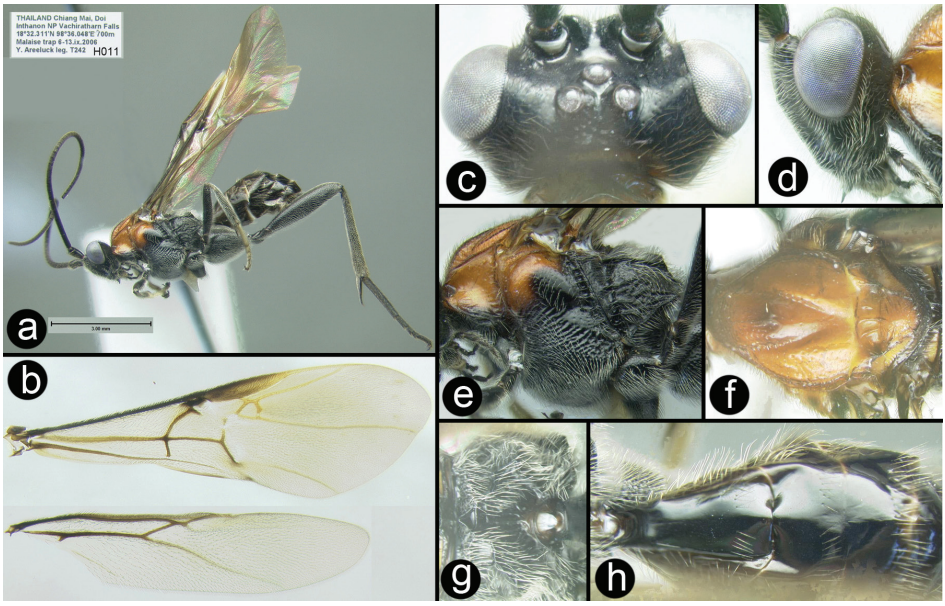


Figure 10. *Euagathis ophippium* (Cameron), female. **A** lateral habitus **B** wings **C** dorsal head **D** lateral head **E** lateral mesosoma **F** dorsal thorax **G** propodeum **H** dorsal metasomal tergites 1–3.

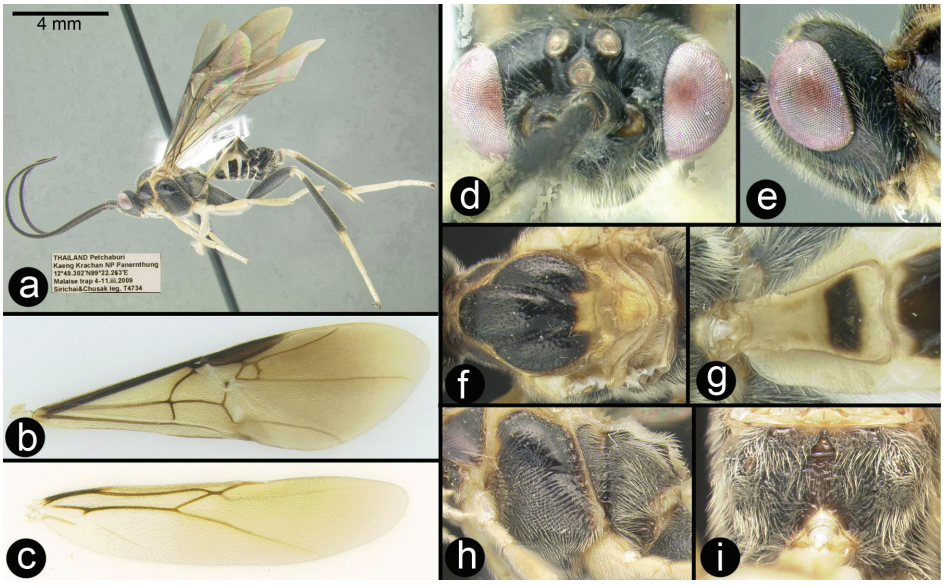


Figure 11. *Euagathis pallitarsis* sp. n., female, paratype. **A** lateral habitus **B** fore wing **C** hind wing **D** dorsal head **E** lateral head **F** dorsal thorax **G** dorsal first metasomal tergite **H** lateral mesosoma **I** dorsal propodeum.

crenulae of the precoxal sulcus coarse (medium-sized), the third and fourth segments of the fore tarsus normal (shortened) and the head, hind femur and mesoscutum largely brown (black).

Description. Holotype, ♀, length of body 8.5 mm, of fore wing 9.8 mm, of ovipositor sheath 0.6 mm.

Head. Antennal segments 49, length of third segment 1.4 times fourth segment, length of third, fourth and penultimate segments 2.8, 2.0 and 1.2 times their width, respectively; apical antennal segment 1.3 times as long as penultimate segment; maxillary palp 0.7 times height of head; malar space 2.8 times as long as basal width of mandible; length of eye 1.8 times temple; temple directly narrowed posteriorly, with long setae and slightly concave laterally; POL:OD:OOL= 5:5:8; face shiny with shallow medial groove dorsally, punctulate, finely rugulose medio-ventrally and long setose; frons, vertex and temple shiny and smooth (Fig. 11d); temple nearly straight near lower level of eye.

Mesosoma. Length of mesosoma 1.3 times its height; pronotum largely smooth, but with some curved striae anteriorly, punctulate dorsally and finely crenulate posteriorly; area near lateral carina of mesoscutum smooth anteriorly and finely crenulate posteriorly; mesoscutum shiny, with spaced and rather coarse punctures and lateral lobes distinctly convex posteriorly (Fig. 11f); notauli complete, anterior half finely crenulate and posterior half smooth or nearly so; scutellum tuberculate, with long setae and densely coarsely punctate, antero-dorsal margin rounded and with irregular transverse rugae; precoxal sulcus complete and all crenulae long and connected to rugae ventrally, area below it punctate-rugose (Fig. 11h); metapleuron coarsely punctate-rugose; propodeum coarsely areolate-rugose, anterior face much shorter than posterior face and with many long setae.

Wings. Fore wing: second submarginal cell wide pentagonal and with short ramellus (Fig. 11b); vein SR1 nearly straight; r:3-SR:SR1 = 4:10:110; vein 2-R1 0.2 times as long as 1-R1; vein cu-a interstitial; no stigmal spot. Hind wing: vein M+CU 2.9 times as long as vein 1-M; area near vein cu-a glabrous.

Legs. Length of hind femur, tibia and basitarsus 5.3, 8.0 and 10.2 times their width, respectively; hind femur superficially pimply and largely smooth ventrally; setae of middle tarsus shorter than width of tarsal segments; third and fourth fore and middle tarsal segments shortened; length of outer and inner spur of middle tibia 0.4 and 0.5 times middle basitarsus, respectively; outer side of middle tibia without pegs, except for 2 apical pegs; length of outer and inner spur of hind tibia 0.3 and 0.6 times hind basitarsus.

Metasoma. First tergite 2.3 times as long as wide apically, gradually widened apically, with short dorsal carinae basally and smooth (Fig. 11g); second metasomal suture faintly impressed; ovipositor sheath 0.06 times as long as fore wing, truncate apically and widened.

Colour. Black; mouthparts (including palpi), fore and middle legs, pronotal side laterally, mesopleuron dorsally and posteriorly, tegulae, mesoscutum posteriorly, scutellum, metanotum, metapleuron near base of hind coxa, apex and ventral face of hind coxa, hind trochanter and trochantellus, base of hind tibia, hind tarsus, first tergite (except subapical dark brown patch), second tergite anteriorly and laterally (but with dark brown patch on epipleuron), posterior margin of following tergites, sternites apically

and apex of ovipositor sheath more or less ivory; pterostigma and veins dark brown, but vein 1-R1 of fore wing light brown; wing membrane light brown (Fig. 11b, c).

Variation. Length of fore wing 8.6–9.8 mm; length of ovipositor sheath 0.06 times as long as fore wing; antennal segments of female 48 (1) or 49 (3); first metasomal tergite 1.9–2.3 times as long as its apical width; dark brown patch of first tergite minute or large; third epipleuron large black or ivory anteriorly.

Distribution. Only known from Thailand. For a distribution map, see Appendix I.

Molecular data. Genbank accession number KC867252 (28S).

Etymology. From "pallidus" (Latin for "pale") and "tarsos" (Greek for "flat part of the foot between toes and heel") because of the pale hind tarsus.

***Euagathis setosimaculata* van Achterberg & Sharkey, sp. n.**
http://zoobank.org/89F401F5-90EF-4F53-8003-F784218DCB84
http://species-id.net/wiki/Euagathis_setosimaculata

Type material. Holotype, ♀ (QSBG), "**Thailand**: Phetchabun, Thung Salaeng Luang N. P., Kaeng Wang Nam Yen, 16°36.587'N, 100°53.395'E, Malaise trap, 22-26. xi.2006 (H138; T1160). For a distribution map, see Appendix I.

Diagnosis. This new species keys to *E. abbotti* (Ashmead, 1900) from the Sunda area, Thailand, Laos and Vietnam in the key by Simbolotti and van Achterberg (1995). Females of both species have the third and fourth segments of the fore tarsus slender, vein 1-R1 of fore wing somewhat darker than the pterostigma, the precoxal sulcus comparatively narrow, the mesoscutum distinctly punctate and the scapus yellow. *E. setosimaculata* sp. n. differs by having the dorsal face of the propodeum much shorter than its posterior face (about as long as posterior face in *E. abbotti*); the hind femur about 4 times as long as wide (5-6 times); the area near vein cu-a of the hind wing glabrous (sparsely setose); vein cu-a of hind wing about as long as wide (distinctly longer than wide).

Description. Holotype, ♀, length of body 7.2 mm, of fore wing 7.5 mm, of ovipositor sheath 0.6 mm.

Head. Antennal segments 48, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 3.1, 2.8 and 1.2 times their width, respectively; apical antennal segment 1.8 times as long as penultimate segment; maxillary palp 0.6 times height of head; malar space 2.7 times as long as basal width of mandible; length of eye 1.8 times temple; temple directly narrowed posteriorly and slightly concave laterally (Fig. 12c); POL:OD:OOL= 12:10:21; face shiny with shallow medial groove dorsally, punctulate and short densely setose; frons, vertex and temple shiny and smooth (Fig. 12c); temple concave near lower level of eye.

Mesosoma. Length of mesosoma 1.5 times its height; pronotum smooth, but setose and punctulate dorsally and moderately crenulate posteriorly; area near lateral carina of mesoscutum finely crenulate; mesoscutum shiny, with spaced and rather coarse punctures and lateral lobes distinctly convex posteriorly (Fig. 12f); notauli complete, crenulate, but posterior third mainly smooth; scutellum slightly convex and densely

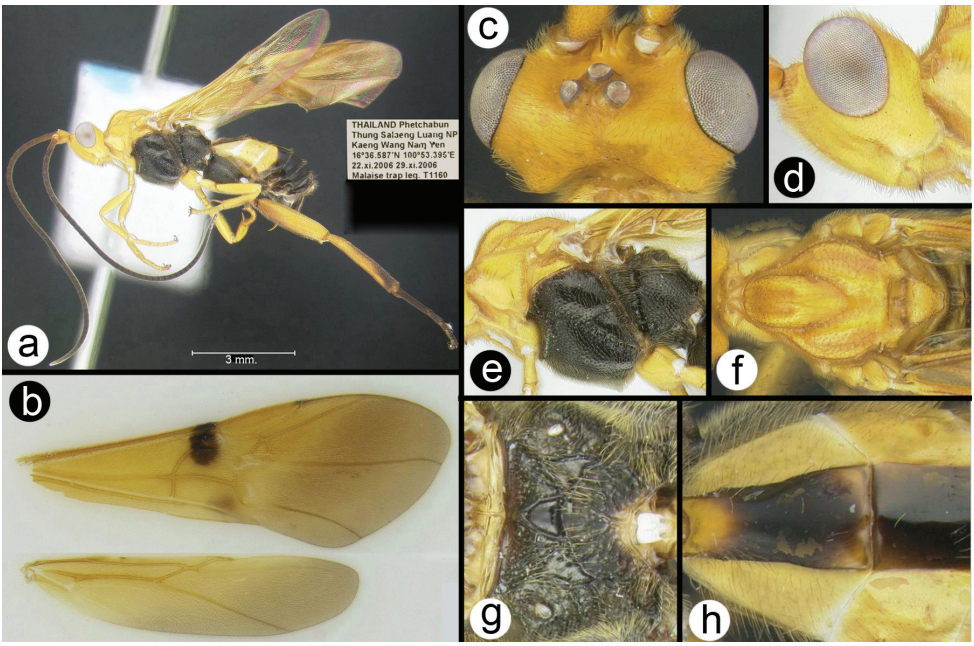


Figure 12. *Euagathis setosimaculata* sp. n., female, holotype. **A** lateral habitus **B** wings **C** dorsal head **D** lateral head **E** lateral mesosoma **F** dorsal thorax **G** propodeum **H** dorsal metasomal terga 1–2.

coarsely punctate, antero-dorsal margin angulate and with transverse carina; precoxal sulcus complete and anterior crenulae comparatively short (Fig. 12e); mesopleuron below precoxal sulcus and metapleuron medially coarsely punctate with interspaces about equal to diameter of punctures; propodeum coarsely areolate and partly rugose, moderately setose, anterior face much shorter than its posterior face.

Wings. Fore wing: second submarginal cell pentagonal and without ramellus (Fig. 12b); vein SR1 straight; r:3-SR:SR1 = 4:2:88; vein 2-R1 0.3 times as long as 1-R1; vein cu-a interstitial; with stigmal spot. Hind wing: vein M+CU 2.9 times as long as vein 1-M; area near vein cu-a setose; vein cu-a about as long as wide.

Legs. Length of hind femur, tibia and basitarsus 3.9, 7.3 and 8.4 times their width, respectively; hind femur reticulate-rugose ventrally; setae of middle tarsus shorter than width of tarsal segments; fore and middle tarsal segments moderately slender; length of outer and inner spur of middle tibia 0.5 and 0.7 times middle basitarsus, respectively; outer side of middle tibia without pegs, except for 2 apical pegs; length of outer and inner spur of hind tibia 0.25 and 0.55 times hind basitarsus.

Metasoma. First tergite twice as long as wide apically, gradually widened apically, without dorsal carinae and smooth (Fig. 12h); second metasomal suture absent; ovipositor sheath 0.08 times as long as fore wing, truncate apically and widened.

Colour. Black; head, scapus and pedicellus, palpi, mesosoma (but mesopleuron, mesosternum, metapleuron, propodeum and hind coxa black), fore and middle legs yellow; nota of first and second tergites, third tergite (but antero-laterally yellow) and

following segments black or dark brown; hind trochanter and femur ventrally, apex and outer side of hind tibia (except basally) and hind tarsus dark brown; pterostigma and veins yellow, but vein 1-R1 infuscate; wing membrane yellowish, but apically brownish (Fig. 12b); apex of ovipositor sheath brown and remainder black.

Distribution. Known only from Thailand. For map showing the locality of the sole specimen, see Appendix I.

Molecular data. Genbank accession numbers: KC899843 (COI); KC867253 (28S).

Etymology. From "setosus" (Latin for "bristly") and "macula" (Latin for "spot, mark") because of the setose base of the hind wing and the partly black body.

Acknowledgements

We are grateful to Dr. Hege Vårdal (NRMS) for the loan of types of Chinese Agathidinae. We thank the staff at Queen Sirikit Botanic Gardens in Chiang Mai for sorting the many hundreds of samples and for the Thai park staff for running Malaise traps and other collection devices. A special thanks to Chaweewan Hutacharern for managing the Thai end of the NSF TIGER project. Funding for MJS was provided by NSF grants DEB-0542864 and EF-0337220.

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Appendix 1

Distribution maps for the described species.

Euagathis abbotti
http://goo.gl/8RAVmM

Euagathis breviantennata
http://goo.gl/3tALum

Euagathis chinensis
http://goo.gl/PZhsVN

Euagathis dravida
http://goo.gl/JwI3tF

Euagathis forticarinata
http://goo.gl/H88q3v

Euagathis ophippium
http://goo.gl/U47xzu

Euagathis pallitarsis
http://goo.gl/c85anm

Euagathis setosimaculata
http://goo.gl/cX48eN

Interactive key, in IntKey format, to *Euagathis* Szépligeti
http://sharkeylab.org/sharkeylab/sharkeyKeys.php

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RESEARCH ARTICLE

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Review of the genus *Tersilochus* Holmgren (Hymenoptera, Ichneumonidae, Tersilochinae) from South Korea

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Abstract

Ten species of the genus *Tersilochus* are found to occur in South Korea. Eight species belonging to the subgenus *Tersilochus* are described as new: *T. fidicinus* **sp. n.**, *T. gangwonus* **sp. n.**, *T. iracundus* **sp. n.**, *T. nigellus* **sp. n.**, *T. obstinatus* **sp. n.**, *T. punctator* **sp. n.**, *T. serratus* **sp. n.**, and *T. uncinatus* **sp. n.** One abundant and widely distributed Palaearctic species, *T.* (*Gonolochus*) *caudatus* Holmgren, is recorded from South Korea for the first time. A key to 10 South Korean species of the genus *Tersilochus* is provided. Recently discovered finger-shaped flagellar structures are found and described in all Korean species of *Tersilochus*.

Keywords

Tersilochus, Tersilochinae, Palaearctic region, South Korea, taxonomy, key

Introduction

Extensive study of South Korean Tersilochinae was initiated 2 years ago by A. Khalaim and co-authors based on materials from Yeungnam University (Gyeongsan, South Korea). Six Tersilochinae genera were recognized in the Korean fauna, and four of them, *Barycnemis* Förster (two species), *Diaparsis* Förster (11 species, including one new species and two unidentified species), *Gelanes* Horstmann (eight species, including four new species), and *Phradis* Förster (two species), have been reviewed in three papers (Balueva et al. 2013a, 2013b; Kim et al. 2013). The genus *Probles* Förster was also partly revised; three new species of this genus are described (Khalaim et al. 2013) and one abundant species will be described in our forthcoming paper (Balueva et al., unpublished).

In this paper, we review one of the largest tersilochine genera, *Tersilochus* Holmgren. This predominantly Holarctic genus comprises three subgenera with about 65 species: *Gonolochus* Förster (six species), *Pectinolochus* Aubert (19 species), and *Tersilochus* s. str. (40 species). Most species of the genus *Tersilochus* occur in Europe (Horstmann 1971, 1981), and only a few species are known from Nearctic (Horstmann 2001), Afrotropical (Khalaim 2013), and probably Oriental (Khalaim 2011) regions. In the East Palaearctic region, eight species of subgenus *Pectinolochus* were recorded from Mongolia, Russian Siberia, and the Far East (Khalaim 2007), three species were recorded from the Palaearctic part of China (Khalaim and Sheng 2009), one species was described from South Korea (Khalaim 2011), and nine species (including seven new species) were recorded from the Russian Far East and Japan (Khalaim 2012). The most abundant species of the genus, *T.* (*G.*) *caudatus* Holmgren, is widely distributed within the Palaearctic region (Khalaim 2007) but has not been recorded from South Korea till now.

Only one species of the genus *Tersilochus*, *T.* (*T.*) *granulatus* Khalaim, was known from South Korea hitherto. The aim of this work is to describe eight new species and provide a key for identification of ten Korean species of the genus *Tersilochus*.

Materials and methods

The ichneumonid collection of Yeungnam University, Gyeongsan, South Korea (further YUG), was studied. From this material, nine species of the genus *Tersilochus* were recognized (eight of them are new to science), and one recently described species, *T. granulatus*, deposited in the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (further ZISP), was re-examined and photographed. All new species are described from females. Unfortunately, we were unable to identify six males.

Most specimens, including all holotypes, are kept at Yeungnam University, and some specimens are deposited in ZISP.

Photographs were taken at ZISP using a DFC290 digital camera attached to a Leica MZ16 stereomicroscope. Partially focused photographs were combined using Helicon Focus software. In the *Material examined* section, we provide abbreviations

for Korean provinces in addition to the complete names, as abbreviations are widely used in our previous papers on Korean Tersilochinae. Morphological terminology predominantly follows Townes (1969, 1971) with changes according to Khalaim (2011). Additional characters in the key are given in square brackets.

Taxonomy

***Tersilochus* Holmgren, 1859**
http://species-id.net/wiki/Tersilochus

Type species. *Thersilochus cognatus* Holmgren, 1860 (= *jocator* Holmgren, 1859) (Horstmann 2005: 1269–1270).

All Korean species have occipital carina complete, scutellum with lateral longitudinal carinae developed only at its basal part, fore wing with second recurrent vein distinctly postfurcal and legs slender with tarsal claws not pectinate.

Key to species of *Tersilochus* occurring in South Korea

1 Second tergite 2.0–2.5 times as long as anteriorly broad. Thyridial depression distinctly elongate. First tergite very slender, about 5.0 times as long as posteriorly broad, smooth, with small glymma situated in apical 0.6–0.7 of first tergite. [Malar space about as long as basal width of mandible. Ovipositor with weak dorsal subapical depression, without teeth, its sheath about twice as long as first tergite.] (Subgenus *Gonolochus* Förster) ..... ***T. caudatus***

– Second tergite 0.8–1.5 times as long as anteriorly broad (Figs 13, 17, 27, 30, 40, 49, 60, 70). Thyridial depression short, distinctly transverse or as long as broad (Figs 13, 17, 27, 30, 40, 49, 60, 70) (except *T. fidicinus* sp. n. with thyridial depression 1.5 times as long as broad). First tergite shorter, 2.5–3.0 times as long as posteriorly broad (Figs 27, 30, 40, 60, 70) (except *T. granulatus* with first tergite 4.5 times as long as broad, Fig. 17), usually striate laterally, with glymma often deep and large, and usually situated at or slightly behind center of first tergite. (Subgenus *Tersilochus* s. str.) **2**

2 Mesopleuron centrally distinctly punctate, smooth between punctures (Fig. 46). Fore wing with metacarpus almost reaching apex of fore wing. Finger-shaped subapical structures present on outer surface of flagellomeres 2 to 6 (Fig. 44). Flagellum with 26 segments (Fig. 43). Ovipositor very short, its sheath about 0.6 times as long as first tergite (Figs 48, 50) ..... ***T. punctator* sp. n.**

– Mesopleuron densely granulate, impunctate or with fine punctures (Figs 2, 9, 24, 29, 56, 66). Fore wing with metacarpus not reaching apex of fore wing (Figs 11, 25, 35, 58, 69). Finger-shaped subapical structures absent on flagellomere 2, present on flagellomeres 3(4) to 6(7) (Figs 8, 21, 34, 55, 65). Flagellum with 17–21 segments (Figs 1, 7, 20, 28, 31, 54, 64). Ovipositor

longer, sometimes very long, its sheath 0.7–3.0 times as long as first tergite (Figs 3, 12, 18, 26, 36, 59, 68) **3**

3 Head, in dorsal view, weakly to moderately rounded and very strongly tapered behind eyes (Figs 16, 53). Clypeus flat (Fig. 52). Small species with body length 3.2–4.0 mm and fore wing length 2.4–2.8 mm..... **4**

– Head, in dorsal view, strongly rounded, weakly tapered just behind eyes (Figs 6, 19, 33, 63). Clypeus conspicuously bent backwards in lower 0.3–0.4 (with transverse bend, as in European *T. jocator* Holmgren; except *T. obstinatus* sp. n., which has clypeus strongly truncate, probably abnormal). Body length 3.7–5.1 mm and fore wing length 2.8–3.9 mm..... **5**

4 Propodeum with basal keel (Fig. 17); all carinae weak (sometimes partly indistinct), without adjacent wrinkles. First tergite brown, entirely smooth, very slender, about 4.5 times as long as broad posteriorly (Figs 15, 17). Second tergite elongate, about 1.5 times as long as broad anteriorly (Fig. 17). Ovipositor without dorsal subapical teeth, its sheath about 0.75 times as long as first tergite ..... ***T. granulatus*** Khalaim

– Propodeum with basal area (Fig. 57); all carinae strong, transverse carina with short adjacent wrinkles (Fig. 57). First tergite black, less slender, 3.0 times as long as broad posteriorly, with petiole distinctly striate laterally and dorsally (Fig. 60). Second tergite transverse, 0.8 times as long as broad anteriorly (Fig. 60). Ovipositor with two dorsal subapical teeth (Fig. 61), its sheath 1.25 times as long as first tergite (Fig. 59)..... ***T. serratus* sp. n.**

5 Eyes conspicuously enlarged; temple short, almost 0.6 times as long as eye width (Fig. 33). [Flagellum brown (Fig. 31). Metasoma behind first tergite brownish yellow (Fig. 36). Ovipositor short, with dorsal subapical notch, its sheath as long as first tergite (Figs 36, 37).]..... ***T. obstinatus* sp. n.**

– Eyes not enlarged; temple longer, 0.75–0.85 times as long as eye width (Figs 6, 19, 63)..... **6**

6 Eyes with inner orbits weakly but distinctly convergent dorsally (Fig. 5). Ovipositor short, apically clavate, its sheath slightly shorter than first tergite (Fig. 12)..... ***T. gangwonus* sp. n.**

– Eyes with inner orbits more or less parallel (Figs 23, 62). Ovipositor apically not clavate, its sheath sometimes much longer than first tergite (Figs 3, 26, 68) **7**

7 Malar space short, 0.4–0.6 times as long as basal width of mandible..... **8**

– Malar space almost as long as basal width of mandible..... **9**

8 Metasoma behind first tergite yellow-brown (Figs 18, 26). Thyridial depression strongly transverse (Fig. 27). Ovipositor short, apically thin and without distinct dorsal notch, its sheath 0.7 times as long as first tergite (Fig. 26)..... ***T. iracundus* sp. n.**

– Metasoma behind first tergite predominantly dark brown (Fig. 3). Thyridial depression 1.5 times as long as broad. Ovipositor longer, with sharp dorsal subapical notch (Fig. 4), its sheath 1.7–1.8 times as long as first tergite (Fig. 3)..... ***T. fidicinus* sp. n.**

9 Propodeal spiracle separated from pleural carina by 2.0–2.5 times diameter of spiracle (Fig. 29). Flagellum with finger-shaped subapical structures on outer surface of flagellomeres 4 to 7. Ovipositor short and robust, evenly upcurved, with sharp dorsal subapical notch, its sheath 1.25 times as long as first tergite ..... ***T. nigellus* sp. n.**

– Propodeal spiracle adjacent to pleural carina (Fig. 66). Flagellum with finger-shaped subapical structures on outer surface of flagellomeres 3 to 6 (Fig. 65). Ovipositor much longer, apically thin and strongly upcurved, its sheath almost 3.0 times as long as first tergite (Fig. 68) .....***T. uncinatus* sp. n.**

***Tersilochus* (*Gonolochus*) *caudatus* (Holmgren, 1860)**
http://species-id.net/wiki/Tersilochus_caudatus

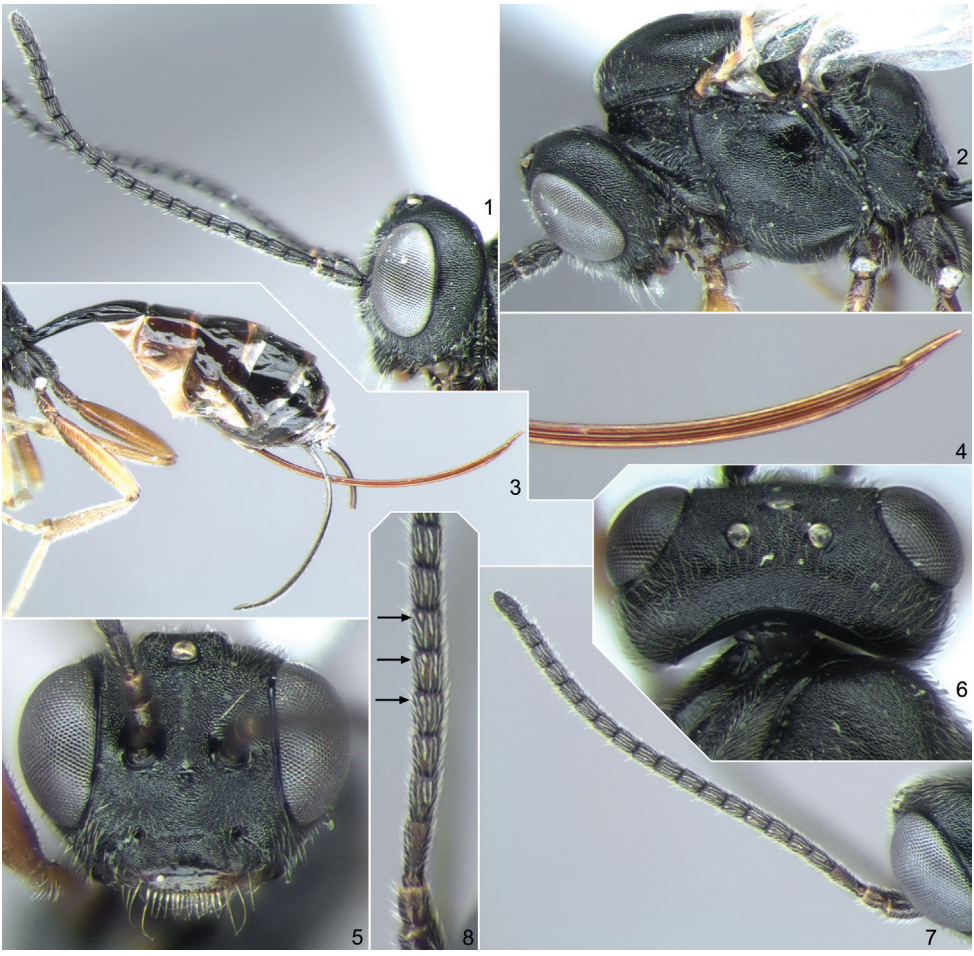
Material examined. South Korea, Gangwon-do (GW), Taebaek-si, Tong-dong, Yeonhwasan, 37°09'00.89"N, 129°00'10.41"E, 14.V.1997, 1 female.

Distribution. Widespread transpalaearctic species. First record from South Korea.

***Tersilochus* (*Tersilochus*) *fidicinus* Khalaim & Lee, sp. n.**
http://zoobank.org/CD6518A9-E696-4130-93EE-CDF1AD227329
http://species-id.net/wiki/Tersilochus_fidicinus
Figs 1–4

Description. *Female* (holotype). Body length 4.8 mm. Fore wing length about 3.9 mm (apices of both wings absent).

Head roundly constricted behind eyes in dorsal view (as in Fig. 6); temple 0.84 times as long as eye width. Inner eye orbits parallel. Mandible with upper tooth much longer than lower tooth. Clypeus lenticular, 3.0 times as broad as long, in profile convex, with lower 0.3 bent backwards; sparsely punctate, very finely granulate and dull in upper 0.7. Malar space 0.5–0.6 times as long as basal width of mandible. Flagellum of antenna filiform, with 19 segments in holotype and 17 in paratype (Fig. 1); subbasal flagellomeres about 1.4 times and subapical flagellomeres about 1.2 times as long as broad; flagellomeres 4 to 6 with distinct subapical finger-shaped structures on outer surface. Face, frons, vertex, and temple distinctly granulate, dull, and impunctate. Mesosoma almost entirely densely granulate; lateral lobes of mesoscutum with fine punctures, and upper posterior corner of mesopleuron finely punctate on almost smooth and shining background. Notaulus very weak, with indistinct wrinkles. Foveate groove very weak, narrow, and short, situated in center of mesopleuron (Fig. 2). Propodeum mediodorsally with fine longitudinal wrinkles; basal part 0.43 times as long as apical area. Propodeal spiracle separated from pleural carina by 1.5–2.0 times diameter of spiracle (Fig. 2). Apical area almost flat, anteriorly widely rounded. Apical longitudinal carinae weak but complete. Fore wing with intercubitus rather long, equal



Figures 1–8. *Tersilochus fidicinus* sp. n., female, holotype: **1** head with antenna, lateral view **2** head and mesosoma, lateral view **3** metasoma with ovipositor, lateral view **4** apex of ovipositor, lateral view. *Tersilochus gangwonus* sp. n., female, holotype (Figs **5**, **6**) and paratype (Figs **7**, **8**): **5** head, frontal view **6** head, dorsal view **7** antenna, lateral view **8** base of antenna, lateral view.

by length to abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius distinctly longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted somewhat below middle. Hind wing with nervellus slightly reclivous or vertical. Metasoma: first tergite 2.8 times as long as broad posteriorly, mostly smooth; petiole trapeziform in cross-section, very finely striate laterally. Glymma deep, situated slightly behind center of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite as long as anteriorly broad. Thyridial depression deep, about 1.5 times as long as broad. Ovipositor evenly upcurved, with deep and sharp dorsal subapical notch (Figs 3, 4); sheath 1.8 times as long as first tergite.

Head (including clypeus), mesosoma, and first tergite black; palpi brownish yellow to brown; tegula yellow. Mandible blackish in basal 0.4, reddish brown centrally and with teeth reddish black. Antenna entirely black. Pterostigma brown with whitish marks on proximal and distal corners. Legs brownish yellow; coxae brownish black; first trochanters brownish. Metasoma behind first tergite predominantly dark brown.

Male. Unknown.

Comparison. Differs from other species of the genus by the combination of long temple, granulate and impunctate head, and mesosoma (Figs 1, 2), weak foveate groove of mesopleuron (Fig. 2), elongate thyridial depression, and long ovipositor with sharp dorsal subapical notch (Figs 3, 4).

Variation. Paratype almost exactly corresponds with the holotype. In paratype, flagellomeres are slightly shorter, propodeum is with weak basal keel, and ovipositor is slightly shorter than in the holotype.

Type material. Holotype female, South Korea, Gangwon-do (GW), Taebaek-si, Hyeoldong, Mt. Taebaek, 37°05'N, 128°54'E, 14.V.1992, coll. J.W. Lee (YUG).

Paratype. 1 female (ZISP), South Korea, Gyeongbuk-do (GB), Uljin-gun, Seomyeon, Wangpi-ri, Wangpicheon, Parkdaljae, Malaise trap, 24.VI–31.VII.2012, coll. J.K. Choi.

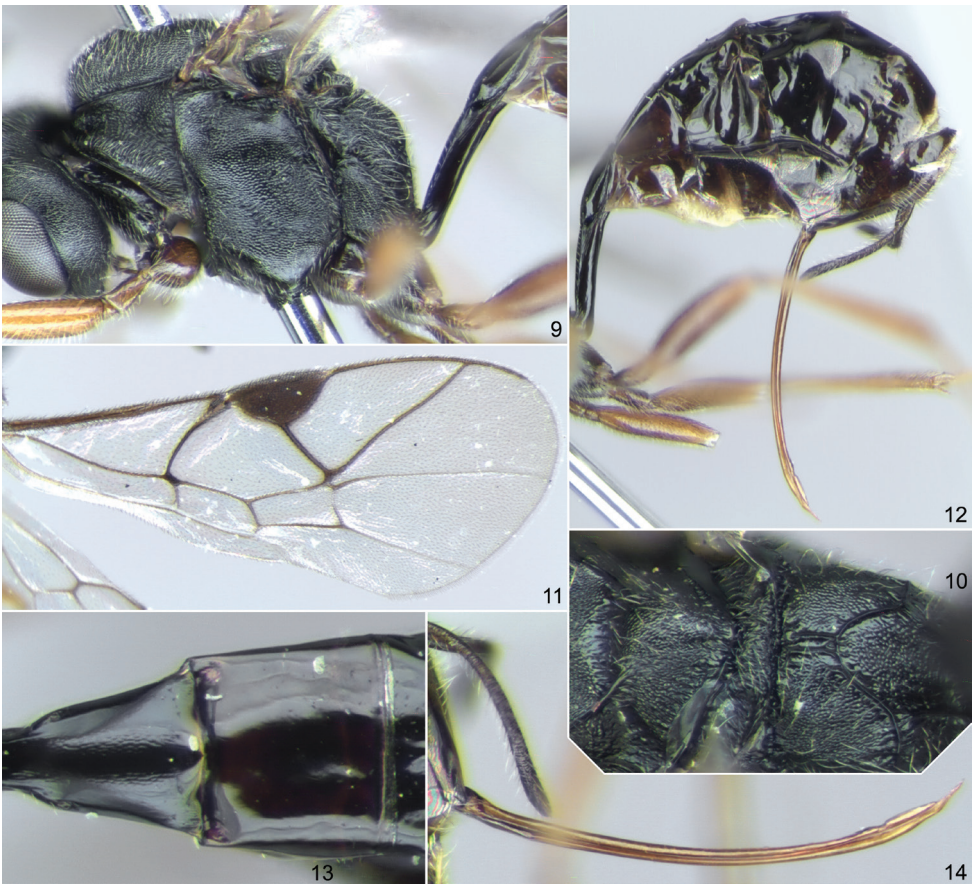
Distribution. South Korea.

Etymology. Named after the Latin *fidicinus* (of lute playing).

***Tersilochus* (*Tersilochus*) *gangwonus* Khalaim & Lee, sp. n.**
http://zoobank.org/FDFC6D32-1939-4731-BCD6-7FECE1D2FC0B
http://species-id.net/wiki/Tersilochus_gangwonus
Figs 5–14

Description. *Female* (holotype). Body length 4.2 mm. Fore wing length 3.35 mm.

Head strongly rounded behind eyes in dorsal view (Fig. 6); temple 0.75 times as long as eye width. Inner eye orbits weakly but distinctly convergent dorsally (Fig. 5). Mandible with upper tooth longer than lower tooth. Clypeus lenticular, 2.5 times as broad as long, in profile convex, with lower 0.4 bent backwards (Fig. 5); sparsely punctate, finely granulate, and dull in upper 0.7. Malar space about as long as basal width of mandible. Flagellum of antenna filiform, with 19 segments (Fig. 7); subbasal flagellomeres 1.4–1.5 times as long as broad, subapical flagellomeres slightly elongate; flagellomeres 4 to 6 with distinct subapical finger-shaped structures on outer surface (Fig. 8, arrows). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 5, 6). Mesosoma entirely densely granulate, dull, and impunctate (Fig. 9); mesopleuron centrally with fine oblique or horizontal striae on granulate background. Notaulus absent. Foveate groove weak, narrow, and short. Propodeum mediodorsally with fine longitudinal wrinkles (Fig. 10); basal part 0.35 times as long as apical area. Propodeal spiracle separated from pleural carina by 0.7–1.0 times diameter of spiracle. Apical area flat, anteriorly widely rounded (Fig. 10). Apical longitudinal carinae anteriorly weak.



Figures 9–14. *Tersilochus gangwonus* sp. n., female, holotype: **9** head, mesosoma and first tergite, lateral view **10** mesoscutum and propodeum, dorsolateral view **11** fore wing **12** metasoma with ovipositor, lateral view **13** postpetiole and second tergite, dorsal view **14** ovipositor, lateral view.

Fore wing (Fig. 11) with intercubitus thickened, about as long as abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius distinctly longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.7 times as long as broad posteriorly, mostly smooth; petiole trapeziform in cross-section, well separated from postpetiole in dorsal view, finely striate laterally before glymma. Glymma deep, situated somewhat behind center of first tergite, joining by distinct furrow to ventral part of postpetiole (Figs 9, 12). Second tergite as long as anteriorly broad (Fig. 13). Thyridial depression short, as long as broad in the holotype (Fig. 13) and transverse in the paratype. Ovipositor short and robust, weakly upcurved, clavate, with rather sharp dorsal subapical notch (Fig. 14); sheath 0.85 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi and lower 0.4 of clypeus brown; mandible yellow-brown, fuscous basally, and with reddish teeth; tegula yellow. An-

tenna entirely black. Pterostigma brown. Legs brownish yellow; coxae brownish black, first trochanters brownish. Metasoma behind first tergite dark brown.

Male. Unknown.

Comparison. Differs from other Korean species of the genus *Tersilochus* by the combination of inner eye orbits convergent dorsally (Fig. 5), and short and clavate ovipositor apically with rather sharp dorsal subapical depression (Figs 12, 14).

Variation. Paratype corresponds well with the holotype but has somewhat less clavate ovipositor and shorter thyridial depression.

Type material. Holotype female, South Korea, Gangwon-do (GW), Taebaek-si, Sodo-dong Mt. Taebaek, Danggol valley, 37°05'N, 128°56'E, 5.V.1999, coll. J.W. Lee (YUG).

Paratype. 1 female (ZISP), South Korea, Gangwon-do (GW), Taebaek-si, Hyeol-dong, Mandeoksa, 37°07'06"N, 128°56'52"E, 6.V.1999, coll. J.W. Lee.

Distribution. South Korea.

Etymology. Named after the type locality, Gangwon province of South Korea.

Tersilochus (*Tersilochus*) *granulatus* Khalaim, 2011

http://species-id.net/wiki/Tersilochus_granulatus
Figs 15–17

Comparison. Differs from other Korean species of the genus by an evenly granulate propodeum with basal keel (Fig. 17), very slender brown first tergite (Figs 15, 17), and distinctly elongate second tergite (Fig. 17).

Remarks. Flagellum with finger-shaped subapical structures present on outer surface of flagellomeres 4 to 6; these structures in this species are very small, inconspicuous, and hardly visible under a light microscope.

Distribution. South Korea: Gyeongsangnam-do (GN).

Tersilochus (*Tersilochus*) *iracundus* Khalaim & Lee, sp. n.

http://zoobank.org/83AB92C8-1729-4ADA-9F15-286F4861DAE5
http://species-id.net/wiki/Tersilochus_iracundus
Figs 18–27

Description. *Female* (holotype). Body length 3.7 mm. Fore wing length 2.8 mm.

Head strongly rounded behind eyes in dorsal view (Fig. 19); temple 0.74 times as long as eye width. Inner eye orbits parallel (Fig. 23). Mandible with upper tooth much longer than lower tooth. Clypeus lenticular, almost 3.0 times as broad as long, in profile convex, with lower 0.4 bent backwards (Fig. 23); sparsely punctate, finely granulate, and dull in upper 0.7. Malar space 0.4 times as long as basal width of mandible. Flagellum of antenna weakly tapered towards apex, with 19 segments (Fig. 20); subbasal flagellomeres 1.3–1.4 times, and subapical flagellomeres about 1.2 times

Figures 15–22. *Tersilochus granulatus* Khalaim, female, holotype (Figs **15**, **16**) and paratype (Fig. **17**): **15** habitus (without apices of wings and ovipositor), lateral view **16** head and anterior part of mesoscutum, dorsal view **17** propodeum and base of metasoma, dorsal view. *Tersilochus iracundus* sp. n., female, holotype: **18** habitus (without wings), lateral view **19** head and anterior part of mesoscutum, dorsal view **20** antenna, lateral view **21** base of antenna, lateral view **22** propodeum and hind coxae, dorsal view.

as long as broad; flagellomeres 4–6 with distinct and flagellomere 7 with rudimental subapical finger-shaped structures on outer surface (Fig. 21). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 19, 23).

Mesosoma entirely granulate, dull, impunctate; mesopleuron centrally with fine oblique striae on granulate background (Fig. 24). Notaulus absent. Foveate groove weak and short, oblique, situated in anterior half of mesopleuron (Fig. 24). Propodeum with narrow basal area, which is 0.4 times as long as apical area (Fig. 22). Propodeal spiracle separated from pleural carina by 1.5 times diameter of spiracle. Apical area slightly impressed, anteriorly rounded (Fig. 22). Apical longitudinal carinae developed in posterior half, anteriorly absent. Fore wing (Fig. 25) with intercubitus thickened, as long as abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius slightly longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical. First tergite almost 3.0 times as long as broad posteriorly, mostly smooth, with petiole more or less round in cross-section, well separated from postpetiole in dorsal view, finely striate laterally before glymma (Fig. 27). Glymma deep, situated somewhat behind center of first tergite, joining by distinct furrow to ventral part of postpetiole (Fig. 26). Second tergite as long as anteriorly broad (Fig. 27). Thyridial depression short, transverse. Ovipositor short, slender, almost straight basally and upcurved in apical 0.3, with fine teeth dorsally and ventrally at apex (Fig. 26); sheath 0.7 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi, mandible (except reddish black teeth), and lower 0.3 of clypeus yellow-brown; tegula yellow. Antenna dark brown. Pterostigma brown. Legs brownish yellow; fore and mid coxae weakly brown, and hind coxa strongly brown. Metasoma behind first tergite yellow-brown.

Male. Unknown.

Comparison. Differs from other Palaearctic species of *Tersilochus* by the combination short malar space, reddish brown behind first tergite of metasoma (Figs 26, 27) and short ovipositor (Fig. 26).

Type material. Holotype female, South Korea, Chungbuk-do (CB), Jecheon-si, Deoksan-myeon, Worak-ri, Deoksanmaepyoso, 36°52'N, 128°13'E, Malaise trap, 6–20.V.2006, coll. J.W. Lee (YUG).

Distribution. South Korea.

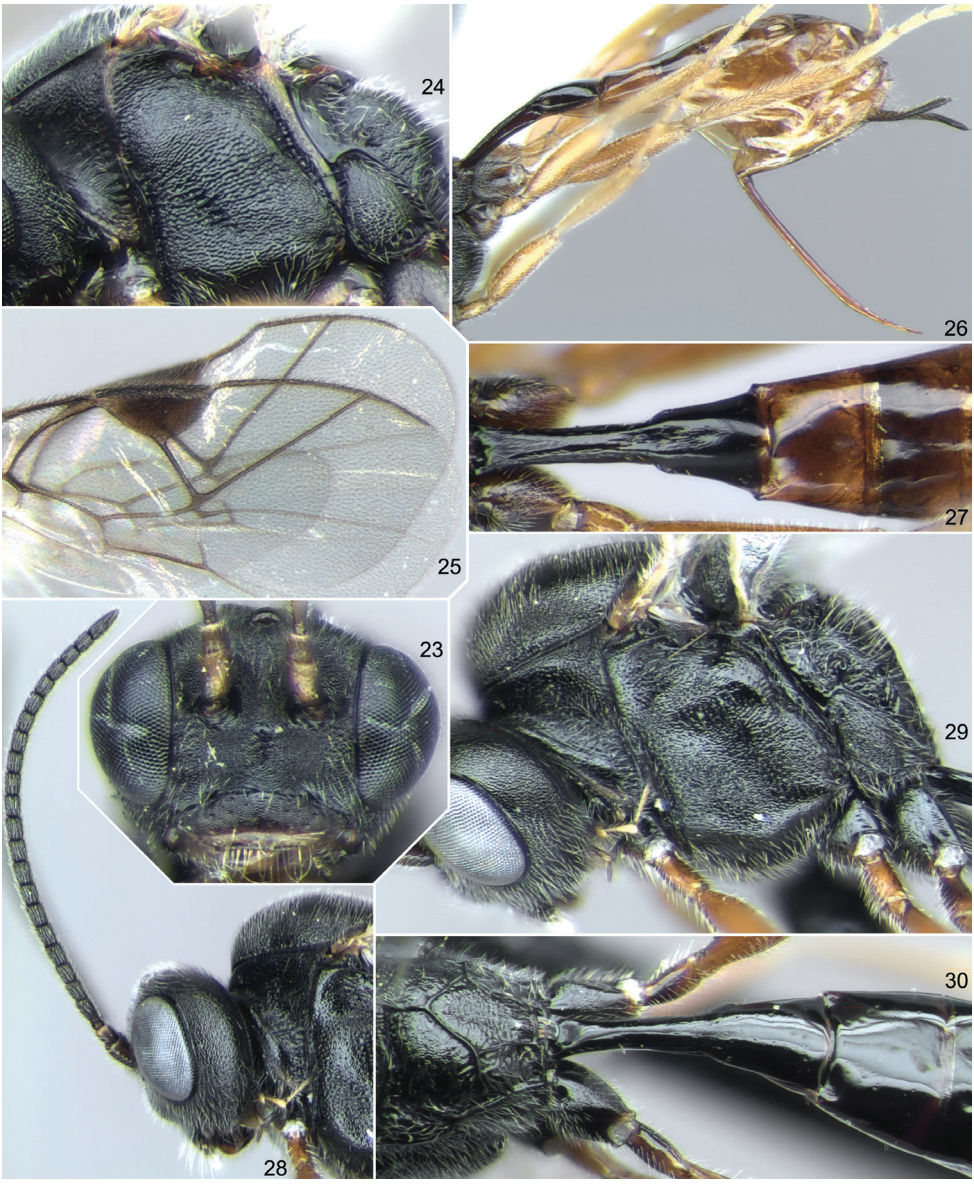
Etymology. Named after the Latin *iracundus* (angry, hot-tempered, furious).

***Tersilochus* (*Tersilochus*) *nigellus* Khalaim & Lee, sp. n.**

http://zoobank.org/3A477F29-AB5D-4141-A92E-C7A2ED9EAF41
http://species-id.net/wiki/Tersilochus_nigellus
Figs 28–30

Description. *Female* (holotype). Body length 5.1 mm. Fore wing length 3.8 mm.

Head strongly rounded behind eyes in dorsal view; temple 0.85 times as long as eye width. Inner eye orbits parallel. Mandible with upper tooth distinctly longer than lower tooth. Clypeus lenticular, 2.7 times as broad as long, in profile slightly convex, with lower 0.3 bent backwards; sparsely punctate, finely granulate, and dull in upper half. Malar space almost as long as basal width of mandible. Flagellum of antenna weakly tapered towards



Figures 23–30. *Tersilochus iracundus* sp. n., female, holotype: **23** head, frontal view **24** mesosoma, ventrolateral view **25** fore wings **26** metasoma with ovipositor, lateral view **27** tergites 1–3 of metasoma, dorsal view. *Tersilochus nigellus* sp. n., female, holotype: **28** head with antenna and anterior part of mesosoma, lateral view **29** mesosoma, lateral view **30** propodeum and base of metasoma, dorsolateral view.

apex, with 21 segments in the holotype and 20 segments in the paratype (Fig. 28); subbasal flagellomeres 1.3–1.5 times and subapical flagellomeres 1.2–1.3 times as long as broad; flagellomeres 4 to 7 with subapical finger-shaped structures on outer surface. Face, frons, vertex, and temple distinctly granulate and dull; face and frons of holotype also with indis-

tinct punctures. Mesosoma entirely granulate, dull, and mostly impunctate; mesopleuron finely and rather densely punctate on finely granulate background (Fig. 29). Notaulus as very weak wrinkle or tubercle. Foveate groove weak and short, situated in anterior half of mesopleuron. Propodeum with basal keel, which is 0.31 times as long as apical area (Fig. 30). Propodeal spiracle separated from pleural carina by 2.0–2.5 times diameter of spiracle (Fig. 29). Apical area flat, anteriorly slightly pointed (Fig. 30). Apical longitudinal carinae anteriorly weak. Fore wing with intercubitus longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius distinctly longer than width of pterostigma. Metacarpus not reaching apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical or slightly reclivous. Metasoma: first tergite 2.6 times as long as broad posteriorly, mostly smooth, with petiole slightly depressed, oval in cross-section, well separated from postpetiole in dorsal view, finely striate laterally before glymma. Glymma deep, situated in apical 0.6 of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite as long as anteriorly broad (Fig. 30). Thyridial depression short, transverse (Fig. 30). Ovipositor evenly upcurved, thickened near apex, with deep and sharp dorsal subapical notch; sheath 1.25 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi and lower 0.3 of clypeus reddish brown; mandible reddish brown with blackish base and teeth; tegula yellow. Antenna with scape and pedicel brownish black and flagellum entirely black. Pterostigma brown. Legs brownish yellow; fore coxa brown basally; mid and hind coxae brownish black; first trochanter of hind leg dark brown. Metasoma behind first tergite dark brown ventrally to brownish black dorsally.

Male. Unknown.

Comparison. Similar to *T. fidicinus* sp. n. but differs by the longer malar space, finely punctate mesopleuron (Fig. 29), propodeum with distinct basal keel (Fig. 30), and shorter thyridial depression (Fig. 30).

Variation. Paratype almost exactly corresponds with the holotype with no obvious variation.

Type material. Holotype female, South Korea, Jeonnam-do (JN), Jeongeup-si, Jangseong-gun, Bukha-myeon, Namchanggol, Malaise trap, Site 18, 19.V.2005, coll. D.K. Jung (YUG).

Paratype. 1 female (ZISP), South Korea, Gyeongbuk-do (GB), Cheongdo-gun, Maejeon-myeon, 35°40'N, 128°50'E, 17.IV.1992, coll. J.W. Lee.

Etymology. Named after the Latin *nigellus* (somewhat black), on account of its almost entirely black body.

***Tersilochus* (*Tersilochus*) *obstinatus* Khalaim & Lee, sp. n.**
http://zoobank.org/CCB8684F-8DD3-48AB-99E2-57DFABEB0AB6
http://species-id.net/wiki/Tersilochus_obstinatus
Figs 31–40

Description. *Female* (holotype). Body length 4.5 mm. Fore wing length 3.35 mm.

Figures 31–37. *Tersilochus obstinatus* sp. n., female, holotype: **31** head with antennae and mesosoma, anterolateral view **32** head, frontal view **33** head, dorsal view **34** base of antenna, lateral view **35** fore wing **36** metasoma with ovipositor, lateral view **37** apex of metasoma with ovipositor, lateral view.

Head very strongly rounded behind eyes in dorsal view (Fig. 33); temple short, almost 0.6 times as long as eye width. Inner eye orbits weakly but distinctly convergent dorsally (Fig. 32). Mandible with upper tooth distinctly longer than lower tooth. Clypeus probably abnormal, with lower margin abruptly bent backwards (Fig. 32); distinctly and sparsely punctate on finely granulate and dull background. Malar space 0.85 times as long as basal width of mandible. Flagellum of antenna filiform, with 18 segments (Fig. 31); subbasal flagellomeres about 1.5 times as long as broad,

subapical flagellomeres slightly elongate; flagellomeres 3 to 7 with distinct subapical finger-shaped structures on outer surface (Fig. 34). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate. Mesosoma entirely granulate, dull, and mostly impunctate; mesoscutum laterally with indistinct punctures. Notaulus absent. Foveate groove situated in anterior half of mesopleuron, not reaching prepectal carina anteriorly, almost straight, narrow, slightly oblique, with transverse wrinkles ventrally (Fig. 31). Propodeum with basal keel (and few fine subparallel wrinkles), which is 0.37 times as long as apical area (Fig. 38). Propodeal spiracle separated from pleural carina by 1.75 times diameter of spiracle. Apical area flat, anteriorly widely rounded (Fig. 38). Apical longitudinal carinae distinct only posteriorly, anteriorly absent. Fore wing (Fig. 35) with intercubitus thick, shorter than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius almost as long as width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted somewhat below middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.5 times as long as broad posteriorly (Fig. 40), with petiole trapeziform in cross-section, well separated from postpetiole in dorsal view, mostly smooth dorsally and laterally, finely striate laterally before glymma, and with postpetiole striate dorsally. Glymma deep, situated at center of first tergite, joining by distinct furrow to ventral part of postpetiole (Fig. 39). Second tergite as long as anteriorly broad (Fig. 40). Thyridial depression short, transverse (Fig. 40). Ovipositor short, weakly upcurved, with moderately deep and sharp dorsal subapical notch (Fig. 37); sheath about as long as first tergite (Fig. 36).

Head, mesosoma, and first tergite black; palpi and lower margin of clypeus yellowish brown; mandible yellowish brown, blackish basally and with black teeth; tegula yellow. Antenna brown. Pterostigma brown. Legs brownish yellow, hind coxa brownish. Metasoma behind first tergite brownish yellow (Fig. 36), tergites 3 to 5 dorsally with brown anterior marks.

Male. Unknown.

Comparison. Differs from other Palaearctic species of *Tersilochus* by the combination of conspicuously enlarged eyes (temple short) (Figs 32, 33), short ovipositor (Fig. 36) and light brownish yellow metasoma behind first tergite (Fig. 36).

Type material. Holotype female, South Korea, Chungnam-do, (CN), Daejeon, Dong-gu, Daejeon University, 35°31'17"N, 126°50'12"E, Malaise trap, 13–28. IV.2006 (YUG).

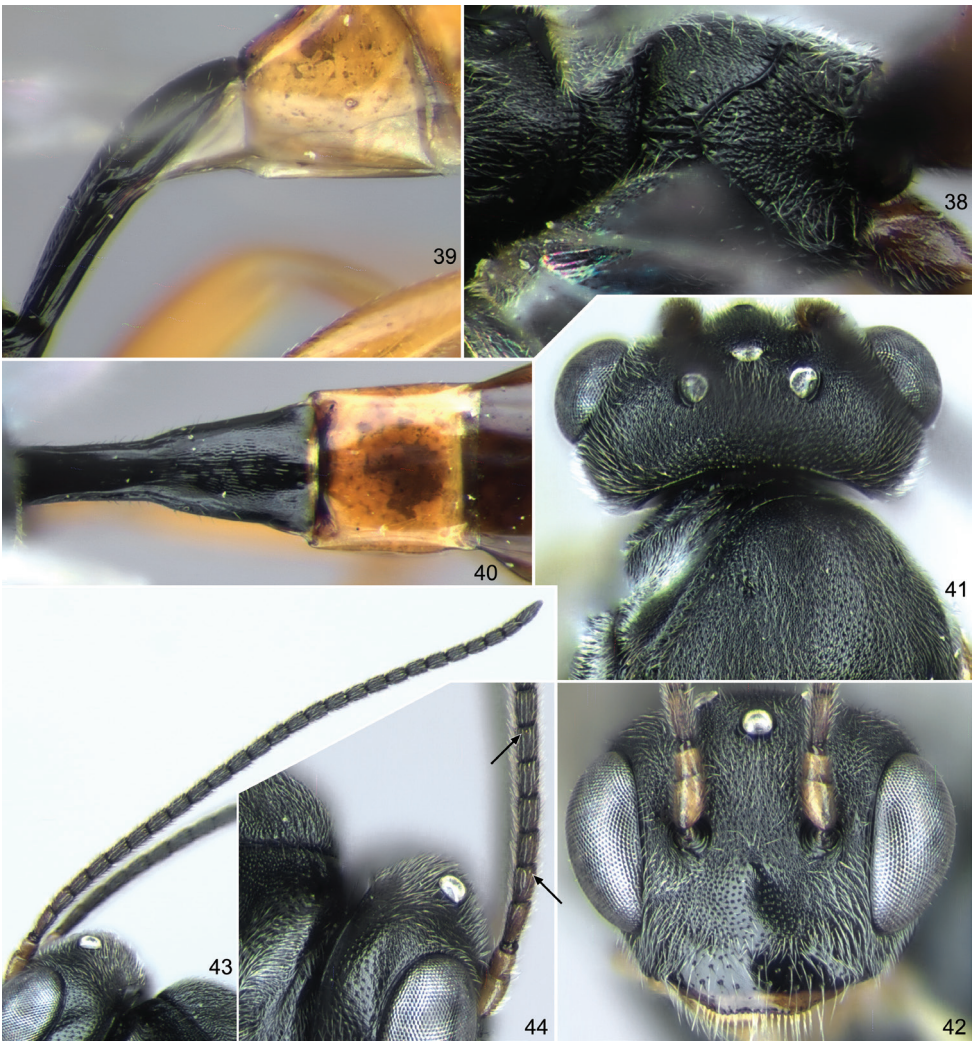
Distribution. South Korea.

Etymology. Named after the Latin *obstinatus* (firm, resolved, resolute, obstinate).

***Tersilochus* (*Tersilochus*) *punctator* Khalaim & Lee, sp. n.**

http://zoobank.org/FDF24F38-F715-40F4-928D-6F4203C2C3C6
http://species-id.net/wiki/Tersilochus_punctator
Figs 41–51

Description. *Female* (holotype). Body length 5.2 mm. Fore wing length 4.4 mm.



Figures 38–44. *Tersilochus obstinatus* sp. n., female, holotype: **38** propodeum, dorsal view **39** base of metasoma, lateral view **40** base of metasoma, lateral view. *Tersilochus punctator* sp. n., female, holotype: **41** head and anterior part of mesosoma, dorsal view **42** head, frontal view **43** antenna, lateral view **44** base of antenna, lateral view.

Head rounded behind eyes in dorsal view (Fig. 41); temple 0.72 times as long as eye width. Inner eye orbits more or less parallel (Fig. 42). Mandible with upper tooth somewhat longer than lower tooth. Clypeus lenticular with lower margin slightly truncate, 2.9 times as broad as long, smooth, and sparsely punctate in upper 0.6, in profile weakly convex (Fig. 42). Malar space 0.8 times as long as basal width of mandible. Flagellum of antenna distinctly tapered towards apex, with 26 segments (Fig. 43); subbasal flagellomeres 1.5–1.6 times and subapical flagellomeres 1.2–1.3 times as long as broad; flagellomeres 2 to 6 with small subapical finger-shaped structures on

outer surface (Fig. 44, arrows). Face, frons, and vertex densely punctate on granulate surface and dull (Figs 41, 42). Temple moderately densely punctate, almost smooth, and weakly shining between punctures. Notaulus with irregular wrinkles. Mesoscutum granulate, finely and densely punctate. Foveate groove about 0.8 times as long as mesopleuron, weakly curved, narrow, with fine transverse wrinkles, not reaching prepectal carina anteriorly (Fig. 46). Mesopleuron distinctly punctate, granulate, and dull below foveate groove, and mostly smooth and shining between punctures above foveate groove (Fig. 46). Propodeum mediodorsally with strong median and two weaker lateral wrinkles, basal part 0.38 times as long as apical area (Fig. 47). Dorsolateral area of propodeum finely granulate, finely and sparsely punctate. Propodeal spiracle separated from pleural carina by almost 2.0 times diameter of spiracle (Fig. 45). Apical area flat, anteriorly rounded (Fig. 47). Apical longitudinal carinae distinct posteriorly and indistinct anteriorly. Fore wing with intercubitus thickened, somewhat longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius longer than width of pterostigma. Metacarpus almost reaching apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.5 times as long as broad posteriorly, mostly smooth, with petiole trapeziform in cross-section and well separated from postpetiole in dorsal view. Glymma small, situated in apical 0.6 of first tergite, joining by distinct furrow to ventral part of postpetiole (Figs 45, 48). Second tergite distinctly transverse, 0.8 times as long as anteriorly broad (Fig. 49). Thyridial depression as long as broad (Fig. 49). Ovipositor very short, weakly upcurved, thickened near apex, with dorsal subapical depression and small notch before this depression (Fig. 50, arrow); sheath 0.6 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi, mandible (teeth reddish black), lower 0.3 of clypeus, and tegula brownish yellow. Antenna with scape and pedicel yellow-brown, flagellum black. Pterostigma dark brown. Legs brownish yellow; fore and mid coxae basally brown; hind coxae brownish black; hind femur centrally with brownish black mark on outer side. Metasoma behind first tergite predominantly yellow-brown ventrally and laterally, tergites 2 and 3 dorsally extensively black with narrow yellow-brown band posteriorly, tergites 4 and 5 with dorsal blackish areas smaller.

Male. Unknown.

Comparison. This is the only species of the genus *Tersilochus* in South Korea with densely punctate mesopleuron (Fig. 46). It differs from other Palaearctic species of *Tersilochus* by the combination of densely punctate and smooth mesopleuron between punctures, well-developed foveate groove (Fig. 46), long metacarpus, and very short ovipositor (Figs 48, 50). It is similar to the Russian Far East *T. grandiculus* Khalaim but distinct in having less slender flagellum of antenna, less punctate head, and shorter second tergite.

Remarks. One female from southeast China generally corresponds well with this species (including small subapical finger-shaped structures on flagellomeres 2–5) but has a flagellum with 20 segments, mesopleuron with weaker punctures and centrally

Figures 45–51. *Tersilochus punctator* sp. n., female, holotype (except Fig. **51**): **45** mesosoma and first tergite, lateral view **46** head and mesopleuron, anterolateral view **47** propodeum, dorsal view **48** metasoma, lateral view **49** first tergite, dorsal view **50** apex of metasoma with ovipositor, lateral view **51** ovipositor, lateral view (China).

mostly finely granulate, propodeal spiracle separated from pleural carina by half diameter of spiracle, thyridial depression almost twice as long as broad, and ovipositor strongly clavate, with conspicuous dorsal subapical depression and rounded tooth before this depression (Fig. 51). This specimen may belong to an undescribed species, so study of an additional material is needed.

Type material. Holotype female, South Korea, Gyeongbuk-do (GB), Yeongju-si, Punggi-eup, Jungnyeong, 35°53'42.7"N, 128°26'22.0"E, Malaise trap, Site-99, 3–12. VI.2009, coll. C.J. Kim (YUG).

Additional material. China, Jiangxi reg., Jiulianshan, 27.IV.2011, coll. M.-L. Sheng, 1 female (deposited in General Station of Forest Pest Management, State Forestry Administration, P.R. China).

Distribution. South Korea, ?China (Jiangxi).

Etymology. Named on account of its densely punctate mesopleuron.

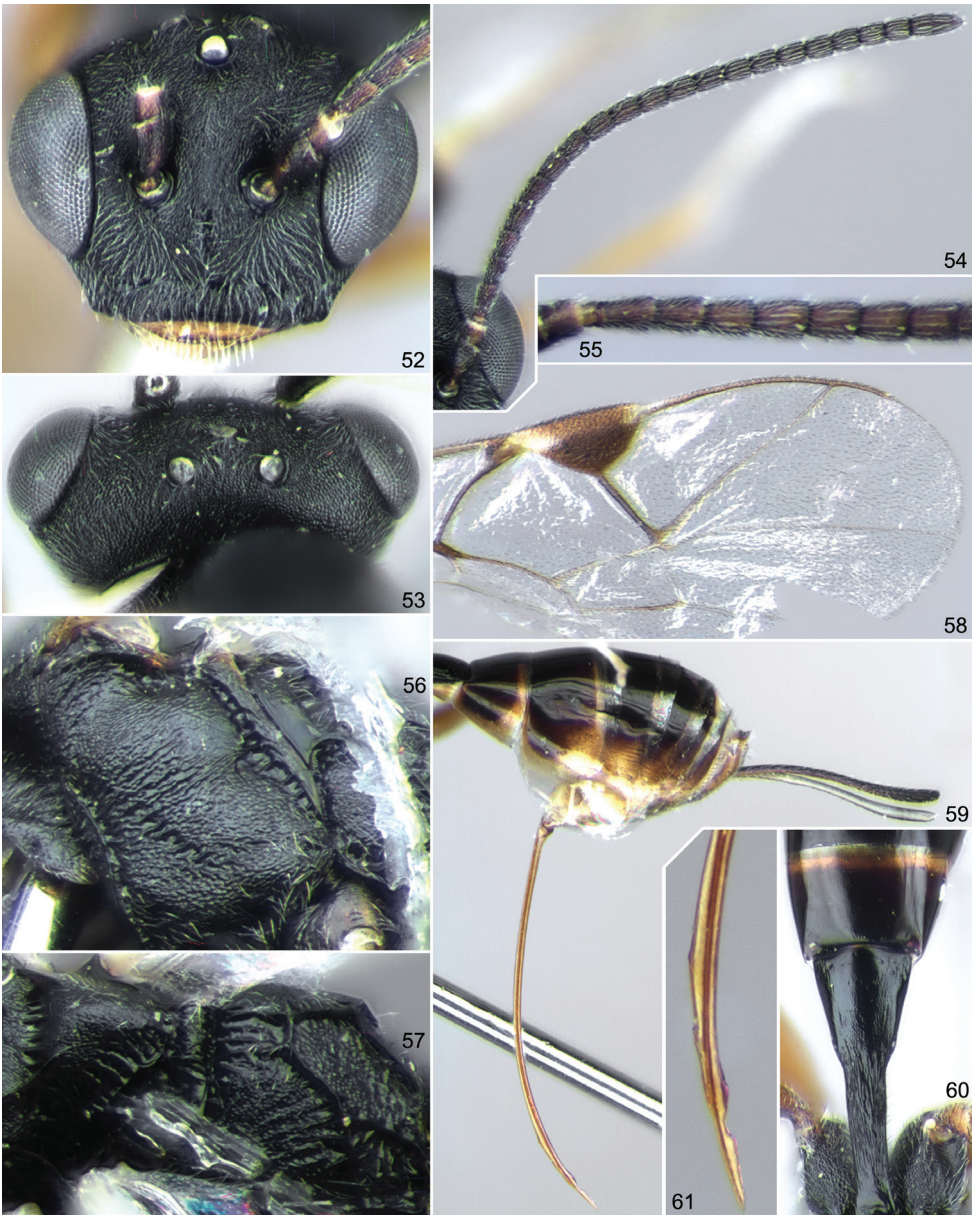
***Tersilochus* (*Tersilochus*) *serratus* Khalaim & Lee, sp. n.**

http://zoobank.org/04B906EC-FEE8-450B-94E6-A38F9B4133BA
http://species-id.net/wiki/Tersilochus_serratus
Figs 52–61

Description. *Female* (holotype). Body length 4.0 mm. Fore wing length 2.8 mm.

Head weakly rounded and strongly narrowed behind eyes in dorsal view (Fig. 53); temple 0.72 times as long as eye width. Inner eye orbits very weakly divergent dorsally (Fig. 52). Mandible with upper tooth longer than lower tooth. Clypeus lenticular, 3.2 times as broad as long, in profile flat, finely granulate and indistinctly punctate in upper 0.7. Malar space as long as basal width of mandible. Flagellum of antenna filiform, with 21 segments (Fig. 54); all flagellomeres 1.2–1.4 times as long as broad; flagellomeres 4–6 with distinct subapical finger-shaped structures on outer surface (Fig. 55). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 52, 53). Mesosoma entirely granulate, dull, and impunctate; mesopleuron centrally with fine, slightly oblique striae on granulate background (Fig. 56). Notaulus absent. Foveate groove weak, with fine transvers wrinkles, oblique, situated in anterior 0.6 of mesopleuron (Fig. 56). Propodeum with rectangular basal area, which is about 1.5 times as long as broad and 0.35 times as long as apical area (Fig. 57); transverse carina with short adjacent wrinkles (Fig. 57). Propodeal spiracle adjacent to pleural carina. Apical area flat, anteriorly truncate (Fig. 57), posteriorly with transverse wrinkles. Apical longitudinal carinae well-developed, reaching transverse carina anteriorly. Fore wing (Fig. 58) with intercubitus slightly longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius somewhat longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted distinctly below middle. Hind wing with nervellus distinctly reclivous. Metasoma: first tergite almost 3.0 times as long as broad posteriorly, with petiole trapeziform in cross-section, entirely striate dorsally and laterally (Fig. 60), and with postpetiole smooth (except base) and well separated from petiole in dorsal view. Glymma deep, situated behind center of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite distinctly transverse, 0.8 times as long as anteriorly broad (Fig. 60). Thyridial depression short, distinctly transverse (Fig. 60). Ovipositor slender, upcurved, with two distinct subapical teeth dorsally and deep depression between these teeth (Figs 59, 61); sheath 1.25 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi, mandible (except reddish black teeth), and lower 0.3 of clypeus yellow-brown; tegula yellow. Antenna dark brown.



Figures 52–61. *Tersilochus serratus* sp. n., female, holotype: **52** head, frontal view **53** head, dorsal view **54** antenna, frontal view **55** base of antenna, lateral view **56** mesopleuron, ventrolateral view **57** scutellum and propodeum, dorsolateral view **58** fore wing **59** apex of metasoma with ovipositor, lateral view **60** first and second tergites, dorsal view **61** apex of ovipositor, lateral view.

Pterostigma brown with conspicuous white spots on its proximal and distal corners (Fig. 58). Legs brownish yellow; fore and mid coxae weakly, and hind coxa strongly darkened with brown. Metasoma behind first tergite yellow-brown ventrally and pre-

dominantly dark brown to brownish black laterally and dorsally; tergites 2 and 3 with narrow pale posterior band (Fig. 59).

Male. Unknown.

Comparison. Differs from other Korean species of the genus by the combination of head weakly rounded and very strongly tapered behind eyes in dorsal view (Fig. 53), flat clypeus (Fig. 52), strongly striate dorsally first metasomal tergite (Fig. 60), and shape of the ovipositor (Fig. 61). This is the only Korean species of the genus *Tersilochus* that possesses an ovipositor with two distinct dorsal subapical teeth (Fig. 61) and thus belongs to the *cognatus* species group (correct name for the *jocator* species group according to Horstmann 2005); *T. iracundus* sp. n. and *T. punctator* sp. n. have ovipositors with rather weak and inconspicuous dorsal subapical teeth (Figs 26, 50, 51).

Type material. Holotype female, South Korea, Gyeongbuk-do (GB), Cheongdo-gun, Gakbuk-myeon, Namsan-3ri, 35°41'N, 128°35'23.0"E, Malaise trap, 1–12. IV.2009, coll. J.W. Lee (YUG).

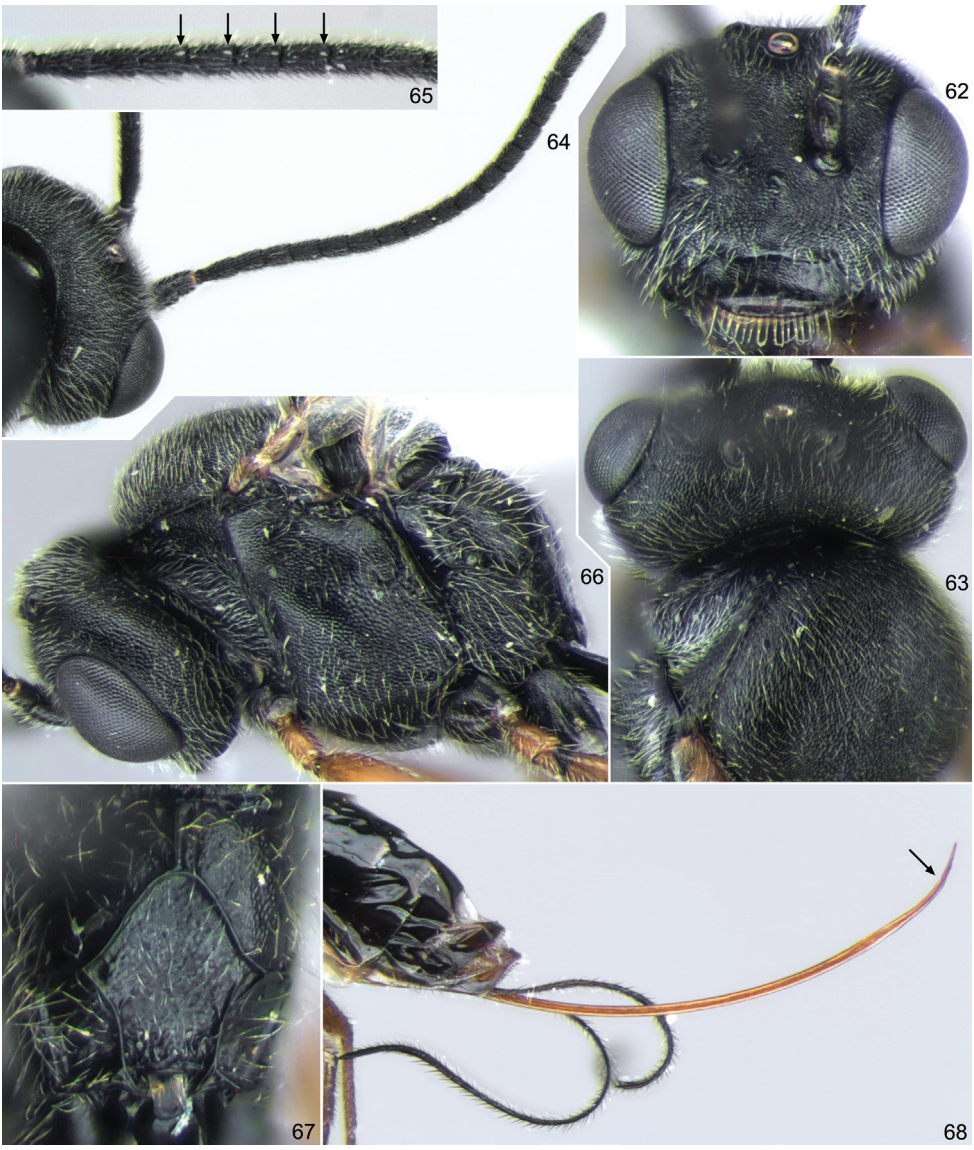
Distribution. South Korea.

Etymology. Named after the Latin *serratus* (serrated, toothed like a saw), on account of its serrate ovipositor apex.

***Tersilochus* (*Tersilochus*) *uncinatus* Khalaim & Lee, sp. n.**
http://zoobank.org/2AF565E7-C651-41DE-9AB1-A0BCF8A9A634
http://species-id.net/wiki/Tersilochus_uncinatus
Figs 62–70

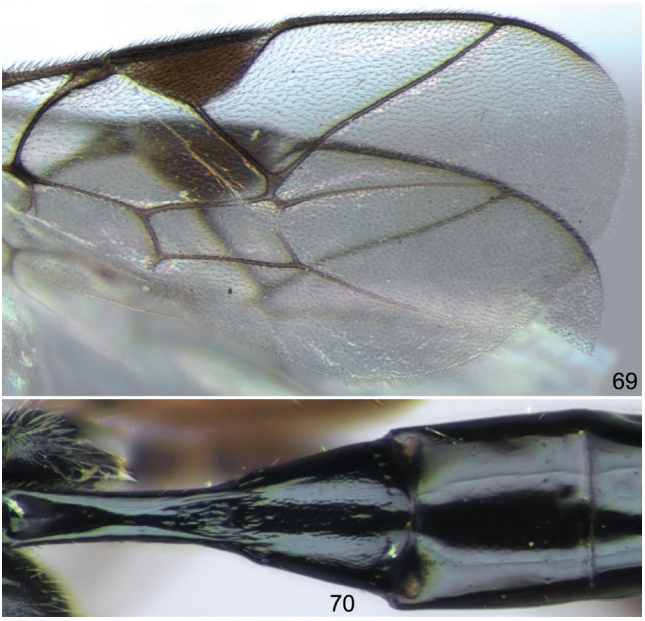
Description. *Female* (holotype). Body length 3.9 mm. Fore wing length 3.05 mm.

Head roundly narrowed behind eyes in dorsal view (Fig. 63); temple almost 0.8 times as long as eye width. Inner eye orbits parallel (Fig. 62). Mandible with upper tooth longer than lower tooth. Clypeus lenticular, 2.75 times as broad as long, with lower 0.3 bent backwards (Fig. 62), in profile weakly convex, finely granulate and with few indistinct punctures in upper 0.7. Malar space almost as long as basal width of mandible. Flagellum of antenna filiform, with 17 segments (Fig. 64); subbasal flagellomeres 1.4–1.5 times and subapical flagellomeres 1.2–1.3 times as long as broad; flagellomeres 3–6 with distinct subapical finger-shaped structures on outer surface (Fig. 65, arrows). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 62, 63). Mesosoma entirely granulate, dull, and impunctate; mesopleuron without striae (Fig. 66). Notaulus absent (Fig. 63). Foveate groove absent (Fig. 66). Propodeum with basal keel, which is 0.34 times as long as apical area (Fig. 67). Propodeal spiracle small, separated from pleural carina by half diameter of spiracle (Fig. 66). Apical area flat, anteriorly rounded (Fig. 67). Apical longitudinal carinae well-developed posteriorly and weak anteriorly near transverse carina. Fore wing (Fig. 69) with intercubitus moderately thickened, longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius longer than width of pterostigma. Metacarpus not reaching apex of fore wing. Postnervulus intercepted slightly below



Figures 62–68. *Tersilochus uncinatus* sp. n., female, holotype: **62** head, frontal view **63** head and mesoscutum, dorsal view **64** head with antenna, dorso-postero-lateral view **65** base of antenna, lateral view **66** head and mesosoma, lateral view **67** propodeum, dorsal view **68** apex of metasoma with ovipositor, lateral view.

middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.7 times as long as broad posteriorly (Fig. 70), mostly smooth, with petiole trapeziform in cross-section, finely striate laterally before glymma, and postpetiole well separated from petiole in dorsal view. Glymma deep, situated slightly behind center of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite as long as anteriorly broad (Fig. 70). Thyridial depression short, distinctly transverse (Fig. 70). Ovipositor slen-



Figures 69–70. *Tersilochus uncinatus* sp. n., female, holotype: **69** fore wing **70** first and second tergites, dorsal view.

der, weakly upcurved in basal 0.8, somewhat thickened subapically, with apex thin, strongly upcurved, and with weak dorsal notch (Fig. 68, arrow); sheath about 3.0 times as long as first tergite.

Head (including clypeus), mesosoma, and first tergite black; palpi brown; mandible fuscous basally and with reddish black teeth; tegula yellow. Antenna entirely black. Pterostigma brown with white spot on distal corner. Legs brown; hind leg with coxa and base of first trochanter strongly darkened with brown. Metasoma behind first tergite brownish black.

Male. Unknown.

Comparison. Differs from other Korean species of the genus *Tersilochus* by the long ovipositor with apex thin and strongly upcurved (Fig. 68).

Type material. Holotype female, South Korea, Gyeongnam-do (GN), Sancheong-gun, Samjang-myeon, Yu Pyeongni, Wangdeungjae, 16.VI–20.IX.2008 (YUG).

Distribution. South Korea.

Etymology. Named after the Latin *uncinatus* (hooked), on account of its apically strongly upcurved ovipositor.

Discussion

All Korean species of *Tersilochus* are rare, being represented in our material by only one or few specimens, whereas in the Russian Far East this genus is conspicuously

much more abundant (Khalaim 2012, pers. data). Almost all specimens were collected in Korea from April to early June, except the paratype of *T. fidicinus* sp. n. (collected in June/July) and the holotype of *T. uncinatus* sp. n. (collected between June and September). Thus, the flight period of the genus in Korea is generally restricted to spring and early summer.

Subapical finger-shaped structures on outer side of subbasal flagellomeres were found and described for all Korean species of *Tersilochus*, and number and location of these structures were used for species separation in the key. Finger-shaped structures on flagellomeres of two European species of *Phradis* Förster were discovered for the first time by Khalaim et al. (2009). Later, these structures were found in many other tersilochine genera, e.g. in Neotropical species of *Allophrys* Förster, *Barycnemis* Förster and *Meggoleus* Townes (Khalaim and Broad 2012), and East Palaearctic species of *Tersilochus* (Khalaim 2012). The finding of finger-shaped structures in Korean species of *Tersilochus* indicates that these structures are widely distributed within the subfamily, and we show that these structures may be used for diagnosing species.

Acknowledgements

We are thankful to Dr M.-L. Sheng for the loan of the additional specimen of *T. punctator*. This work was supported by the Russian Foundation for Basic Research (grant no. 13-04-00026) and the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR No. 2014-02-001, 1834-302).

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Geographical distributions of *Bembix* (Hymenoptera, Crabronidae, Bembicinae) in southern Africa, with notes on biology

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Abstract

Geographical distributions based on available records are presented for the 37 currently recognized species of *Bembix* Fabricius known to occur in southern Africa. These are *albata* Parker, *albicapilla* Arnold, *albofasciata* Smith, *anomalipes* Arnold, *arnoldi* Arnold, *atrospinosa* Turner, *baumanni* Handlirsch, *bubalus* Handlirsch, *cameronis* Handlirsch, *capensis* Lepeletier, *capicola* Handlirsch, *carinata* F. Smith, *cultrifera* Arnold, *denticauda* Arnold, *diversipennis* F. Smith, *flavicincta* R. Turner, *fraudulenta* Arnold, *fuscipennis* Lepeletier, *gracilens* J. Parker, *harenarum* Arnold, *karroensis* Gess, *liturata* R. Turner, *loupata* R. Parker, *massaica* Cameron, *melanopa* Handlirsch, *moebii* Handlirsch, *monedula* Handlirsch, *namibensis* Gess, *ochracea* Handlirsch, *olivata* Dahlbom, *regnata* Parker, *scaura* Arnold, *sibilans* Handlirsch, *triangulifera* Arnold, *ulula* Arnold, *venusta* Arnold, and *zinni* Gess.

A single specimen of *Bembix compedita* R. Turner has been recorded from South Africa but as the species is known principally from Malawi this requires confirmation.

Some diagnostic characters are given for the hitherto undescribed female of *namibensis*.

A range of distribution patterns are noted – narrowly endemic to widespread through the Afrotropical Region and into Egypt. Four species, *albata, arnoldi, harenarum* and *fraudulenta* appear to have strictly southern African coastal distributions.

A summary of the knowledge of flower associations, nesting and prey are given for those species for which data are available.

Keywords

Sand wasps, Bembix, southern Africa, distributions, flower associations, prey, nesting

Introduction

Bembix with 346 species recognised (Pulawski 2013) is by far the most species rich of the Bembicinae. It is most diverse in the Afrotropical and Australian Regions. Currently the number of recognized species recorded from southern Africa (= Africa south of latitude 15°S) appears to be 37.

The first description of a *Bembix* species from the Afrotropical Region (excluding Madagascar) was published in 1838 by Spinola. His species, *B. undulata*, allegedly came from the Cape of Good Hope but has not since been recognised.

The foundations of our knowledge of the genus in sub-saharan Africa may be considered to have been laid by two authors, Lepeletier and Dahlbom, who publishing independently but in the same year, 1845, together gave descriptions of nine species. Synonymy on the one hand and lack of recognition on the other has left us with three of these species, all common in southern Africa, *fuscipennis* Lepeletier, *capensis* Lepeletier, and *olivata* Dahlbom (= *intermedia* Dahlbom).

Smith (1856) added *carinata* and later (1873) *diversipennis* and *albofasciata*, while Magretti in 1884 and 1892 added two further species, neither since recognised.

The first comprehensive account of the genus on a world basis was published by Handlirsch (1893) in whose monograph no fewer than 17 new species from the Afrotropical Region were described. This was followed by the papers of Cameron (1908, 1910, Turner 1912a, b, 1913, 1917a, b) in each of which further species were described.

The year 1929 saw the publication of two major papers dealing with the genus – those of Parker and Arnold. Parker's published in June of that year had described eight new species from the Afrotropical Region. Arnold's paper, published in December, had 12 new species and several new sub-species.

Inevitably some synonyms and homonyms came into existence and these were for the most part dealt with by Arnold (1931) who correctly gave Parker's names priority. At the same time, however, Arnold was perhaps somewhat hasty in dismissing as synonyms, apparently without close study, some other species described as new by Parker; notably *stevensoni* Parker as a synonym of *fuscipennis* Lepeletier and *tenebrosa* Parker and *refuscata* Parker as synonyms of *diversipennis* Smith. This action by Arnold led to a pointed and critical reply by Parker (1942) which in turn was answered by Arnold (1951). Unanimity was not reached and instead the points at issue became more clouded.

Further papers having a bearing on *Bembix*, some with descriptions of new species, were published by Arnold in 1933, 1935, 1936, 1944, 1946, 1952 and 1960.

A list of a few *Bembix* species collected in South Africa by the Lund University Expedition in 1950–1951 was given by de Beaumont (1967).

Other than the brief references to nesting sites, prey and nest parasites given by Brauns (1911), Arnold (1929), Cuthbertson (1939), Hesse (1956) and Callan (1964) nothing was published on the biology of *Bembix* in the Afrotropical Region before 1970. However, the biology of the genus had been better studied in other regions. The most outstanding and inspiring account was that of Evans (1957) dealing with American species, to be followed by Evans and Mathews (1971, 1973 and 1975) and Evans and O'Neill (1988 and 2007).

In 1970 Friedrich Gess undertook an investigation of the *Bembix* specimens from the major collections of southern Africa with a view to undertaking a revision of the genus in that region. Three undescribed species and one synonymy were discovered. Some other taxonomic problems were identified but due to the inadequacy of the holdings of the relevant species and the consequent need for additional material from specific localities a revision was considered to be premature. However, Friedrich Gess (1986) published the three new species, *namibensis, zinni* and *karooensis*, and sank *junodi* Arnold into synonymy with *B. ulula* Arnold. In addition, in the same publication, he gave biological notes for 10 other species and a review of the nature of the prey of the genus with particular reference to the Afrotropical species. These were constituted from scattered published records (including those given in F.W. Gess 1981) which in some instances are obscure and generally overlooked, from specimen labels of the Albany Museum material and from personal observations. This represented as nearly as possible a complete compilation of the biological knowledge of *Bembix* and was intended to form a foundation on which to build. Subsequently, a study was made of the nesting of *Bembix bubalus* at Oudtshoorn in the Little Karoo (Gess and Gess 1989).

Recently Friedrich Gess revisited the possibility of undertaking a revision of *Bembix* and to this end he determined a considerable number of specimens assembled since his earlier investigations. Regrettably, due to his ill health over many years and his subsequent death on 6 August 2013 the revision did not come to be. However, the wealth of material determined greatly increases the knowledge of geographical distributions of many of the species and offers previously unpublished records of floral associations, nesting and prey. Towards the end of his life Sarah Gess offered to take his unfinished manuscript and from it to produce a paper to insure that the work already done by Friedrich Gess would not be wasted. The present contribution is therefore a compilation of material examined by and determined by Friedrich together with some of his taxonomic and morphological notes. To this Sarah has added some additional records from specimens not seen by nor determined by Friedrich Gess but extracted from the Iziko South African Museum entomology collection Specify database available at www.sabif.co.za, photographs of a pair of specimens of most species, maps depicting the known geographical distributions in southern Africa, comments on the geographical the distributions of the species, and of their flower associations, nesting and prey, indicating whether or not such data are known. Clearly, although the contribution is based on the work of Friedrich Gess, it has not been checked or approved by him and therefore should errors be found he should not be held responsible for them.

As is the established practice of Friedrich Gess, the notation used for expressing geographic coordinates is as in the gazetteer of *The Times Atlas of the World* (Bartholomew et al. 1981). The figures before the stop are degrees, those after the stop are minutes; the stop is not a decimal point. Co-ordinates have been given in square brackets in the text for those localities for which none are given on the data labels. In instances where the locality given is imprecise the word circa is added.

For plotting the distribution maps ArcMap 10.1 GIS by ESRI was used with the co-ordinates in decimal degrees.

Acronyms for institutions in which material is housed follow Evenhuis (2013). These are: AMGS = Albany Museum, Grahamstown, South Africa; BMNH = The Natural History Museum, London; DMSA = Durban Museum, South Africa; MHNG = Muséum d'Histoire Naturelle de Genève, Genève, Switzerland; RMCA = Musée Royale de l'Afrique Centrale, Tervuren, Belgium; SANC = National Collection of Insects, Pretoria, South Africa; SMNS = Staatliches Museum für Naturkunde, Stuttgart, Germany; NMBZ = Natural History Museum of Zimbabwe, Bulawayo (formerly National Museum of Southern Rhodesia); NMNW = National Museum of Natural Science, Windhoek, Namibia; NMW = Naturhistorisches Museum Wien, Austria; SAMC = South African Museum, Iziko Museums of Cape Town, South Africa; TMSA = Transvaal Museum, now National Museum of Natural History, Ditsong Museum, Pretoria, South Africa; ZMHB = Zoologisches Museum der Humboldt Universität, Berlin.

In the lists of material examined the data are given as on the specimen labels. Any additions are given in square brackets. The collectors are given in the data string in parenthesis after collection date. Where ‚collectors' are given as an institution on the specimen data labels and not as an individual the names are as on the labels and are therefore not necessarily current institutional names and are not necessarily given in a consistent format. The acronyms in square brackets denote the institutions in which the specimens are currently housed and therefore follow current names for the institutions as given in the paragraph above.

Taxonomy

***Bembix afra* Handlirsch**
http://species-id.net/wiki/Bembix_afra

Bembex afra Handlirsch, 1893: 740, pl. 1, fig. 20, ♂ (Holotype, ♂, no locality, South Africa, in SMNS); Handlirsch 1895: 1002 (Cape Province); Dalla Torre 1897: 502 (in catalogue of world Hymenoptera); Arnold 1929: 342, figs 11, 11a, 11b, pl. 6, fig. 6, ♂ (in revision of southern African Sphecidae); 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix afra Handlirsch, R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Pulawski 2013: 2 (in catalogue of world Sphecidae sensu lato).

Material examined. SOUTH AFRICA: Melboschstrand (sic), 7.iv.1947 (Nat. Museum S. Rhodesia), ♂; Modderfontein, 15.ii.1925 (Brauns), ♂ [SAMC ex NMBZ].

"Melboschstrand" probably meant to be Melkboschstrand, now Melkbosstrand, on the southwest coast.

"Modderfontein" could be one of any of the following Modderfonteins near: Kamiesberg, Carnarvon, Britstown, De Aar, Aliwal North, Wuppertal, Sutherland, Merveville or Cape Town.

Additional records extracted from database of specimens in collection of SAMC. ZIMBABWE: Rua, 15.xii.1975 (A.J.S. Weaving), sex not given, determiner not given. SOUTH AFRICA: Western Cape: Hex River [32.24S, 19.46E], 1.i.1884 (collector not given), sex not given, determiner J.C. Bridwell; Hex River, 1.xi.1885 (collector not given), sex not given, determiner not given.

Geographical distribution. It would appear from the few records available that this species is present in the Western Cape, South Africa. The accuracy of the determination of the single specimen from Zimbabwe has not been determined.

Floral associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix albata* J. Parker**
http://species-id.net/wiki/Bembix_albata
Fig. 1a

Bembix albata J. Parker, 1929: 127, pl. 7, figs 85, 86, ♂, ♀ (Holotype, ♂, Lüderitz Bay, Namibia, in ZMHB); Lohrmann 1948: 449 (member of *arnoldi* species group); R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae as *B. abata*); Gess and Gess 2003: 121 (flower visiting records); Pulawski 2013: 2 (in catalogue of world Sphecidae sensu lato).

Bembex albata J. Parker, Arnold 1931: 216 (justification of synonymy with *Bembex albopilosa*).

Bembex albopilosa Arnold, 1929: 378, figs 41, 41a–c, pl. 6, fig. 40, ♂ (Holotype, ♂, Klipfontein, South Africa, in SAMC and paratype, Swakopmund, Namibia, in SAMC) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Arnold 1931: 209 and 216 (synonymized with *B. albata*); R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae).

Note. *Bembix albata* was described by Parker from five males and three females from Lüderitzbucht, Namibia (formerly South West Africa) (xii.1903, L. Schultze). The synonym, *Bembex albopilosa* was described by Arnold from a male from Swakopmund (Namibia, and a male (holotype) from Klipfontein (L. Péringuey). The exact locality of this latter locality is unclear but is taken to be the place of this name in the vicinity of Hondeklip Bay, Namaqualand.

Material examined. NAMIBIA: Carlowa's Camp, Angra Fria (SE 1812 Aa) [= 18.00–18.15S, 12.00–12.15E], 14–16.xi.1970 (collector?) (H1066), 16 ♀♀ [NMNW]; 4 km. N [of] Cape Cross (21.43S, 13.59E), 18.iii.2000, 3 ♀♀, 1 ♂ (visiting white flowers of *Brownanthus kuntzei* (Schinz) Ihlenf. & Bittrich, Aizoaceae: Mesembryanthe-

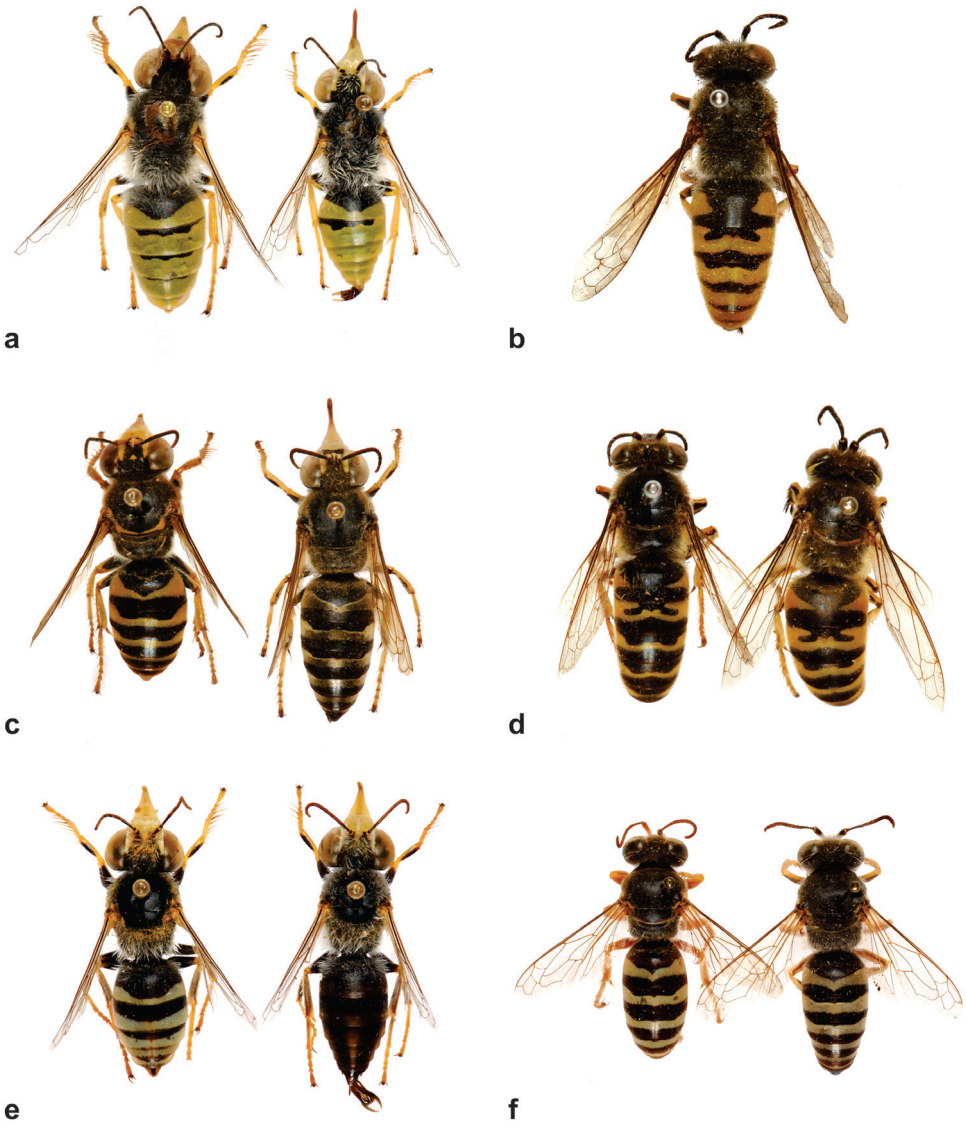

Figure 1. *Bembix* spp.: **a** *albata*, female, male **b** *albicapilla*, female **c** *albofasciata*, female, male **d** *anomalipes*, female, male **e** *arnoldi*, female, male **f** *atrospinosa*, female, male. (approximate lengths of females: **a** 21 mm; **b** 18.5 mm; **c** 17 mm; **d** 19.5 mm; **e** 17 mm; **f** 19.5 mm)

ma); NW of Cape Cross (21.44S, 13.59E), 14.iii.1999, 20 ♂♂ (visiting white flowers of *Brownanthus kuntzei*); 113 km. N [of] Swakopmund (21.51S14.05E), 18.iii.2000, 1 ♀ (visiting white flowers of *Brownanthus kuntzei*); 110 km. NW [of] Swakopmund (21.50S, 14.05E), 15.iii.1999, 1 ♀ (visiting white flowers of *Psilocaulon salicornioides* (Pax) Schwantes, Aizoaceae: Mesembryanthema); 53 km N [of] Swakopmund (22.16S,

14.23E), 19.111.2000, 5 ♀♀ (visiting white flowers of *Brownanthus kuntzei*); 10 km N [of] Swakopmund at wireless mast (22.35S, 14.32E), 21.iii.1997, 10 ♀♀, 1 ♂ (4 ♀♀ visiting white flowers of *Psilocaulon salicornioides*; 4 ♀♀ visiting white flowers of *Brownanthus kuntzei*); same locality, 11.iv.1998, 4 ♀♀, 4 ♂♂ (visiting white flowers of *Brownanthus kuntzei*); Swakopmund, Swakop R[iver] at bridge (22.42S, 14.32E), 16.iii.1999, 1 ♀, 3 ♂♂ (visiting white flowers of *Zygophyllum stapffii* Schinz, Zygophyllaceae) – (all F.W. and S.K. Gess) [all AMGS]; Swakopmund [22.40S, 14.32E], vii.1931 (Bradfield), 1 ♂; same locality 21.xii.1977 (Empey), 2 ♀♀, 4 ♂♂; same locality, 17.xii.1978 (Empey), 1 ♀ [AMGS]; Swakopmund, 15.xi.1984 (F.J. Herbst), 1 ♀; Swakopmund, 16.xi.1984 (F.J. Herbst), 3 ♀♀, 1 ♂; Swakopmund, 28.ii.1966 [F. Herbst], 2 ♀♀ [AMGS]; Rooibank Desert Park [near Walvis Bay] [23.11S, 14.49E], 15.xii.1977 (Empey), 2 ♀♀, 2 ♂♂ [AMGS]; Silvia Hill, Lüderitz (SE 2514 Bb) [25.09S, 14.51E], 15–16.ix.1971 (collector ?) (H4131), 2 ♀♀; Agate Beach, Lüderitz (SE 2615 Ca) [26.36S, 15.11E], 21-x.1970) (collector ?) (H 1065), 2 ♂♂; Elizabeth Bay, Lüderitz (SE 2615 Cc) [26.55S, 15.11E], 1–2.iii.1972 (collector ?) (H7106), 18 ♀; [NMNW]; Lüderitzbucht [26.29S, 15.09E], 26.iii.1929 (Fr. Eberlanz), 1 ♂ [AMGS]; Lüderitz, Dias Point (26.39S, 15.05E), 29.ii.2000, 32 ♀♀ (visiting pink flowers of ?*Brownanthus* sp.); same locality, 1.iii.2000, 12 ♀♀ (11 ♀♀ visiting mounds of *Zygophyllum clavatum* Schltr. & Diels, Zygophyllaceae; 1 ♀ visiting pink flowers of *Brownanthus* sp.); Kaukausib Spring – Gryllenthal, (26.58S, 15.31E), 5.ix.2002, 3 ♀♀ (hunting flies on *Euphorbia* sp. and resting on sand) (all F.W. and S.K. Gess) [all AMGS]; Bogenfels, Lüderitz (SE 2715 Ad) [= 27.46S, 15.39E], 28–29.ii.1972 (collector ?) (H7082), 1 ♀[NMNW]; E [of] Oranjemund, foot of Skilpad (28.28S, 16.40E), 23.ix.1997, 4 ♀♀ (visiting white flowers of ?*Psilocaulon* sp., Aizoaceae: Mesembryanthema); between Oranjemund and check point (28.34S, 16.28E), 26.ix.1997, 1 ♀; Oranjemund, fringes of golf course (28.37S, 16.27E), 22.xi.1997, 1 ♂ (visiting pale pink flowers of *Drosanthemum* sp., Aizoaceae: Mesembryanthema) – (all F.W. and S.K. Gess) [all AMGS]. NORTHERN CAPE: Grootderm [near Alexander Bay][28.36S, 16.40E], 10.xii.1949 (G. van Son) 2 ♂♂ [Dipsong]; Port Nolloth [29.15S, 16.52E], i.1922, 2 ♂♂ (W. Austen).

Geographical distribution. This species appears to have a mainly coastal distribution (Fig. 2a). At present it is known only from Angra Fria in northern Namibia to Klipfontein near Hondeklip Bay, Namaqualand, South Africa, that is for over 12 degrees latitude and in excess of 1400 km of coastline. It is probable that its distribution may extend northwards into Angola. The only record slightly inland from the coast is that for the sandy Sperrgebiet (southern Namib Desert) at Kaukausib Spring, Gryllenthal.

Floral associations. Recorded from two plant families: Aizoaceae (Mesembryanthema, *Brownanthus kuntzei* (Schinz) Ihlenf. & Bittrich, *Psilocaulon salicornioides* (Pax) Schwantes and *Drosanthemum* sp.); Zygophyllaceae (*Zygophyllum clavatum* Schltr. & Diels and *Zygophyllum stapffii* Schinz).

Nesting. Unknown but most likely nesting in the sandy hummocks. At localities along the coast, sampled by F. W. and S. K. Gess, the species was found principally

associated with the sandy hummocks formed around *Brownanthus*, *Psilocaulon* and *Zygophyllum clavatum* and visiting the flowers of these plants.

Prey. Three females were recorded hunting flies on *Euphorbia* sp. at Kaukausib Spring.

Bembix albicapilla **Arnold**

http://species-id.net/wiki/Bembix_albicapilla
Fig. 1b

Bembix albicapilla Arnold, 1946: 93, figs 40, 40a–c, ♂ (Holotype, ♂, Zimbabwe, Insuza River, in SAMC ex NMBZ); R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Pulawski 2013: 2 (in catalogue of world Sphecidae sensu lato).

Material examined. ZIMBABWE. Holotype, Insuza R. [circa 19.56S, 25.50E], Forest, Vic. Road, 24.xii.1939, 1 ♂; Sawmills [19.35S, 28.02E], 25.xii.1939 (R.H.R. Stevenson), 1 ♂, [both SAMC ex NMBZ].

Arnold described *Bembix albicapilla* from the unique male specimen from Insuza Forest. The specimen from Sawmills is generally melanistic when compared with the type. Most noticeable in this respect is the labrum which instead of being wholly ocreous as in the type is mostly black except for a narrow ochreous treak in the midline, somewhat expanded distally but not reaching proximal third. In addition the lemon yellow band on the first tergite is widely interrupted in the middle and the black spots on the second and third tergites are fused with the transverse basal black bands.

Geographical distribution. Recorded from two sites in Zimbabwe (Fig. 2b).

Floral associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

Bembix albofasciata **Smith**

http://species-id.net/wiki/Bembix_albofasciata
Fig. 1c

Bembex albofasciata F. Smith, 1873: 296, ♂ (Holotype or syntypes, ♂, no locality, KwaZulu-Natal, South Africa, in BMNH); Handlirsch 1893: 891(original description copied); Dalla Torre 1897: 502 (in catalogue of world Hymenoptera); Arnold 1929: 336, figs 7, 7a, 7b, pl. 6, figs 1, 2, ♂, ♀ (in revision of southern African Sphecidae).

Bembex Karschii Handlirsch, 1893: 742, pl. 1, fig. 21, pl. 6, fig. 18, ♂, ♀ (Syntypes, no localities, Cape Province and Transvaal, South Africa, in BMNH, MHNG, ZMHB, SMNS); Dalla Torre 1897: 507 (in catalogue of world Hymenoptera); Turner 1912b: 373, (synonymy of *B. karschii* with *B. albofasciata*).

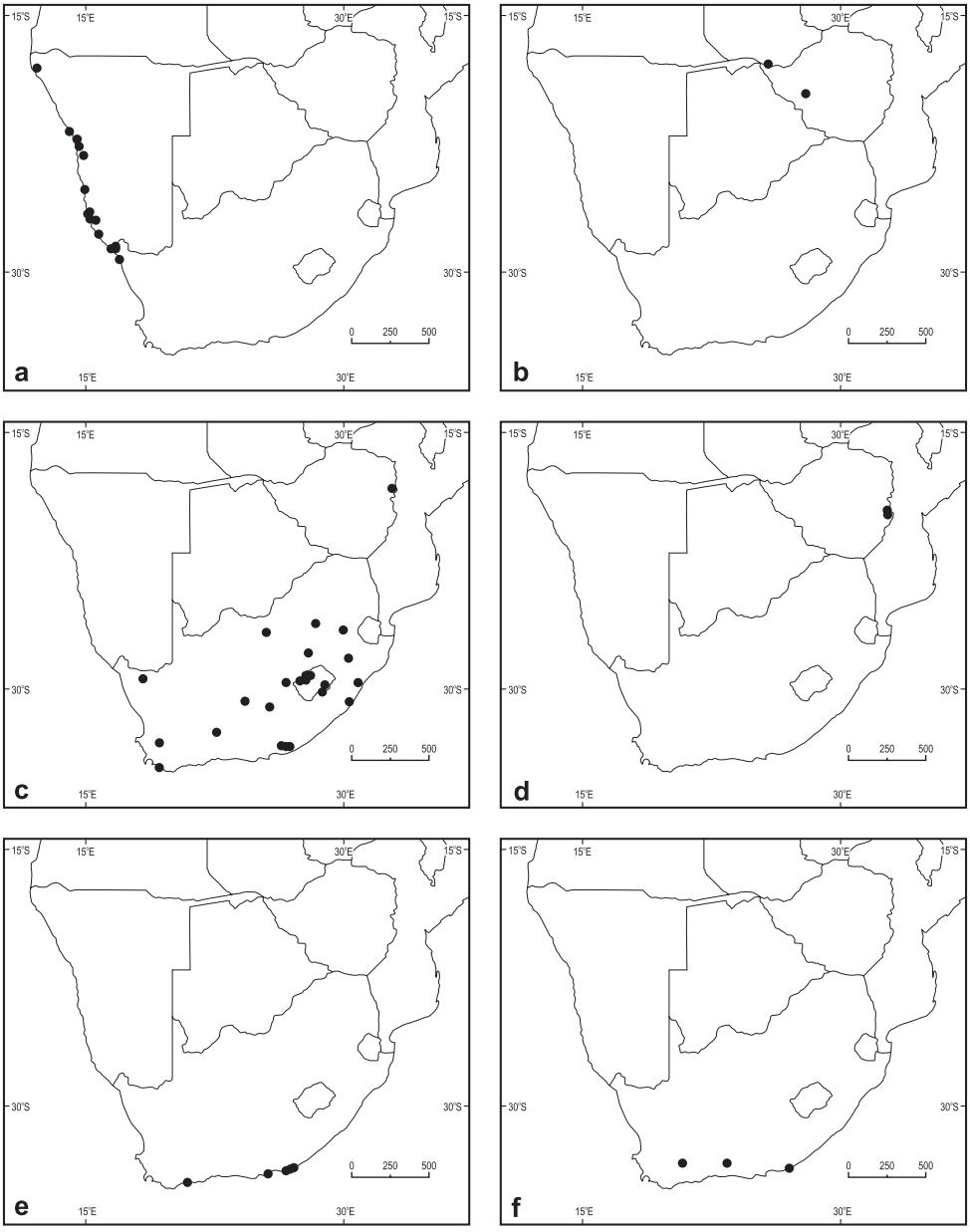

Figure 2. Distributions of collection records of *Bembix* spp.: **a** *albata* **b** *albicapilla* **c** *albofasciata* **d** *anomalipes* **e** *arnoldi* **f** *atrospinosa.*

Bembix albofasciata Smith, R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Gess 1981: 21 (nest, prey); 1986: 149–151 (nesting, nest Fig. 27, plants visited, prey); Gess and Gess 2003: 121–122 (flower visiting records); Evans and O'Neil 2007: 183 (summary of information on nesting habits); Pulawski 2013: 3 (in catalogue of world Sphecidae sensu lato).

Note. Turner (1912b: 373) stated that the range does not appear to be very extensive, the series in the National Collection (i.e. The Natural History Museum London) being mostly from the southern Transvaal, with one or two specimens from Lesotho (as Basutoland) and northern KwaZulu-Natal (as Zululand).

Material examined. ZIMBABWE: Inyanga [18.13S, 32.44E], 20.i.1948, 1 ♀ [SAMC ex NMBZ]; Inyanga, 7.ii.1940 (G. Arnold) 1 ♀ [SAMC ex NMBZ]; Inyanga, 9.ii.1940 (G. Arnold), 1 ♀ [SAMC ex NMBZ]; Rhodes Inyanga National Park [18.19S, 32.44E], 13.i.1955 (B.R.S., P.G.) 1 ♂ [AMGS]. LESOTHO: Bokong P.O. [29.20S, 28.18E], 26.xii.1946 (A. Jacot- Guillarmod), 1 ♂ [AMGS]; Mahlatsa [29.10S, 27.57E], 30.xii.1951 (A. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes [29.08S, 27.51E], ii.1940 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 1.1943 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, 26.ii.1944 (C. Jacot-Guillarmod), 1 ♀ with prey Asilidae [AMGS]; Mamathes, 13.i.1945 (A. Jacot-Guillarmod), 1 ♀[AMGS]; Mamathes 31.xii.1945 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, 13.i.1946 (Miss M.H. Marr), 1 ♀ [AMGS]; Mamathes, 8.xii.1946 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 28.xii.1946 (C. Jacot-Guillarmod), 1 ♂[AMGS]; Mamathes, 19.i.1947 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, 18.xii.1949 (C. Jacot-Guillarmod), 1 ♀ with prey Diptera [AMGS]; Mamathes, 15.i.1950 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, 21.i.1950 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 29.i.1950 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 4.ii.1950 (C. Jacot-Guillarmod), 1 ♀ with prey *Eristalis tenax* (L.) (Syrphidae) [AMGS]; Mamathes,14.ii.1950 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 10.xii.1950 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; 2.xii.1951 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 2.xii.1951 (A. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 1.i.1952 (C. Jacot-Guillarmod), 1 ♀ on *Calpurnia intrusa* [Fabaceae: Papilionoideae]; Mamathes, 27.i.1952 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, 3.ii.1952 (C. Jacot-Guillarmod) 1 ♀ [AMGS]; Mamathes, 15.ii.1952 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, 31.xii.1952 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Mamathes, 2.i.1953 (C. Jacot-Guillarmod), 1 ♂, 1 ♀, on *Calpurnia intrusa* [Fabaceae: Papilionoideae] [AMGS]; Mamathes, 6.i.1953 (C. Jacot-Guillarmod), 2 ♂♂ [AMGS]; Mamathes, 28.ii.1956 (C. Jacot-Guillarmod), 2 ♀♀ [AMGS]; Mamathes, 2.i.1959 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, i.1961 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes, 20.xii.1930 (C. Jacot-Guillarmod), 1 ♀ [SAMC ex NMBZ]; Mamathes, iii.1940 (C. Jacot Guillarmod), 1 ♀ [DMSA]; Mamathes, 27.xii.1946 (C. Jacot-Guillarmod), 1 ♂ [SAMC ex NMBZ]; Mamathes, 28.xii.1946 (Jacot-Guillarmod), 1 ♂ [SAMC ex NMBZ]; Mamathes, 6.i.1953 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Qachasnek [30.7S, 28.42E], 14.i.1969 (C. Jacot-Guillarmod), 3 ♀♀ [AMGS]; Roma [29.28S, 27.44E], 17.xii.1964 (C. Jacot-Guillarmod), 2 ♂♂ [AMGS]; Teyateyaneng [29.9S, 27.45E], 25.xi.1945 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Tlametlu River [29.28S, 27.25E], 26.i.1955 (C. Jacot-Guillarmod), 1 ♀; n[ea]r Morija [circa 29.38S, 30.48E], (5400 f[ee]t, 25.i.1955 (L. Bevis), 1 ♀ [DMSA]; Mashai R[iver] [circa 29.40S, 28.47E], 24.i.1939 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Pulane, n[ea]r Mateka [29.14S, 27.53E], 5.i.1954 (L. Bevis), 1 ♂ [DMSA]; n[ea]r Posong [??], 8.i.1953 (L. Bevis),

1 ♂ [DMSA]. SOUTH AFRICA: GAUTENG: Benoni [26.11S, 28.18E], 28.xi.1964 (Empey), 1 ♀ [AMGS]; Ermelo [26.32S, 29.59E] 26.xi.1948, (N.C. Mokhele), 1 ♀ [AMGS]; Strubens Valley, Florida [26.31S, 29.57E], 26.i.1966 (Empey), 1 ♀ [AMGS]. LIMPOPO: Sabie, 25.iii.1970 (Empey), 1 ♀ [AMGS]. NORTH WEST PROVINCE: Delarey [Delareyville] [26.41S, 25.26E], i.1917 (Brauns), 1 ♂ [SAMC ex NMBZ]. FREE STATE: Chicago, Lindley District [27.53S, 27.55E] (D.J. Brothers), 1 ♂, 13 ♀♀, 1 ♀ with prey *Chrysomyia marginalis* Wied. (Calliphoridae), 1 ♀ with prey *Sarcophaga* (Calliphoridae) [AMGS]; Dewetsdorp [29.35S, 26.40E], xii.1951 (R. Howell), 1 ♂ (bearing pollinia of Apocinaceae (formerly Asclepiadaceae) attached to most of the pulvilli) [AMGS]. KWAZULU-NATAL: Dundee [28.11S, 30.15E], 21.i.1961 (Empey), 1 ♀ [AMGS]; Oribi Gorge [30.43S, 30.16E], xi.1960, 1 ♀ [National Museum Zimbabwe]. WESTERN CAPE: Upper Sources Olifants River, Ceres [circa 33.05S, 19.14E], xii.1949 (Mus. Staff), 1 ♀, 2 ♂♂ [SAMC]; Hermanus [34.27S, 19.12E], i.1952 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Spitzkop, Meirings Poort [32.26S, 22.34E], i.1935 (Museum Staff), 2 ♀♀ (SAMC). EASTERN CAPE: Baviaanskloof (30.39S, 24.15E), 5–9.ii.1996 (A. Weaving), 1 ♂ [AMGS]; Belmont Valley, Grahamstown [33.19S, 26.38E], 20.i.1970 (F.W. Gess), 2 ♀♀ on *Foeniculum vulgare* Mill. (Apiaceae); Belmont Valley, Grahamstown, 24.i.1970 (F.W. Gess), 1 ♀ on *Foeniculum vulgare* Mill. (Apiaceae); Belmont Valley, Grahamstown, 24.i.1970 (C. Jacot-Guillarmod), 8 ♀♀ on *Foeniculum vulgare* Mill. (Apiaceae); Belmont Valley, Grahamstown, 17–25.i.1970 (J.G.H. Londt), 1 ♂, 7 ♀♀ on *Foeniculum vulgare* Mill. (Apiaceae); Belmont Valley, Grahamstown, 5.ii.1970 (F.W. Gess), 2 ♀♀ on flowering lucerne (Fabaceae: Papilionoideae); Hilton farm [33.15S, 26.20E], Grahamstown, 6.xii.1974 (D.W. Gess), 1 ♀, 1 ♂; same locality, 11.xii.1975 (F.W. Gess), 1 ♂; same locality, 29.i.-3.ii.1976 (F.W. Gess), 1 ♀ (Malaise trap); same locality, 9.xii.1977 (D.W. Gess), 1 ♀; same locality, 20.xii.1977 (D. W. Gess), 1 ♂; same locality, 2.i.1978 (D.W. Gess), 1 ♀, 1 ♂; same locality, 12.i.1978 (D.W. Gess), 3 ♀♀; same locality, 13.i.1978 (D.W. Gess), 2 ♀♀, 2 ♂♂; same locality, 13.i.1978 (H.W. Gess), 1 ♂; same locality, 17.i.1978 (F.W. Gess), 1 ♂; same locality, 24.i.1978 (D.W. Gess), 1 ♀; same locality, 24.i.1978 (H.W. Gess), 1 ♀; same locality, 7.ii.1978 (D.W. Gess), 1 ♀; same locality, 9.ii.1978 (F.W. Gess), 7 ♀♀, 1 ♂ (1 ♀ captured at nest entrance with prey: *Lomatia pulchriceps* Loew, ♂, Bombyliidae); 14.ii.1978 (F.W. Gess), 1 ♀; same locality, 16.ii.1978 (F.W. Gess), 1 ♀, 1 ♂; same locality, 23.ii.1978 (F.W. Gess), 1 ♂; same locality, 2.xii.1979 (F. W. and S.K. Gess), 1 ♂ (on yellow flowers of *Senecio pterophorus* DC, Asteraceae); same locality, 7–11.xii.1979 (F.W. Gess), 1 ♂ (Malaise trap); same locality, 3.xii.1982 (F.W. and S.K. Gess), 1 ♀; same locality, 9.xii.1982 (F.W. and S.K. Gess), 1 ♀; same locality, 30.i.1986 (F.W. and S.K. Gess), 1 ♀ [all AMGS]; Coombs Valley (33.16S, 26.50E), 2.i.1976 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Paradise Kloof, Grahamstown [33.18S, 26.32E], 3.xii.1964 (D.J. Brothers), 1 ♀ [AMGS]; Port Elizabeth [30.58S, 25.37E], 7.i.1961 (B.S. Brunhuber), 2 ♀♀ [AMGS].

Geographical distribution. Widespread from southern Zimbabwe southwards to the Eastern and Western Cape provinces of South Africa (Fig. 2c).

Floral associations. Recorded from four plant families: Asteraceae (*Senecio pterophorus* DC); Apiaceae (*Foeniculum vulgare* Mill.); Fabaceae (Papilionoideae, *Calpurnia intrusa* (R. Br. in W.T. Aiton) E. Mey and lucerne); and Apocynaceae (formerly Asclepiadaceae, determined from pollinia attached to specimen).

Nesting. At Hilton near Grahamstown 14 nests were investigated. All were single celled, sloping burrows in friable soil. The main shaft terminated in a spur. Provisioning is progressive.

Prey. Recorded taking 10 families of Diptera: Tabanidae, Asilidae, Muscidae, Stratiomyidae, Conopidae, Calliphoridae, Mydidae, Tachinidae, Bombyliidae, and Syrphidae.

Bembix anomalipes Arnold

http://species-id.net/wiki/Bembix_anomalipes
Fig. 1d

Bembex anomalipes Arnold, 1929: 334, figs 5, 5a–e, pl. 6, fig. 5 (Holotype, ♂, Penkridge, near the eastern border of Zimbabwe, in SAMC and paratype, ♂, Mbanza-Mgungu, Zaire (as Thysville, Congo), in RMCA) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix anomalipes Arnold, R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Pulawski 2013: 7 (in catalogue of world Sphecidae sensu lato).

Female. Undescribed. In size, coloration, vestiture and in general appearance generally very similar to male. Face at level of antennal sockets wider (relative to width of head) than in male; scapes normal; first joints of anterior tarsi only slightly less dilated than in male, spines on basal joint not lanceolate; tarsi of middle legs similar. Cu-a of hindwing slightly inclined towards the base as in male. Sternite II as in male, closely punctate except in the middle near the apex, fairly shining.

This species is characterised in both sexes by the labrum furnished with a very fine median longitudinal carina, expanded over the distal third into a low raised tubercle whose upper surface is slightly hollowed out. This development is unique, in the southern African species at least.

Material examined. ZAMBIA: Abercorn [now Mbala] [8.50S, 31.24E], x.1943 (Nat. Museum S. Rhodesia), 1 ♂, 1 ♀ [SAMC ex NMBZ]; Abercorn, vi.1945 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]; Abercorn, viii.1945 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]. ZIMBABWE: Penkridge [19.33S, 32.47E], 23.x.1927 (R.H.R. Stevenson), holotype ♂ [SAMC ex NMBZ]; Risitu River, Melsetter [19 48S, 32 52E], xi.1967 (Nat. Museum S. Rhodesia), 2 ♀♀ [SAMC ex NMBZ].

Geographical distribution. From the few specimens available this species appears to have a northern distribution (Fig. 2d), not having been recorded south of Zimbabwe.

Flower associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix arnoldi* Arnold**
http://species-id.net/wiki/Bembix_arnoldi
Fig. 1e

Bembex arnoldi Arnold, 1929: 353, figs 20, 20a, ♂ (Syntypes, Jeffrey's Bay, Eastern Cape, South Africa, in TMSA) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Arnold 1936: 27, pl.1, fig. 8, ♀.
[non] *Bembex arnoldi* Arnold, 1929: 354, pl. 6, fig. 15, ♀ [= *carinata* F. Smith]
Bembix arnoldi Arnold, Lohrmann, 1948: 449 (member of *arnoldi* species group of *Bembix*); Gess 1986: 151–152 (nesting, flower visiting, hunting and prey capture); Gess and Gess 1988: 246–247, Fig. 14.19 (habitat and hunting); Gess and Gess 1998: 35, Fig. 22.18 (habitat, hunting); Evans and O'Neil 2007: 183 (summary of nesting habits); not listed in R. Bohart and Menke 1976; Pulawski 2013: 8 (in catalogue of world Sphecidae sensu lato).

Note. Arnold (1929: 353) and (1936: 27) gives the author of this species as Brauns but as Brauns never published the description (or even the name) and as Arnold clearly published the description on Brauns behalf (as is evident from his comments (1936: 27) then the author must be Arnold himself. The correct form is thus not *B. arnoldi* Brauns but *B. arnoldi* Arnold!

Brauns (Arnold 1929: 354) recorded the species in addition from Jeffrey's Bay. [This seems to have been in error, the female concerned being that of *carinata* Smith (see Arnold 1936: 28)]. Brauns' observations were that this species is confined to sand dunes on the seashore.

Material examined. SOUTH AFRICA: EASTERN CAPE: Kleinemonde [33.32S, 27.03E], ix.1956 (M.J.A. Cooke) [AMGS], 1 ♂; Port Alfred [33.36S, 26.55E], 1.ii.1959 (E.McC. Callan), 1 ♀ [AMGS]; Kasouga Dunes [33.39S, 26.44E], xii.1954 Cooke), 1 ♀ [AMGS]; Boknes (33.43S, 26.35E), 16.i.1984 (D.W. Gess), 1 ♀, 3 ♂♂ (on flowers of *Phylohydrax carnosa* (Hochst) Puff, Rubiaceae) [AMGS]; same locality and date, (H.W. Gess), 2 ♀♀ (on flowers of *Phylohydrax carnosa*) [AMGS]; same locality, 20.i.1984 (D.W. Gess), 2 ♀♀ (on flowers of *Phylohydrax carnosa*) [AMGS]; same locality, 24.i.1984 (F.W. and S.K. Gess), 2 ♀♀, 6 ♂♂ (on flowers of *Phylohydrax carnosa*) [AMGS]; same locality and date (R.W. Gess), 3 ♂♂ (on flowers of *Phylohydrax carnosa*) [AMGS]; same locality, 9.i.1986 (D.W. Gess), 4 ♀♀ (on flowers of *Phylohydrax carnosa*) [AMGS]; Zwartkops [now Swartkops] [33.52S, 25.36E], Port Elizabeth, 25.xi.1919 (collector variously given as C.B. Krüger or C.B. Kruger), 2 ♂♂ [AMGS], 1 ♂ [SAMC ex NMBZ]; Zwartkops, Algoa Bay, 25.xi.1921 (Dr Brauns), 1 ♂ [AMGS], 1 ♂ [SAMC ex NMBZ]; Zwartkops, Port Elizabeth, 25.xi.1921 (Dr Brauns), 2 ♂♂ [SAMC ex NMBZ], 1 ♂ [DMSA]. WESTERN CAPE: Port Beaufort [34.24S, 20.49E], 26.i.2004 (F.W. and S.K. Gess), 1 ♂ (visiting flowers of *Scaevola plumieri* (L.) Vahl, Goodeniaceae on dunes of seashore [AMGS].

Geographical distribution. The species appears to have a strictly coastal distribution (Fig. 2e). At present it is known from the Eastern Cape, from Kleinemonde to Zwartkops near Port Elizabeth and from the Western Cape at Port Beaufort. At both Boknes and Port Beaufort the species was found frequenting the first line of supra-littoral dunes and visiting the flowers associated with these dunes.

Floral associations. Recorded from two plant families: Rubiaceae (*Phylohydrax carnosa* (Hochst.) Puff); Goodeniaceae (*Scaevola plumieri* (L.) Vahl).

Nesting. Unknown but most likely nesting in the supra-littoral dunes. At Boknes was repeatedly observed digging burrows on the seaward side of the fore-dunes.

Prey. One record only, Diptera: Muscidae (on ocean wrack on tideline).

***Bembix atrospinosa* R.Turner**
http://species-id.net/wiki/Bembix_atrospinosa
Fig. 1f

Bembex atrospinosa R. Turner, 1917b: 289, ♂, ♀ (Syntypes, South Africa, Eastern Cape, Willowmore, South Africa, in BMNH or TMSA?); Arnold 1929: 335, figs 6, 6a-e, ♂, ♀ (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix atrospinosa R. Turner, R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Pulawski 2013: 9 (in catalogue of world Sphecidae sensu lato).

Note. Described by R. Turner from Willowmore (December, Dr Brauns) and recorded by Arnold from the same locality.

Material examined. SOUTH AFRICA: EASTERN CAPE: Willowmore [33.15S, 23.30E], 17.xii.1916 (Brauns), 1 ♀ [AMGS], 1 ♂ [SAMC ex NMBZ]; same locality and collector, 15.xii.1917, 1 ♂, 20.xii.1917, 1 ♀, 25.xii.1917, 1 ♀ [all 3 SAMC ex NMBZ]; Kleinemonde [33.32S, 27.03E], i.1905 (Mrs G. White), 1 ♂ [AMGS]. WESTERN CAPE: Rooinek [Pass], Laingsburg Distr. [33.20S, 20.52E], i.1949 (Zinn-Hesse Mus. Exp.), 2 ♀♀ [SAMC].

Geographical distribution. From the few specimens available apparently southern, Eastern and West Cape provinces of South Africa (Fig. 2f).

Flower associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix baumanni* Handlirsch**
http://species-id.net/wiki/Bembix_baumanni
Fig. 3

Bembix Baumanni Handlirsch, 1893c: 813, pl. 2, fig. 18, pl. 5, fig. 24, ♂ (Holotype, ♂, South Africa, former Transvaal, no locality, in MHNG); Dalla Torre

Figure 3. *Bembix baumani*, male. (approximate length: 16.5 mm).

1897: 502 (in catalogue of world Hymenoptera); Arnold 1929: 359, figs 24, 24a (in revision of southern African Sphecidae).

Bembix baumanni Handlirsch, de Beaumont 1967b: 506 (South West Africa [Namibia], Kakaoveld, Sanitatas, about 85 miles WSW Ophopoho); R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Pulawski 2013: 9 (in catalogue of world Sphecidae sensu lato).

Additional records extracted from database of specimens in collection of SAMC. SOUTH AFRICA: Eastern Cape: Dunbrody [33.34S, 25.41E] (no date) (O'Neil), no sex given, determined by G. Arnold. Six additional records with no determiner are given, five from the Western Cape and one from Namibia.

Geographical distribution. The few records available are for Namibia, the former Transvaal, the Eastern Cape and possibly Western Cape. Clearly further records are required to clarify the distribution pattern.

Flower associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix bubalus* Handlirsch**
http://species-id.net/wiki/Bembix_bubalus
Figs 4a–c, 6a

Bembex bubalus Handlirsch, 1893: 719, pl. 1, fig. 8, pl. 3, fig. 22, pl. 4, fig. 9, pl.5, fig. 39, pl. 6, fig. 6, ♂, ♀ (Syntypes, South Africa, former Transvaal and former Cape Province, no localities, in MHNG and ZMHB); Dalla Torre 1897: 503 (in catalogue of world Hymenoptera); Arnold 1929: 332, figs 4, 4a–c, ♂, ♀ (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphegidae).

Bembix bubalus Handlirsch, R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Gess and Gess 1989: 151–160, figs 1, 2, 3, 4, 5, 6 (flower visiting, nesting, first case of nest sharing in *Bembix*, prey capture, prey); De Melo 2000: 105 (use of one nest by more than one female); Evans and O'Neil 2007: 183 (summary of information on nesting habits); Pulawski 2013: 16 (in catalogue of world Sphecidae sensu lato).

Note. Described by Handlirsch from three males and two females from South Africa: "Transvaal (Coll. Saussure) und Cap (Mus. Berolin. et Coll. Saussure)". Arnold recorded it from Willowmore.

Material examined. SOUTH AFRICA: NORTHERN CAPE: N. Namaqualand, Lekkersing [29.00S, 17.00E], iii.1935 (Museum Staff) [A.J. Hesse et al.], 2 ♀♀ [SAMC]; Fraserburg [31.55S, 21.30E], 24.xii.1972 (Empey), 1 ♂ [AMGS]. WESTERN CAPE: Oudtshoorn, Onverwacht (33.38S, 22.14E), 9–12.xii.1986 (F.W., H.W. and R.W. Gess), 77 ♀♀, 18 ♂♂ (8 ♀♀, 4 ♂♂ on flowers of *Acacia karroo* Hayne; 14 ♂♂ on flowers of *Acacia caffra* (Thunb.) Willd. (both Fabaceae, Mimosoideae); 1 ♀ on flowers of *Zygophyllum retrofractum* Thunb. (Zygophyllaceae); 25 ♀♀ with prey: Syrphidae (*Eristalis tenax* (L.), *Eristalodes taeniops* (Wied.); Bombyliidae (*Bombylius ornatus* Wied., *Systoechus* spp. and others); Tabanidae and Stratiomyidae) [AMGS]; Olifants River between Citrusdal and Clanwilliam, x-xi.1931 (Museum Staff) [A.J. Hesse et al.], 2 ♂♂ [SAMC]; Upper Sources Olifants River, Ceres [circa 33.05S, 19.14E], xii.1949 (Mus. Exp.) [A.J. Hesse et al.], 1 ♂ [SAMC]; Touwsrivier [33.20S, 20.02E], 9.i.1975 (Empey), 1 ♀ [AMGS]; Merweville Distr. [32.40S, 21.31E], i-ii.1947 (H. Zinn), 1 ♀ [SAMC]; Spitzkop, Laingsburg Dist. [33.3S, 20.35E], iii.1938 (Mus. Staff) [A.J. Hesse et al.], 2 ♀♀ [SAMC]; Moordenaars Karroo, Laingsburg Div. [circa 32.58S, 20.49E], iii.1937 (Mus. Staff) [A.J. Hesse et al.], 2 ♀♀ [SAMC]; Rooinek [Pass], Laingsburg Distr. [33.20S, 20.52E], i.1949 (Zinn – Hesse Mus. Exp.), 1 ♀ [SAMC]; Murraysburg [31.58S, 23.47E], 2.i.1978 (Empey), 1 ♀, 2 ♂♂ [AMGS]; Rietbron [32.54S, 23.08E], 13.i.1965 (H.N. Empey), 1 ♂ [AMGS]. EASTERN CAPE:Mountain Zebra Park (32.15S, 25.27E), 12–16.ii.1988 (A.J. Weaving), 2 ♀♀ [AMGS]; Willowmore [33.15S, 23.30E], ii.1913 (Brauns), 2 ♀♀ [SAMC ex NMBZ; DMSA]; same locality and collector, 1.xii.1919, 1 ♀ [SAMC ex NMBZ]; same locality and collector, 10.xii.1919 (Brauns), 1 ♂ [AMGS]; same locality and collector, 18.

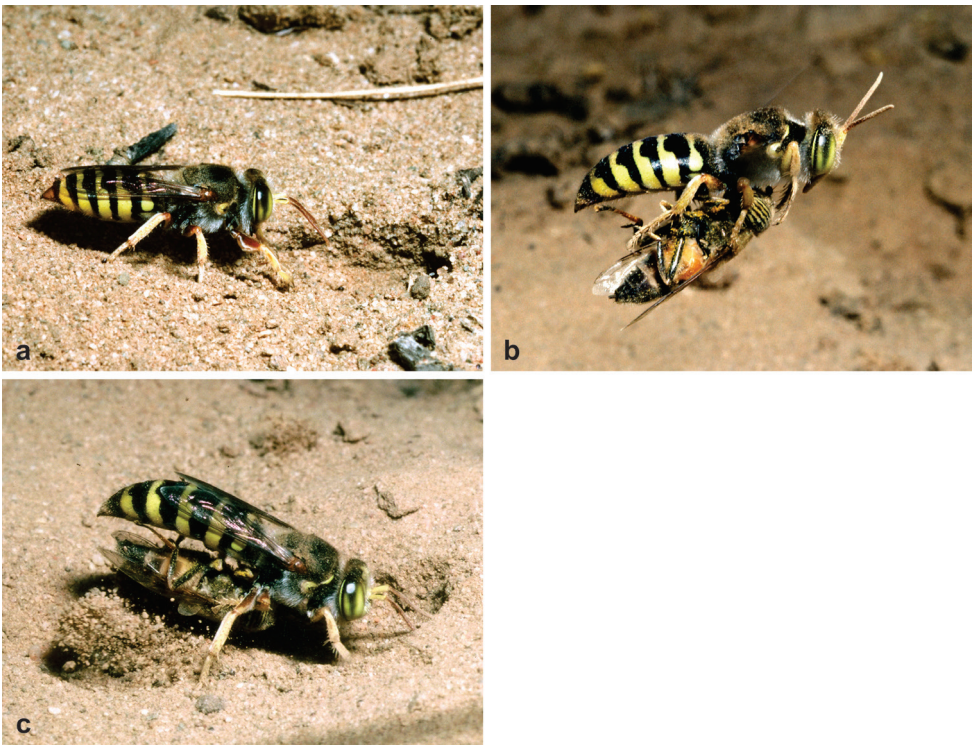

Figure 4. *Bembix bubalus*: **a** raking sand back from nest entrance during nest excavation **b** carrying syrphid prey, coming in to land at nest entrance; holding syrphid prey whilst clearing temporary closure from nest entrance preparatory to entering.

xii.1919, 1 ♂ [SAMC ex NMBZ]; same locality and collector, 20.xii.1920, 1 ♀ [AMGS]; same locality and collector, 3.i.1926, 1 ♀ [AMGS]; same locality, 12.i.1965 (H.N. Empey), 5 ♀♀, 2 ♂♂ [AMGS]; Kingwilliamstown [circa 32.53S, 27.24E], 16.i.1965 (H.N. Empey), 1 ♂ [AMGS].

Geographical distribution. This species appears to have a southern distribution in the Succulent Karoo and southern Nama-Karoo with one outlying record from Kingwilliamstown to the east of the Nama-Karoo (Fig. 7a). The record for a syntype from the "Transvaal" seems questionable.

Flower associations. Recorded from two plant families: Fabaceae (Mimosoideae, *Acacia karroo* Hayne. and *A. caffra* (Thunb.) Willd.) (both Fabaceae: Mimosoideae; Zygophyllaceae (*Zygophyllum retrofractum* Wied.).

Nesting. Nesting in large aggregations of up to 1,000 or more nests in level friable soil, nest multicellular, sloping burrow in friable soil, the main shaft terminating in a spur, provisioning progressive. Notable for exhibiting nest sharing.

Prey. Recorded taking seven families of Diptera: Stratiomyidae, Tabanidae, Syrphidae, Bombyliidae, Muscidae, Sarcophagidae, and Tachinidae.

***Bembix cameronis* Handlirsch**
http://species-id.net/wiki/Bembix_cameronis
Fig. 6b

Bembex Cameronis Handlirsch, 1893: 715, pl. 1, fig. 6, pl. 4, fig. 7, pl. 6, fig. 4, ♂, ♀ (Syntypes, South Africa, in ZMHB, NMW); Dalla Torre 1897: 503 (in catalog of world Hymenoptera as *cameronii*); Arnold 1929: 329, figs. 1, 1a-f, pl. 6, fig. 34; Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix cameronis Handlirsch, R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Gess 1981: 21 (nesting); Gess 1986: 152, 157 (nesting, flowers visited, prey); Gess and Gess 1994: 100 (flower visiting); S. Gess 1996: 276, 280, 281, 283, 295 (flower visiting records); Gess and Gess 2003: 122 (flower visiting records); Evans and O'Neil 2007: 185 (summary of prey records); Pulawski 2013: 17 (in catalogue of world Sphecidae sensu lato).

Note. Described by Handlirsch from a male and a female from the Cape ("Cap") (Berlin Museum) and a female from "Südafrika" (P. Cameron). Arnold (1929) examined and figured a male in the South African Museum from Tradouw Pass, Swellendam (Western Cape).

The specimens examined (FWG) from Lesotho differ from those from the "Cape Province" and from the description of the species (based on Cape material) in being melanistic (i.e. in having the extent of the yellow markings reduced). Most noticeable in this respect is: scape in male entirely black (except radicle and extreme apex), in female with upper surface marked with black streaks; labrum usually with large black streaks on basal two-thirds; clypeus in male black except for a wide apical band somewhat expanded basally in midline, in female with a pair of black spots at base and sometimes a smaller pair on disc (these spots sometimes fused); yellow region on lower face between antennal sockets reduced and inner orbital bands shortened; pronotum with posterior margin black or with only a very narrow yellow band, in male with sides almost entirely black (except for small yellow area on anterior-ventral region of mesopleura), in female with yellow markings mostly present but much reduced; sterna with amount of yellow reduced; black markings on legs more extensive.

Material examined. NAMIBIA: N of Kalkveld on road to Otjiwarongo (20.50S, 16.13E), 25.iii.1997 (F.W. and S.K. Gess), 1 ♀ (visiting deep pink flowers of *Hermbstaedtia* sp., Amaranthceae) [AMGS]; Nomtsas (24.25S, 16.51E), 18.iii.1997 (F.W. and S.K. Gess), 1 ♀ (visiting white flowers of *Limeum argute-carinatum* Wawra & Peyr., Molluginaceae) [AMGS]. SOUTH AFRICA: WESTERN CAPE: 31.5 km from Clanwilliam on road (R363) to Klawer [31.56S, 18.44E], 9–10.x.1990 (F.W. and S.K. Gess), 2 ♀♀, 1 ♂ (on yellow flowers of *Athanasia trifurcata* (L.) L., Asteraceae) [AMGS]; Bul[s]hoek, Klawer – Clanw[illiam] [32.00S, 18.47E], x.1950 (Mus. Exp.) [A.J. Hesse et al.], 1 ♂ [SAMC]; 18.5 km from Clanwilliam on road (R363) to Klawer [32.01S, 18.49E], 9.x.1990 (F.W. and S.K. Gess), 1 ♂ (on yellow flowers of *Aspalathus pulicifolia* (Dahlgren), (Fabaceae: Papilionoideae)

[AMGS]; 17.5 km from Clanwilliam on road (R363) to Klawer [32.01S, 18.49E], 9.x.1990 (F.W. and S.K. Gess), 4 ♀♀ (on yellow flowers of *Athanasia trifurcata* (L.) L., Asteraceae) [AMGS]; 16.5 km from Clanwilliam on old road [R363] to Klawer [32.02S, 18.49E], 13.x.1990 (F.W. and S.K. Gess), 2 ♀♀[AMGS]; 12.5 km from Clanwilliam on road (R363) to Klawer [32.05S, 18.50E], 9.x.1990 (F.W. and S.K. Gess), 1 ♀ (on yellow flowers of *Athanasia trifurcata* (L.) L., Asteraceae) [AMGS]; Clanwilliam Dam, Caleta Cove (32.14S, 18.56E), 19–20.x.1989 (D.W. Gess), 1 ♂ (visiting flowers of *Athanasia trifurcata* (L.) L., Asteraceae) [AMGS]; 10 km from Clanwilliam on old road to Citrusdal [32.15S, 18.57E], 6.x.1991 (D.W. Gess), 8 ♂♂ (on yellow flowers of *Pteronia divaricata* Less, Asteraceae) [AMGS]; Clanwilliam Dam, E bank, 19.2 km S of caravan park (32.17S, 18.56E), 5.x.1995 (F.W., S.K. and R.W. Gess), 3 ♂♂ (on ground) [AMGS]; Clanwilliam Dam. E bank, 20 km S of caravan park (32.17S, 18.56E), 3.x.1997 (F.W. and S.K. Gess), 1 ♂ [AMGS]; Graafwater District, Heerenlogement (31.58S, 18.33E), 8.x.1955 (F.W., S.K. and R.W. Gess), 1 ♂ (visiting pink flowers of *Psilocaulon* spp., Aizoaceae: Mesembryanthema) [AMGS]; between Klipfontein and Olaf Bergfontein (32.02S, 18.33E), 1 ♀, 2 ♂♂ (visiting pale pink flowers of *Psilocaulon acutisepalum* (Berger) N.E. Br., Aizoaceae: Mesembryanthema) [AMGS]; Graafwater (32.09S, 18.33E), 14.x.1994 (F.W. and S.K. Gess), 1 ♂ (on pink flowers of *Psilocaulon* sp., Aizoaceae: Mesembryanthema) [AMGS]; Clanwilliam District, Kransvlei (32.14S, 18.51E), 7–13.x.1987 (F.W. and S.K. Gess), 2 ♀♀, 3 ♂♂ (1 ♀ stylopized; 1 ♂ on flowers of *Athanasia trifurcata* (L.) L., Asteraceae) [AMGS]; Paleisheuwel [32.29S, 18.44E], xi.1948 (Mus. Exp.) [A.J. Hesse et al.], 3 ♀♀ 3 ♂♂ [SAMC]; Citrusdal Dist. [circa 32.33S, 19.01E], xi.1948 (Mus. Exp) [A.J. Hesse et al.], 1 ♂ [SAMC]; Upper Sources Olifants River, Ceres [circa 33.05S, 19.14E], xii.1949 (Mus. Exp.) [A.J. Hesse et al.], 1 ♀ [SAMC]; 43 km ENE of Ceres on road to Sutherland [33.12S, 19.44E], 2–3.xii.1989 (F.W. and S. K. Gess), 1 ♀ (on flowers of *Limonium* sp., Plumbaginaceae) [AMGS]; Gouph, Laingsburg Dist. [circa 33.12S, 20.52E], ix.1937 (Mus. Staff) [A.J. Hesse et al.], 1 ♀ [SAMC]; 17 km N of Ceres near top of Gydo Pass [33.14S, 19.20E], 30.xi.1989 (F.W. and S.K. Gess), 1 ♂ [AMGS]; Leipoldtville – Eland's Bay [32.13S, 18.29E – 32.18S, 18.21E], xi.1948 (Mus. Exp.) [A.J. Hesse et al.], 1 ♀, 6 ♂♂ [SAMC]; Constable [33.16S, 20.17E], xii.1962 (S.A.M) [A.J. Hesse et al.], 1 ♀ [SAMC]; Matroosberg Station [33.24S, 19.48E], 12.i.1962 (SAMC) [A.J. Hesse et al.], 1 ♂ [SAMC]; circa 2 km S of Matroosberg Station (33.26S, 19.50E), 4.xii.1986 (H.W. Gess), 1 ♀ (on white flowers of "mesem", Aizoaceae: Mesembryanthema) [AMGS]; road between Montagu and Matroosberg Station (circa 33.32S, 19.52E), 4.xii.1986 (F.W., S.K. and H.W. Gess), 3 ♀♀, 1 ♂ (2 ♀♀, 1 ♂ on white flowers of "mesem", Aizoaceae: Mesembryanthema) [AMGS]; Ouberg Pass, by road 27 km NE of Montagu (33.40S, 20.16E), 3.xii.1986 (S.K. Gess), 1 ♂ [AMGS]; Oudtshoorn, Frischgewaagd (33.39S, 22.13E), 7–8.xii.1986 (F.W. and S.K. Gess), 2 ♀♀, 1 ♂ (1 ♀, 1 ♂ on flowers of *Senecio rosmarinifolius* L.f., Asteraceae) [AMGS]; Raubenheimer Dam near Oudtshoorn [33.41S, 24.43E], 10.x.1972 (C.F. Jacot-Guillarmod), 1 ♂ [AMGS]; Oudtshoorn, Zebra [33.46S, 22.19E], x.1951 (Mus. Expd) [A.J. Hesse et al.], 1 ♀ [SAMC];

near Danger Point, Gansbaai (34.37S, 19.20E), 18.xi.2012 (D.W and G.M. Gess), 3 ♂♂ (2 ♂♂ on *Muraltia satureioides* DC., Polygalaceae; 1 ♂ on ground amongst same) [AMGS]; Pearly Beach, Bredasdorp [34.39S, 19.29E], xii.1958 (SAMC.) [A.J. Hesse et al.], 1 ♀ [SAMC]; Pearly Beach, 25.i.1971 (M.W. Strydom), 1 ♀ [SANC]; EASTERN CAPE; Kranzdrif, Grahamstown [33.09S, 26.32E], 5.xi.1947 (C. Jacot-Guillarmod), 1 ♀; near Lake Mentz [now Darlington Dam] [circa 33.12S, 25.09], 7.xi.1973 (R. Bayliss), 1 ♀; Hilton, Grahamstown [33.15S, 26.20E], 19.xi.1967 (C. Jacot-Guillarmod), 1 ♂; same locality, 25.i.1974 (D.W. Gess), 1 ♀, 3.xi.1977 (F.W. Gess), 1 ♀ (on flowers of *Lasiospermum bipinnatum* (Thunb.) Druce, Asteraceae), 12.i.1978 (H.W. Gess), 1 ♀, 29.xi.1979 (F.W. Gess), 3 ♀♀, 3 ♂♂ (on flowers of *Senecio pterophorus* DC., Asteraceae), 29–30. xi.1979 (F.W. Gess), 2 ♂♂ (Malaise trap), 1.xii.1979 (F.W. and S.K. Gess), 2 ♀♀ (on flowers of *Senecio pterophorus* DC., Asteraceae), 2.xii.79 (F.W. and S.K. Gess), 2 ♀♀, 4 ♂♂ (2 ♀♀, 3 ♂♂ on flowers of *Senecio pterophorus* DC., Asteraceae, 1 ♂ on flowers of *Athanasia filiformis* L.f., Asteraceae), 5–7.xii. 1979 (F.W. Gess), 2 ♀♀ (Malaise trap), 11–16.xii.1979 (F.W. Gess), 1 ♀ (Malaise trap), 16–22.xii.1979 (F.W. Gess), 1 ♀ (Malaise trap), 4.xi.1982 (F.W. and S.K. Gess), 1 ♂, 14.xii.1982 (D.W. Gess), 1 ♀, 28.xi.1983 (D.W. Gess), 1 ♂, 1.xii.1983 (F.W. and S.K. Gess), 1 ♀, 6.xi.1984 (A.J. Weaving), 1 ♂; Burnt Kraal, Grahamstown [33.16S, 26.29E], 12.ii.1969 (F.W. Gess), 1 ♀ [all AMGS]. NORTHERN CAPE: Nieuwoudtville, Skuinshoogte Pass (31.16S, 19.08E), 23–30.ix.1994 (F.W. and S.K. Gess), 1 ♂ (buzzing around white flowered "mesem", Aizoaceae: Mesembryanthema) [AMGS]; Namaqualand, Springbok, Hester Malan [now Goegap] Nature Reserve [29.38S, 17.59E], 15–21.x.1987 (F.W. and S.K. Gess), 1 ♂ (Malaise trap) [AMGS]; 15 km N [of] Nieuwoudtville on road to Loeriesfontein [31.16S, 19.E], 3–8.x.1989 (F.W. and S.K. Gess), 1 ♀ [AMGS]; Namaqualand, Bowesdorp [30.20S, 17.56E], xi.1931 (Museum Staff), 2 ♂♂ [SAMC]. LESOTHO: Makhaleng River, Mountain Road [AMGS], 3.i.1959 (C. Jacot-Guillarmod), 2 ♀♀, 1 ♂ [AMGS]; Mahlatsa [29.13S, 28.00E], 12.i.1948 (A. Jacot-Guillarmod), 1 ♀ [AMGS]; Bokong P.O. [29.17S, 28.23E], 26.xii.1946 (A. Jacot-Guillarmod), 1 ♀ (with prey: Bombyliidae) [AMGS].

Geographical distribution. Namibia, Nama-Karoo, south through the Succulent Karoo and eastwards through the Nama-Karoo of South Africa into Lesotho (Fig. 7b).

Floral associations. Recorded from seven plant families: Asteraceae (*Athanasia trifurcata* (L.) L., *A. filiformis* L. f., *Senecio rosmarinifolius* L.f., *S. pterophorus* DC., *Lasiospermum bipinnatum* (Thunb.) Druce and *Pteronia divaricata* Less); Amaranthaceae (*Hermbstaedtia* sp.); Molluginaceae (*Limeum argute-carinatum* Wawra & Peyr.); Aizoaceae (Mesembryanthema, *Psilocaulon* spp. and "mesems"), Polygalaceae (*Muraltia satureioides* DC.); Fabaceae (Papilionoideae, *Aspalathus pulicifolia* (Dahlgren)); Plumbaginaceae (*Limonium* sp.).

Nesting. Single nest investigated - a single celled, sloping burrow in friable soil. The main shaft terminated in a spur.

Prey. Recorded taking one family of Diptera: Bombyliidae (*Systoechus* sp.), from two well separated sites, Hilton, Eastern Cape, South Africa and Bokong, Lesotho.

***Bembix capensis* Lepeletier**
http://species-id.net/wiki/Bembix_capensis
Fig. 6c

Bembex capensis Lepeletier, 1845: 273, ♂ (Holotype, ♂, no locality, South Africa, former Cape Province, in collection M. Spinola, Turin, Italy); F. Smith 1856: 322 (in catalogue of Hymenoptera in British Museum); Dalla Torre 1897: 503 (in catalogue of world Hymenoptera); Handlirsch 1893: 853, pl. 3, figs 4, 26, ♂, ♀ (in revision of world Bembicinae); Cameron 1910: 144; Arnold 1929: 377, figs 40, 40a–c, pl. 6, fig. 32, ♂, ♀ (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Arnold 1935: 503 (Kalahari, South Africa); Gadallah 2002: 63 (in key to Egyptian *Bembix* based on male genitalia).

Bembix capensis Lepeletier, J. Parker 1929: 143 (in revision of Stizini and Bembicini); de Beaumont 1967: 506 (Natal [KwaZulu-Natal], South Africa); Carpenter 1920 (prey); Ulleyt and De Vries 1940 (prey); R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Gess and Gess 1994: 100 (flower visiting); Gess 1981: 21 (prey) Gess 1986: 152, 157 (prey); S. Gess 1996: 276, 280, 281, 283, 295 (flower visiting records); Guichard 1989: 146 (Saudi Arabia); Gadallah 1997: 259 (in revision of Egyptian *Bembix*); Gess and Gess 2003: 122 (flower visiting records); Gadallah and Assery 2004: 230 (in checklist of Sphecidae of Saudi Arabia); Roche 2007a: 109 (in checklist of Egyptian Ampulicidae, Sphecidae and Crabronidae, redescription); Roche 2007b: 7 (in checklist of Egyptian Ampulicidae, Sphecidae and Crabronidae); Pulawski 2013: 17 (in catalog of world Sphecidae sensu lato).

Bembex natalis Dahlbom, 1845: 489, ♀ (Holotype or syntypes, South Africa, Port Natal [Durban, KwaZulu-Natal], in Lund or Stockholm). Handlirsch 1893: 853, synonymised with *B. capensis*; F. Smith 1856: 324 (in catalogue of Hymenoptera in British Museum).

Note. Described by Lepeletier (1845) from the Cape of Good Hope and subsequently recorded from various parts of southern Africa: Handlirsch (1893) from the Transvaal and "Capland"; Cameron (1910) from Olifants River (Transvaal); and Parker (1929) from South West Africa (now Namibia). Arnold (1929) stated it to be "a common species widely distributed throughout Rhodesia (now Zimbabwe) and South Africa", and (1935) recorded it from three localities (Gemsbok Pan, Gomodimo and Ngami) in the Kalahari (Botswana). De Beaumont (1967) recorded it from Tugela River, 12 miles WNW Bergville, Natal (now KwaZulu Natal).

Material examined. TANZANIA: Old Shinyanga [3.34S, 33.24E), 18.vii.1954 (E. Burtt), 1 ♀ (with cocoon) [SAMC ex NMBZ]. ZIMBABWE: Sawmills [19.35S, 28.02E], 26.x.1919 (G. Arnold), 1 ♂ [AMGS]; Sawmills [19.35S, 28.02E], 12. xi.1920 (Rhodesia Museum), 1 ♂ [SAMC ex NMBZ]; Sawmills, 1.iv.1923 (Roy Stevenson), 1 ♂ [SAMC ex NMBZ]; Sawmills, 16.xi.1924 (Rhod. Museum), 1 ♀ [SAMC ex NMBZ]; Sawmills R[oa]d, Nyamandhlovu [circa 19.52S, 28.15E],

26.iii1961 (Nat.Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ];Nyamandhlovu [19.52S, 28.15E], xi.1960 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Bulawayo [20.07S, 28.32E], xi.1912 (G. Arnold), 1 ♀ [AMGS]; Bulawayo, 7. ix.1913 (G. Arnold), 1 ♀ [SAMC ex NMBZ]; Bulawayo, 29.ix.1923 (R. Stevenson), 2 ♂♂ [AMGS]; Bulawayo, 1.x.1923 (R. Stevenson), 1 ♂ [SAMC ex NMBZ]; Bulawayo, 17.iii.1924 (R.H.R. Stevenson), 1 ♂ [AMGS]; Bulawayo, 5.x.1924 (Rhodesia Museum), 1 ♀ [SAMC ex NMBZ]; Bulawayo, 26.xii.1951 (Nat. Museum S.Rhodesia), 1 ♂ [SAMC ex NMBZ]; Gwaai [= Gwai] [19.17S, 27.43E],14.x.1926 (R.H.R. Stevenson), 1 ♀ [AMGS]; Turk Mine [19.44S, 28.48E], 24.xi.1957 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]; Turk Mine, 16.xii.1957 (Nat. Museum S. Rhodesia), 1 ♂ [AMGS]; Turk Mine, 2.xi.1958 (Nat.Museum S. Rhodesia),2 ♂♂ [1 ♂ AMGS; 1 ♂ SAMC ex NMBZ]; Turk Mine, 1.xi.1959 (Nat. Museum S. R.), 1 ♀ [SAMC ex NMBZ]; Turk Mine, i.1961 (Nat. Museum S. R.), 1 ♂ [SAMC ex NMBZ]; Hillside [20.12S, 28.37E], 1.xii.1922 (Swinburne and Stevenson), 1 ♂ [SAMC ex NMBZ]; Hillside [20.12S, 28.37E], 6.v.1924 (R.H.R. Stevenson), 1 ♂ [AMGS]; Umguza R[iver] [19.42S, 28.25E], 24.x.1930 (R.H.R. Stevenson), 1 ♀ [AMGS]; ia (28.06S, 32.26E), 4–5.iii.1987 (A.J. Weaving), 1 ♂ [AMGS]. NAMIBIA: Gautsche Pan, Bushmanland (19.48S, 20.35E), 9–13.vi.1971 (no collector given), 2 ♀♀ [NMNW]; Noachabeb 97, Keetmanshoop [SE 2718 Ad) [27.26S, 18.31E], 7–12.i.1972 (no collector given), 2 ♀♀ [NMNW]; Oshakati, Ovamboland (SE 2715 Da) [17 48S, 15.42E], 5.v.1971 (no collector given), 1 ♀; Claratal 18 (SE 2216 Dd) [22 48S, 16.50E], Windhoek, 27.i.1971 (no collector given), 1 ♀ [NMNW]; Otjikoko-Süd (SE 2116 Ad) [21.22S, 16 22E], Omaruru, 18.xi.1971 (no collector given), 2 ♀♀ [NMNW]; Takuasa (SE 1720 Cd), Kavango, 14–19.vii.1971 (no collector given), 1 ♀ [NMNW]; 30 km E [of] Karasburg on road from Ariamsvlei (28.00S, 19.03E), 12.iii.1997 (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers of *Geigeria* sp., Asteraceae) [AMGS]; Great Karas Mountains [circa 27.11S, 18.44E], xi.1936 (Mus. Staff), 6 ♀♀ [SAMC]; Ongandjera [17.55S, 15.05E], iii.1923 (S. W. Africa Mus. Exped.), 2 ♂♂ [SAMC]; Windhoek [22.35S, 17.04E], no date, no collector recorded), 1 ♀ [SAMC]; Swakop River Bed on road to Goanikontes (22.41S, 14.35E), 11.iv.1998 (F.W. and S.K. Gess), 10 ♀♀, 6 ♂♂ visiting white flowers of *Psilocaulon salicornioides* (Pax) Schwantes, Aizoaceae: Mesembryanthema) [AMGS]; Swakop River at bridge nr mouth (22.42S, 14.32E), 12.iv.1998 (F.W. and S.K. Gess), 1 ♀ (on moist sand) [AMGS]; Swakopmund, Swakop R[iver] at bridge (22.42S, 14.32E), 16.iii.1999 (F.W. and S.K. Gess), 1 ♀ [AMGS]; 18 km west of 1237/C26 junction (23.09S, 16.42E), 1 ♂ (visiting deep-pink flowers of *Hermstaedtia* sp., Amaranthaceae) [AMGS]; Gamsberg, E of Pass (23.19S, 16.31E), 12.iii.1999 (F.W. and S.K. Gess), 1 ♂ visiting yellow flowers of *Geigeria* sp., Asteraceae) [AMGS]; Namutoni [18.48S, 16.59E], 1919 (J. Breyer), 1 ♂ [AMGS]. LESOTHO: Mamathes [29.08S, 27.51E], 18. xi.1945 (L. Bevis), 1 ♂ [AMGS]; Mamathes [29.08S, 27.51E], 9.xi.1947 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; same locality and collector, 8.xi.1949, 2 ♂♂, 12.xi.1949, 1 ♂, 13.xi.1949, 3 ♂♂, 17.xi.1949, 1 ♂, 18.xi.1949, 1 ♂, 18.xii.1949, 1♀, 29.i.1950, 1 ♀, 14.xi.1954,

1 ♀ [all 11 AMGS]; nr. Medicani [??], 20.i.1939 (L. Bevis), 1 ♀ [AMGS]. SOUTH AFRICA: GAUTENG: Pretoria North [25.40S, 28.10E], 17.x. 1947 (C. Jacot-Guillarmod), 3 ♀♀, 1 ♂ [AMGS]; Pretoria North [25.40S, 28.10E], 19.x.1947 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; Pretoria North [25.40S, 28.10E], 29.xi.1964 (Empey), 1 ♂ [AMGS]; Pretoria North Sandpits [25.40S, 28.15E], 25.x.1947 (C. Jacot-Guillarmod), 1 ♀ (with prey: Sarcophagidae); Pretoria North Sandpits, 26.x.1947 (C. Jacot-Guillarmod), 2 ♂♂ (bearing pollinia of Asclepiadaceae on tarsi) [AMGS]; Johannesburg [26.10S, 28.02E], 9.ii.1967 (J.G.H. Londt), 2 ♀♀, 1 ♂ [AMGS]; Johannesburg North, Raedene [26.09S, 28.06E], 28.iii.1966 (Empey), 4 ♀♀, 2 ♂♂ [AMGS]; Johannesburg North, Raedene, 21.v.1966 (Empey), 3 ♀♀ [AMGS]; Johannesburg North, Wilds [26.09S, 28.3E], 17.iii.1962 (Empey), 1 ♀ [AMGS]; Johannesburg East [circa 26.12S, 28.3E], 4.xii.1961 (Empey), 1 ♀ [AMGS]; Johannesburg West [26.12S, 28.3E], 6.i.1958 (Empey), 1 ♀ [AMGS]; Johannesburg West, 4.i.1959 (Empey), 1 ♀ [AMGS]; Johannesburg West, 3.ii.1959 (Empey), 1 ♂ [AMGS]; Johannesburg West, 4.xii.1961 (Empey), 3 ♀♀, 1 ♂♂ [AMGS]; Johannesburg West, 30.x.1966 (Empey), 1 ♂ [AMGS]; Florida Hills [26.10S, 27.52E], 19.iii.1960 (Empey), 1 ♀ [AMGS]; Florida Hills, 26.ii.1961 (Empey), 1 ♀ [AMGS]; Florida Hills, 2.iv.1961 (Empey), 2 ♀♀ [AMGS]; Florida Hills, 25.ii.1968 (F.J. Herbst), 1 ♂ [AMGS]; Strubens Valley, Florida [26.10S, 27.56E], 14.xi.1965 (Empey), 1 ♀ [AMGS]; Strubens Valley, Florida, 29.xi.1965 (Empey), 1 ♀ [AMGS]; Strubens Valley, Florida, 6.xii.1969 (Empey), 1♀ [AMGS]; Strubens Valley, Florida, 21.xii.1969 (Empey), 1 ♀ [AMGS]; Mondeor Hills [26.16S, 28.0E], 6.i.1958 (Empey), 1 ♂ [AMGS]; Mondeor Hills,6.xii.1961 (Empey), 1 ♀ [AMGS]; Alberton [26.18S, 28.15E], 4.xii.1961 (Empey), 1 ♂ [AMGS]; Alberton [26.18S, 28.15E], 28.i.1966 (Empey, 1 ♀ [AMGS];Benoni [26.11S, 28.18E], 28.xi.1964 (Empey), 1 ♀ [AMGS]; Mid-West Transvaal, Midway Station [26.43S, 27.06E], 29.iv.1963 (Empey), 3 ♀♀ [AMGS]. NORTH WEST PROVINCE: Pienaarsrivier [25.10S, 27.59E], 2.xi.1967 (Empey), 2 ♀♀ [AMGS]; Schweitzer-Reneke [27.11S, 25.18E], 27.ii.1979 (F. Herbst), 1 ♂ [AMGS]; MPUMALANGA: Nelspruit [25.29S, 30.59E], 15.x.1967 (Empey), 1 ♀ [AMGS]; Maboki, Lydenb[urg] [circa 25.10S, 30.29E], no date (F.J. Kroeger]. 1 ♀ [SAMC]; Skukuza [24.59S, 31.36E], 6.ii.1965 (D.J. Brothers, 1 ♂ [AMGS]. KWAZULU-NATAL: Sordwana Bay [now Sodwana Bay] [27.32S, 32.41E], 27.iv.1977 (F.J. Herbst), 1 ♂ [AMGS]; Dundee [28.11S, 30.15E], 21.i.1961 (Empey), 2 ♂♂ [AMGS]; Nagle Dam District [29.35S, 30.37E], 16.i.1966 (F. Herbst), 1 ♂ [AMGS]; Kloof [29.47S, 30.50E], ii.1915 (Marley), 1 ♀ [SAMC]; Ladysmith [28.32S, 29.46E], 26.iii.1960 (Empey), 2 ♀♀ [AMGS]; Mfongosi [28.43S, 30.48E], xii.1934 – ii.1935 (W.E. Jones), 1 ♂ [SAMC]. FREE STATE: Chicago, Lindley Dist. [circa 27.53S, 27.57E], 17–18.i.1968 (D.J. Brothers), 4 ♀♀, 3 ♂♂ [AMGS]; Kroonstad [27.43S, 27.19E], ii.1946 (S. Brothers), 1 ♂ [AMGS]; same locality and collector, v.1946, 1 ♀ [AMGS]; same locality, 29.xi.1946 (C. Jacot-Guillarmod), 1 ♀ [AMGS]; same locality, ii.1948 (D.J. Brothers), 1 ♂ [AMGS]; same locality, 4.iv.1948 (J. Brothers), 1 ♂ [AMGS]; same locality, 22.xii.1964 (D.J. Brothers), 1 ♂ [AMGS];

same locality and collector, xii.1965, 2 ♀♀ [AMGS], 31.xii.1965, 4 ♂♂ [all 6 AMGS]; Flora, Marquard [28.40S, 27.28E], 1.i.1960 (C. Jacot-Guillarmod), 3 ♀♀ [AMGS]; Bloemfontein [29.06S, 27.07E], 10.iii.1931 (Nat. Museum S. Rhodesia), 1 ♂ [AMGS]; same locality, 20.iii.1931 (C. Jacot-Guillarmod), 2 ♂♂ [1 ♂ AMGS; 1 ♂ SAMC ex NMBZ]; Smithfield [30.09S, 26.30E], 1909 (Kannemeyer), 1 ♀ [SAMC]. NORTHERN CAPE: Kalahari Gemsbok National Park, Nossob River bed 11 km NNE [of] Twee Rivieren [26.24S, 20.41E], 8–11.iii.1990 (F.W. and S.K. Gess), 5 ♀♀, 5 ♂♂ (on yellow flowers of *Deverra aphylla* (Cham. & Schlechtd.) DC, Apiaceae) [AMGS]; Namaqualand, Springbok, Hester Malan [now Goegap] Nature Reserve [29.38S, 17.59E], 15–21.x.1987 (F.W. and S. K. Gess), 5 ♂♂ (Malaise trap) [AMGS]; Namaqualand, Bowesdorp [30.20S, 17.18E], xi.1931 (Mus. Staff), 1 ♀, 1 ♂; Namaqualand, Kamiesberg to Sors Sors (30.11S, 18.01E), 9–12.x.1997 (F.W. and S. K. Gess), 4 ♂♂ (visiting blue flowers of *Anchusa capensis* Thunb., Boraginaceae) [AMGS]; Vanwyksfontein, 8 km W. of Norvalspont [30.39S, 25.23E], 15–24.i.1985 (D.W. Gess), 4 ♀♀, 6 ♂♂ (2 ♀♀, 6 ♂♂ on flowering), 4 ♂♂ (3 ♂♂ Malaise trap) [AMGS]; Thee Kloof [32.05S, 20.41E], Fraserburg Div. (*Acacia karroo* Hayne, Fabaceae, Mimosoideae) [AMGS]; same locality, 28–30. xi.1988 (F.W. and S.K. Gess), xi.1935 (Mus. Staff), 1 ♂ [SAMC]; Tanqua Karoo [circa 32.15S, 19.45E], i.1949 (Zinn – Hesse Mus, Exp.), 3 ♀♀, 3 ♂♂ [SAMC]; 26 miles North of Postmasburg [circa 28.18S, 23.05E], 1 ♂ [SAMC]; Sutherland Distr. [circa 32.24S, 20.40E], 8.i.1942 (H. Zinn), 1 ♂ [SAMC]; Richmond District [circa 31.23S, 23.56E], iii.1931 (Museum Staff), 2 ♀♀ [SAMC]; Kimberley [28.43S, 24.46E], ii.1951 (R.C. Bigalke), 2 ♀♀ [AMGS]. WESTERN CAPE: Citrusdal Dist. [circa 32.33S, 19.01E], xi.1948 (Mus. Exp.), 1 ♂; Clanwillium, Rondegat (32.15S, 18.56E), 15.x.1997 (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers of *Athanasia trifurcata* (L.) L.(Asteraceae) [AMGS]; 31.5 km from Clanwilliam on road (R363) to Klawer [31.56S, 18.44E], 9–10.x.1990 (F.W. and S.K. Gess), 2 ♂♂ (on yellow flowers of *Athanasia trifurcata* (L.) L., Asteraceae) [AMGS]; Prince Albert Dist[rict], Tierberg (Study Site) (33.10S, 22.16E), 26.xi.- 5.xii.1987 (F.W., S.K. and R.W. Gess), 1 ♂ (on flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae) [AMGS]; Prince Albert Dist., Tierberg Farm (33.10S, 22.15E), 21.i.1996 (F.W. and S.K. Gess), 1 ♂ (visiting cream flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae) [AMGS]; Dikbome, Merweville, Koup [32.54S, 21.22E], i.1953 (H. Zinn), 7 ♀♀, 10 ♂♂ [SAMC]; Merweville Dist[rict] [32.40S, 21.31E], ii.1948 (H. Zinn], 1 ♀ [SAMC]; Merweville Distr[ict] [32.40S, 21.31E], ii.1943 (H. Zinn), 1 ♂ [SAMC]; Merweville Dist[rict], i.-ii.1947 (H. Zinn), 1 ♀ [SAMC]; Merweville, Laingsburg Dist. [32.40S, 21.31E], i.1959 (H. Zinn), 1 ♀ [SAMC]; Constable [33.16S, 20.17E], ii.1958 [Mus.Staff], 1 ♀ [SAMC]; Klipberg n[ea]r Darling [circa 33.23S, 18.23E], 8 v.1968 (C.G.C. Dickson), 1 ♀ [SAMC ex NMBZ]; Beaufort West Dist[rict] [circa 32.18S, 22.36E], ii.1958 (S. A. M. sic [South African Museum]), 3 ♀♀, 5 ♂♂; Plumstead [Cape Town] [34.15S, 18.28E], xi.1942 (A. Banwick), 1 ♂; Cape Town [33.55S, 18.22E], 1909 (Master Péringuey), 1 ♀ [SAMC]; Cape Town [33.55S, 18.22E], 8.xii.1958 (M.S. Thomson), 1 ♀ [AMGS];

Bushmans Riv[er], Letjiesbosch, Koup [32.34S, 22.16E], xi.1935 (Mus. Staff), 1 ♂ [SAMC]; Murraysburg Dist[rict] [circa 31.58S, 23.47E], iii.1931 (Museum Staff), 6 ♀♀, 5 ♂♂ [SAMC]; Murraysburg [31.58S, 23.47E], xi.1935 (Mus. Staff), 1 ♀, 2 ♂♂ [SAMC]; EASTERN CAPE: Grahamstown [33.19S, 26.31E], iii.1945 (G.H. Frank), 1 ♂ [AMGS]; Grahamstown [33.19S, 26.31E], 22.iii.1958 (E.McC. Callan), 1 ♀ [AMGS]; Hilton farm, Grahamstown [33.15S, 26.20E], 22.x.1967 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; Hilton farm, Grahamstown, 2.i.1974 (D.W. Gess), 1 ♂; Hilton farm, Grahamstown, 6.xii.1977 (D.W. Gess), 2 ♂♂; Hilton farm, Grahamstrown, 20.xii.1977 (D.W. Gess), 1♀; Hilton farm, Grahamstown, 27. xii.1977 (D.W. Gess), 1 ♀; Hilton farm, Grahamstown, 2.i.1978 (D.W. Gess), 1 ♂; Brak Kloof farm, Grahamstown [33.26S, 26.23E], i.1901(Mrs G. White), 1♂ [AMGS]; Brak Kloof farm, Grahamstown, iii.1901(Mrs G. White), 1 ♂ [AMGS]; Kasuga (sic) [Kasouga] [33.39S, 26.44E], 25.ix.1958 (R.E. Boltt), 1 ♂ [AMGS]; Bashee [now Mbashe] River [32.13S, 28.54E], 28.ix.1973 (E. Herbst), 1 ♀, 4 ♂♂ [AMGS]; same locality and collector, 12.xii.1975, 3 ♀♀ [AMGS]; Fort Beaufort [32.46S, 26.40E], 20.i.1960 (C. Jacot-Guillarmod), 1 ♀, 3 ♂♂ [AMGS]; Fort Beaufort, Umdala [Mdala] [32.48S, 26.41E], iii.1954 (S. A. Museum), 2 ♀♀, 1 ♂ [SAMC]; Willowmore [28.55S, 18.13E], xi.1908 (Brauns),1 ♂ [AMGS]; Willowmore, i.1914 (Rhodesia Museum), 1 ♀, 1 ♂ [SAMC ex NMBZ]; Willowmore, xii.1919 (Brauns), 1 ♀ [AMGS]; Middelburg Div. [circa 31.30S, 25.00E], xi.1935 (Mus.Staff), 1 ♂ [SAMC]; Middelburg [31.30S, 25.00E], 3.ii.1957 (E.McC. Callan), 1 ♂ [AMGS]; Burgersdorp [31.00S, 26.20E], 1.v.1952 (N. Gane), 1 ♀ [AMGS]; Alicedale [33.15S, 26.04E], 2.xii1970 (F.W. Gess), 3 ♂♂ [AMGS]; same locality and date (J.G.H. Londt), 1 ♀, 2 ♂♂ [AGM]; Alicedale, NewYear's Dam [33.15S, 26.04E), 16.xii.1971 (F.W. Gess), 1 ♀ [AMGS]; Resolution farm, Fort Brown [33.08S, 26.37E], 24.i.1928 (Miss Walton), 1 ♂ [AMGS]; Resolution farm, Fort Brown, 29.i.1928 (Miss Walton), 1 ♂ [AMGS]; Resolution farm, Fort Brown, 8. ii.1928 (Miss Walton). 1 ♂ [AMGS]; Resolution farm, Fort Brown, 29.ii.1928 (A. Walton), 1 ♀ [AMGS]; Dunbrody [33.28S, 25.33E], xii.1917 (V. Powles), 1♀ [AMGS]; Pluto's Vale [33.14S, 26.40E], Grahamstown, 8.xi.1964 (C. Jacot-Guillarmod, 1 ♀ [AMGS]; Port Elizabeth [33.58S, 25.40E], i.1952 (B.R. Stuckenberg), 2 ♀♀ [AMGS].

Geographical distribution. A widespread species from Egypt southwards to the south coast of South Africa (Fig. 7c).

Flower associations. Recorded from seven plant families: Asteraceae (*Geigeria* sp. and *Athanasia trifurcata* (L.) L.); Aizoaceae (Mesembryanthema, *Psilocaulon salicornioides* (Pax) Schwantes); Amaranthaceae (*Hermstaedtia* sp.); Apiaceae (*Deverra aphylla* (Cham. & Schlechtd.) DC)); Fabaceae (Mimosoideae, *Acacia karroo* Hayne); Boraginaceae (*Anchusa capensis* Thunb.); Apocynaceae (formerly Asclepiadaceae, *Gomphocarpus filiformis* (E. Mey.) D. Dietr.).

Nesting. Unknown.

Prey. Recorded taking six families of Diptera: Sarcophagidae, Tabanidae, Glossinidae, Calliphoridae, and Tachinidae.

***Bembix capicola* Handlirsch**
http://species-id.net/wiki/Bembix_capicola
Fig. 6d

Bembex capicola Handlirsch, 1893: 814, pl. 2, fig. 19, pl. 5, fig. 25, pl. 7, fig. 10, ♂ (Syntypes, South Africa, former Cape Province and "Kafferland", in NMW, ZMHB); Dalla Torre 1897: 503 (in catalogue of world Hymenoptera); Arnold 1929: 360, figs 25, 25a, 25b, pl. 6, figs 20, 21, ♂, ♀ (in revision of the southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix capicola Handlirsch, Ullyett and De Vries 1940 (prey); R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Gess 1986: 153, 157 (prey); Pulawski 2013: 18 (in catalog of world Sphecidae sensu lato).

Note. Handlirsch (1893) described the species from specimens from "Cap" and from "Kafferland". Arnold (1929) recorded it from Johannesburg, Cape Town, Lady Grey and Grahamstown.

Material examined. LESOTHO: Bokong P.O. [29.17S, 28.23E], 26.xii.1946 (L. Bevis), 1 ♂ [AMGS]; Mamathes [29.08S, 27.51E], i.1940 (C. Jacot-Guillarmod), 2 ♀♀ (1 ♀ with prey: Calliphoridae), [SAMC ex. NMBZ; DMSA]; Mamathes, ii.1940 (C. Jacot-Guillarmod), 1 ♀ [DMSA]; Mamathes, 7.i.1934 (C. Jacot-Guillarmod), 1 ♂, i.1940 (C. Jacot Guillarmod) 6 ♀♀ (4 with prey, Syrphidae, Calliphoridae, ?Muscidae), xii.4.1941 (C. Jacot Guillarmod and A. Jacot-Guillarmod), 1 ♀, 19.i.1947 (C. Jacot-Guillarmod), 7 ♂♂, 1 ♀, 14.i.1951 (C. Jacot-Guillarmod), 1 ♂ [AMGS]; nr. Mokhotlong (7800 feet) [circa 29.17S, 29.04E], 15.i.1955 (L. Bevis), 4 ♀♀, 5♂♂ [DMSA]; Malingoaneng [29.19S, 28.47E], 15.i.1955 (A. Jacot-Guillarmod) 1 ♀, 2 ♂ [AMGS]; Roma [29.28S, 27.44E] 17.xii.1964 (C. Jacot-Guillarmod) 1 ♂, 1 ♀, 17.xii.1964 (D.J. Brothers), 2 ♂♂ [AMGS]; Tlametlu River [29.28S, 27.25E], 8.i.1953 (C. Jacot-Guillarmod), 1 ♂, 1 ♀, 26.i.1955 (C. Jacot-Guillarmod), 7♀♀ [AMGS]. SWAZILAND: Swaziland, 1.xi.1912 (no collector), 1 ♂ [SANC]. SOUTH AFRICA: GAUTENG: Johannesburg [26.12S, 28.2E], 24.xii.1907 (Duncan), 1 ♀ [AMGS]; Florida Hills [26.10S, 27.56E], 17.ii.1962 (Empey), 1 ♂ [AMGS]; Benoni [26.11S, 28.18E], 17.xii.1962 (Empey), 1 ♂ [AMGS]; Pretoria [25.44S, 28.12E], 1912 (collector ?), 1 ♀ [SANC]; Pretoria [25.44S, 28.12E], i.1939 (G.C. Ullyett), 3 ♀♀ [SANC]; Strubens Valley, Florida [26.31S, 29.57E], 26.ii.1961 (Empey), 2 ♀♀ [AMGS]; Strubens Valley, Florida, 17.iii.1962 (Empey), 1 ♂ [AMGS]; Mondeor [26.16S, 28.0E], 11.xii.1959 (Empey), 1 ♂ [AMGS]. MPUMALANGA: Brakfontein b. Delmas [26.08S, 28.43E], 5.iii.1924 (Lingnau), 1 ♀ [SAMC ex NMBZ]. KWAZULU-NATAL: Himeville [29.45S, 29.30E], 24.xii.1938 (Nat.Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Sani Pass, nr Himeville [29.35S, 29.33E], 21.xii.1938 (L. Bevis), 2 ♂♂ [DMSA]. FREE STATE: Wepener [29.44S, 27.02E], 29.xii.1924 (Lingnau), 1 ♂ [SAMC ex NMBZ]; EASTERN CAPE: Hamburg [33.17S, 27.28E], 26.ii.1961 (collector ?), 1 ♀ [SANC]. WESTERN CAPE: Palmiet R[iver] [near Kleinmond, southern Hottentots Holland Mts.] [circa 34.20S, 19.02E], xii.1932 (H.G. Wood), 7 ♂♂ [SAMC].

Geographical distribution. Widespread in southern Zimbabwe, Botswana and Namibia and extending south through South Africa to the coast (Fig. 7d).

Flower associations. Unknown.

Nesting. Unknown

Prey. Recorded taking four, possibly five, families of Diptera: Sarcophagidae, Syrphidae, Calliphoridae, and, possibly, Muscidae.

***Bembix carinata* F. Smith**
http://species-id.net/wiki/Bembix_carinata
Fig. 5

Bembex undulata Dahlbom, 1845: 487, ♀, junior primary homonym of *Bembex undulata* Spinola, 1839 (Holotype or syntype, ♀, South Africa, no locality, in LUND).

Bembex carinata F. Smith, 1856: 323, ♀ (Holotype or syntype, ♀, South Africa, Cape of Good Hope in BMNH). Synonymised with *Bembex undulata* by Dalla Torre 1897: 503 (in catalogue of world Hymenoptera); Handlirsch 1893: 800 (in revision of world Bembicinae); Dalla Torre 1897: 503 (in catalogue of world Hymenoptera).

Bembex carinata F. Smith, Lohrmann 1939: 142 (member of *melanopa* group); R. Bohart and Menke 1976: 545 (in checklist of world Sphecidae); Pulawski 2013 (in catalogue of world Sphecidae sensu lato).

Additional records extracted from database of specimens in collection of SAMC. SOUTH AFRICA: West Cape: Mossel Bay [34.11S, 22.08E], 1.xii.1921 (R.E. Turner), two specimens, sex not given, one determined by G. Arnold; Cape Town [33.56S, 18.25E], 1.i.1915 (L. Peringuey), sex not given, determined by H. Brauns; Cape Town, 1.i.1909 (L. Peringuey jnr), sex not given, determined by J.C. Bridwell.

Geographical distribution. Recorded only from Cape Town and Mossel Bay, possibly indicating a south western coastal distribution. Further records are required to establish a distribution pattern.

Floral associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix compedita* R. Turner**
http://species-id.net/wiki/Bembix_compedita

Bembex kohli R. Turner, 1912: 415, ♂, ♀, junior primary homonym of *Bembex kohlii* Morice, 1897 (Syntypes, Malawi, Blantyre and Mlanji Boma in BMNH).

Bembex compedita R. Turner, 1913: 746, substitute name for *Bembex kohli* R. Turner, 1912; Arnold 1929: 375, figs 38, 38a–c, ♂, ♀ (in revision of South African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix compedita R. Turner, 1912, Lohrmann 1948: 286 (member of *fuscipennis* species group); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Pulawski 2013: 21 (in catalogue of world Sphecidae sensu lato).

Specimens examined. MALAWI (as Nyasaland): S.W. of Lake Chilwa, 9.i.1914 (S.A. Neave) 1 ♀; Zomba, 9.xi.1943 (Nat. Museum S. Rhodesia), 1 ♂, 1 ♀ [both SAMC ex NMBZ]; Zomba, 9.xi.1943 (Nat. Museum S. Rhodesia) 2 ♀♀ [AMSG].

Additional records extracted from database of specimens in collection of SAMC. KENYA: Nairobi, 7.v.1920 (no collector given), no sex given, no determiner given; MALAWI [as Nyasaland], Zomba, 20.vii.1911, no sex given, no determiner given; same locality, 1.i.1915 (H.S. Stannus), no sex given, no determiner given; same locality, 20.vii.1911 (R. Drumond), no sex given, no determiner given; same locality, 9.xi.1943 (Rhodesia Museum), no sex given, no determiner given; same locality, 18.xi.1943 (Rhodesia Museum), no sex given, no determiner given. SOUTH AFRICA: Free State, Bloemfontein [29.06S, 26.07E], 20.iii.1921 (C.F. Jacot-Guillarmod), no sex given, determined by G. Arnold.

Geographical distribution. The above records confirm the northern occurrence of this species in Malawi and Kenya, however, the record for Bloemfontein suggests that it is also found to the south in the Free State. As there is one record only from the south additional material is required to establish the veracity of this record.

Floral associations. Unknown.

Nesting. Unknown

Prey. Unknown.

***Bembix cultrifera* Arnold**

http://species-id.net/wiki/Bembix_cultrifera

Fig. 6e

Bembix cultrifera Arnold, 1929: 339, figs. 9, 9a-c, pl. 6, figs 4, 44, ♂, ♀ (Holotype, ♂, Southern Rhodesia [Zimbabwe], Bulawayo, in SAMC ex NMBZ) (in revision of southern African Sphecidae); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); W.J. Pulawski 2013: 21 (in catalogue of world Sphecidae sensu lato).

Material examined. ZIMBABWE: no locality, no date (M. Jeffreys) ♀; Bulawayo [20.07S, 28.32E], 24.xii.1924 (R.H.R. Stevenson), ♀, Xmas [Christmas], 1924 (R.H.R. Stevenson), ♀, 28.xii.1924 (R.H.R. Stevenson), Allotype ♀; Sanyati Valley [17.58S, 29.17E], ix-x.1925 (R.H.R. Stevenson), ♀; Sawmills [19.35S, 28.02E], 10.xii.1926 R.H.R. Stevenson), holotype, ♂; Turk Mine [19.44S, 28.48E], 18.xi.1957 (Nat. Museum S. Rhodesia), 2 ♂♂, 1.xii.1957 (Nat. Museum. S. Rhodesia) 1 ♂; Turk Mine Matabele'd, 23.xi.1959 (Nat. Museum S.R.), 1 ♀; Umtali [18.57S, 32.40E], i.1928 (R.H.R. Stevenson), 1 ♀; 29.xi.1930 (G. Arnold), 1 ♀;

Figure 5. *Bembix carinata*, female and male. (approximate length of female: 17 mm).

same date (Rhodesia Museum), 1 ♀ [all SAMC ex NMBZ]. NAMIBIA: Tsumeb [19.15S, 17.02E], i.1953 (N. Ward-Able). SOUTH AFRICA: Gauteng: Buffelspoort Dam [25.47S, 27.29E], 1.xii.1968 (H. Empey), 1 ♀ [AMGS]; Limpopo, Hope (Ellisras) [now Lephalale] [23.40S, 27.45E], 23.xi.1968 (H. Empey), 1 ♂ [AMGS].

The specimen from Buffelspoort Dam agrees well with the characters indicated by Arnold (1929: 340) in his comparison with the female of *speciosa* Arnold (= *regnata* Parker) except that the mesonotal disc has well developed streaks (forming a U-shaped [yellow] mark, the lateral arms, however, not joining the basal part). Some females from Bulawayo and Umtali also show rudiments of the lateral arms of this mark. In *regnata* Parker this yellow mark seems to be variable in its size and development, so it is clear that it has no value as a taxonomic character to separate these two species.

Three specimens (determined by G. Arnold) are given in the database of SAMC, two from Victoria Falls [17.55S, 25.50E], and one from Bulawayo [20.07S, 28.32E], sex not given.

Geographical distribution. Recorded from Zimbabwe, from north to south, from eastern Namibia and from Limpopo, northern South Africa (Fig. 7e).

Floral associations. Unknown.

Nesting. Unknown

Prey. Unknown.

***Bembix denticauda* Arnold**
http://species-id.net/wiki/Bembix_denticauda
Fig. 6f

Bembix denticauda Arnold, 1946: 91, figs 39, 39a, 39b, ♂, ♀ (Syntypes, Zimbabwe, Melsetter [Chimanimani] [19.48S, 32.52E], in SAMC ex NMBZ). R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Pulawski 2013: 22 (in catalogue of world Sphecidae sensu lato).

Material examined. SOUTH AFRICA: Transvaal [Limpopo], Letaba River Res. [23.39S, 31.9E], 9.ix.1965 (H.N. Empey), 1 ♂.

Geographical distribution. The previously published records are from southeastern Zimbabwe; the present records extend the distribution south of the Limpopo River into Limpopo Province, South Africa (Fig. 7f).

Floral associations. Unknown.

Nesting. Unknown

Prey. Unknown.

***Bembix diversipennis* F. Smith**
http://species-id.net/wiki/Bembix_diversipennis
Fig. 8a

Bembex diversipennis F. Smith, 1873b: 297, ♂, ♀ (Syntypes, Angola, in BMNH); Radoszkowski 1881: 2007 (Angola); Handlirsch 1893c: 786 (in revision of world Bembicinae); Dalla Torre 1897: 504 (in catalogue of world Hymenoptera); Magretti 1899: 605 (Somalia: Lugh at 3°48'N 42°33'E); Bingham 1902 (South Africa: Pretoria); R. Turner 1912: 373 (Angola, Zimbabwe, Ethiopia); Arnold 1929: 346 (in revision of southern African Sphecidae); Schouteden 1930: 96 (Zaire); Scott in Arnold 1933: 371 (Ethiopia: Harar District).

Bembix diversipennis F. Smith, J. Parker 1929: 139 (in revision of Stizini and Bembicini, Togo); Lohrmann 1948: 446 (member of *diversipennis* species group of *Bembix*); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Pulawski 2013: 23 (in catalogue of world Sphecidae sensu lato).

Bembix tenebrosa J. Parker, 1929: 90, ♂, ♀ (Holotype, ♂, German East Africa [Tanzania]); Arnold 1931: 214, synonymised with *Bembex johnstoni*; J. Parker 1942: 205 (valid species); Arnold 1960: 465, synonymised with *Bembix diversipennis*.

Note. Turner (1912b: 373) wrote "the localities for this species in the National Collection [Natural History Museum, London] are from Angola to Nyasaland, Mashonaland [Zimbabwe] and Harar, Abyssinia [Ethiopia]".

Turner (1917a: 437) wrote: "In a considerable series of that species [i.e. *diversipennis*] from E. Africa the thorax is always without yellow markings in both sexes, except

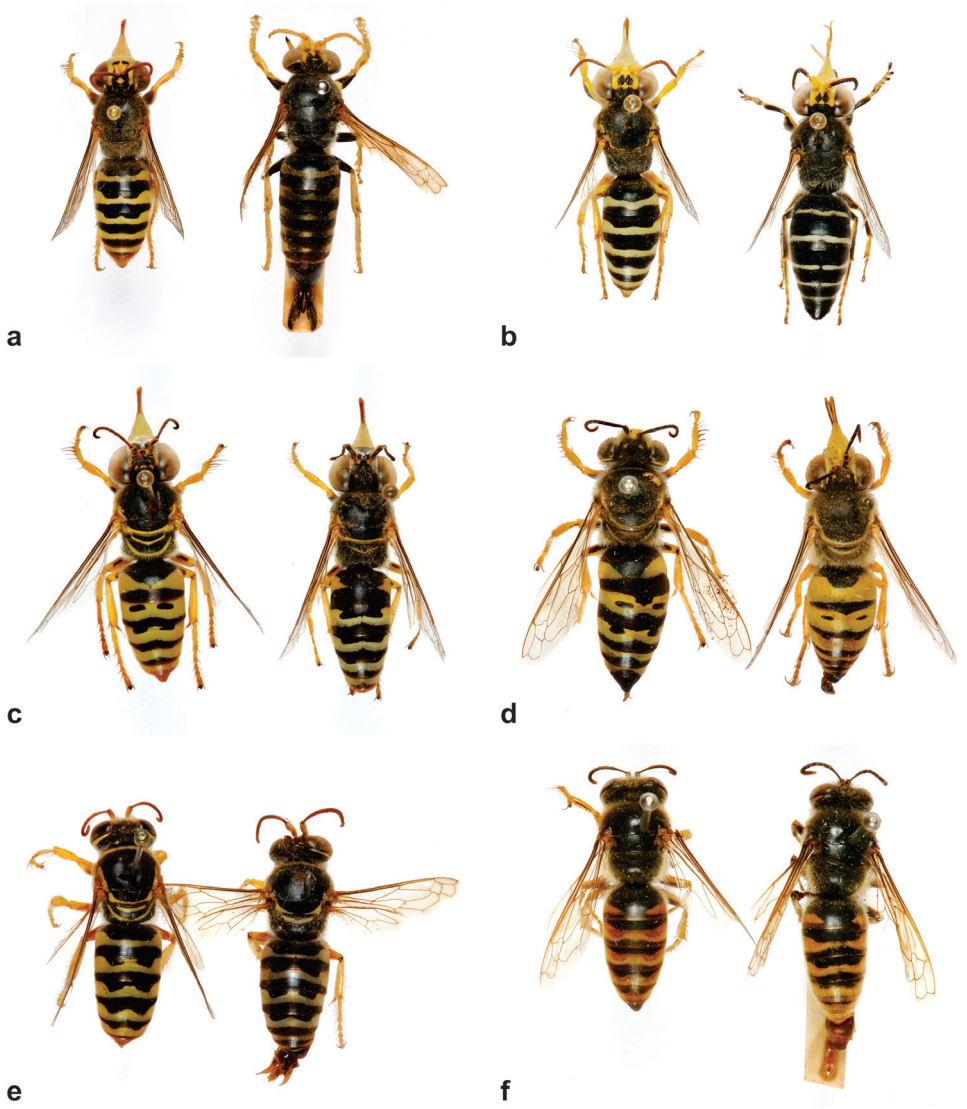

Figure 6. *Bembix* spp.: **a** *bubalus*, female, male **b** *cameronis*, female, male **c** *capensis*, female, male **d** *capicola*, female, male **e** *cultrifera*, female, male **f** *denticauda*. (approximate length of females: **a** 19.5 mm; **b** 18 mm; **c** 17 mm; **d** 18 mm; **e** 17 mm; **f** 18 mm).

one female from Harar. The yellow markings on the abdomen vary much, but do not form continuous fasciae as in most West-African specimens. The wings are hyaline in the male, more or less fuscous at the base in the female in all specimens which I have seen."

Material examined. ZAMBIA: Buleya Mweru [18.0S, 35.0E], 25.i.1944 (Nat. Museum S. Rhodesia), 2 ♀♀ [1 ♀ SAMC; 1 ♀ SAMC ex NMBZ]; ??, 10.xii.1955 (C.B. Cottrell), 2 ♀♀, 1 ♂ [AMGS]; ZIMBABWE: Nantwich [18.36S, 26.01E], 20.xii.1949 (Nat. Museum S. Rhodesia], 1 ♂ [SAMC]; Penkridge [19.31S, 32.44E], 6.xi.1927 (R.H.R. Stevenson),

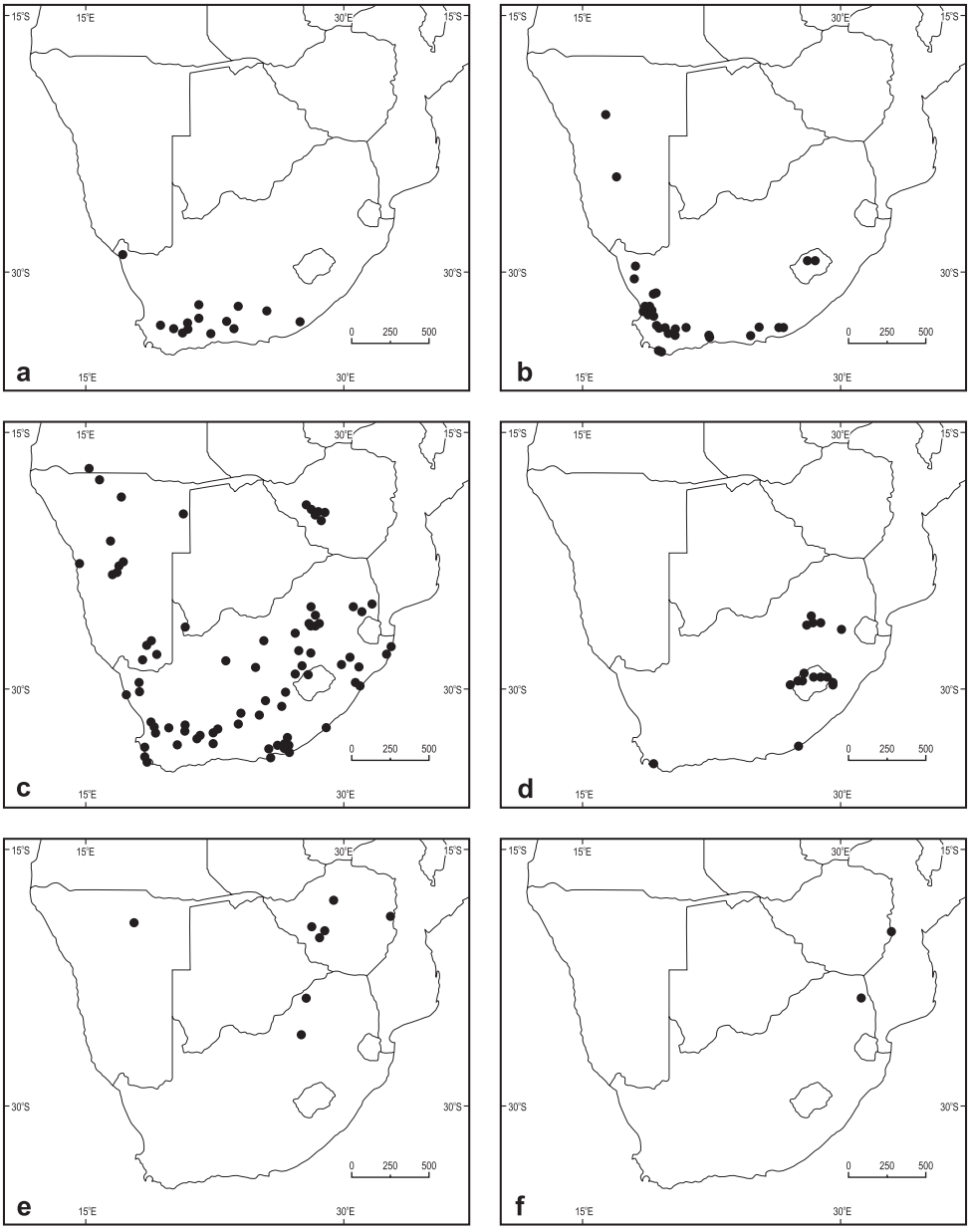

Figure 7. Distributions of collection records of *Bembix* spp.: **a** *bubalus* **b** *cameronis* **c** *capensis* **d** *capicola* **e** *cultrifera* **f** *denticauda*.

2 ♂♂ [1 ♂ SAMC; 1 ♂ SAMC ex NMBZ]; Rhodesdale [18.20S, 31.25E], 8/10.xi.1923 (R. Stevenson), 1 ♀ [AMGS]; same locality, 8/16.xi.1923 (R. Stevenson), 1 ♀ [AMGS], 1 ♂ [SAMC], 1 ♂ [SAMC ex NMBZ]; same locality, 10/16.xi.1923 (R. Stevenson), 1 ♂ [SAMC ex NMBZ]; T[relawney] R[esearch] S[tation, Harare] [17.32S, 30.28E],

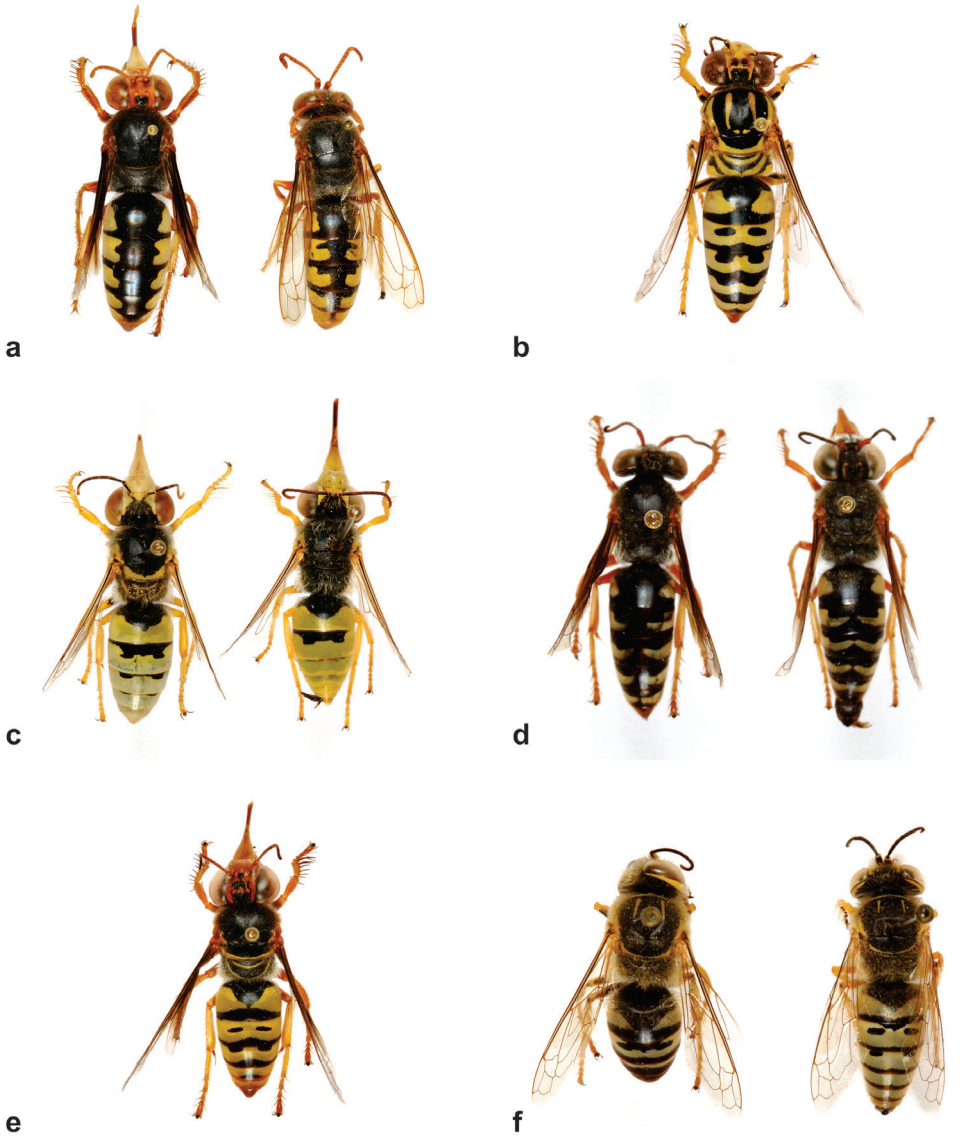

Figure 8. a *Bembix* spp.: *diversipennis*, female, male **b** *flavicincta*, female **c** *fraudulenta*, female, male **d** *fuscipennis*, southern melanistic form, female, male **e** *fuscipennis*, northern yellow form, female **f** *harenarum*, female, male. (approximate lengths of females: **a** 27 mm; **b** 22.5 mm; **c** 12.5 mm; **d** 18.5 mm; **e** 18 mm; **f** 15.5 mm)

14.xii.1953 [(N.J. Myers)], 1 ♀ [AMGS]; Umtali District [circa 18.57S, 34.40E], 24.x.1931 (P.A. Sheppard), 2 ♂♂ [1 ♂ SAMC; 1 ♂ SAMC ex NMBZ]; same locality, 2.xi.1931 (P.A. Sheppard, 1 ♂ [SAMC ex NMBZ]; same locality, 19.xi.1931 (P.A. Sheppard), 1 ♂ [AMGS]; Turk Mine [19.44S, 28.45 E], 6.xii.1956 (Nat.Museum S. Rhodesia), 2 ♀♀ [SAMC ex NMBZ]; same locality, 1.xii.1957 (Nat.Museum S. Rhodesia),

2 ♂♂ [1 ♂ SAMC, 1 ♂ SAMC ex NMBZ]; same locality, 2.xi.1958 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; same locality, 1.xi.1959 (Nat. Museum S. R.), 1 ♂ [AMGS]; Matopos [now Matobo] [20.35S, 28.30E], 18.xi.1923 (G. Arnold), 2 ♀♀ [1 ♀ SAMC; 1 ♀SAMC ex NMBZ]; same locality, 18.xi.1923 ((Rhodesia Museum), 1 ♂ [SAMC ex NMBZ]. MOZAMBIQUE: Dondo, PEA [19.41S, 34.45E], 4.ii.1924 (R.H.R. Stevenson), 2 ♀♀ [1 ♀ SAMC; 1♀ SAMC ex NMBZ]. SOUTH AFRICA: LIMPOPO: Ellisras [now Lephalale] [23.40S, 27.46E], 22.xi.1978 (D.J. Brothers), 1 ♀ [AMGS]; Hope, Ellisras] [23.40S, 27.45E], 11.xi.1967 (F.J. Herbst), 1 ♂ [AMGS]; Hope, Ellisras [now Lephalale], 12.xi.1967 (Empey), 1 ♀, 2 ♂♂ [AMGS]; Swadini, Blyde River, E. Transvaal [24.34S, 30.48E], 1.xii.1982 (F.J. Herbst), 1 ♀, 1 ♂ [AMGS]; Sabie [25.06S, 30.47E], 22.xii.1966 (H. Empey), 1 ♂ [AMGS]; Sabie Bungalow [circa 25.10S, 30.48E], 30.xii.1962 (H.N. Empey), 1 ♂ [AMGS]; Skukusa, K[ruger] Nat[ional] Park [24.59S, 31.38E], 17.xi.1979 (F.J. Herbst), 2 ♀♀, 1 ♂ [AMGS]; Vaalwater [24.15S, 28.08E], 24.xi.1968 (F.J. Herbst), 1 ♂ [AMGS]; Rust de Winter [25.13S, 28.29], 8.ii.1975 (Empey), 1 ♀ [AMGS]; Letaba Reserve, North East Transvaal [23.39S, 31.04E], 1.x.1966 (H. Empey), 1 ♂ [AMGS]; Buffelspoort Dam, Western Transvaal [25.47S, 27.29E], 27.xii.1970 (Empey), 2 ♀♀, 2 ♂♂ [AMGS]; Buffelspoort Dam, 7.xii.1968 (F.J. Herbst), 1 ♂ [AMGS]; Buffelspoort Dam, 31.12.1978 (F.J. Herbst), 3 ♀♀, 2 ♂♂ [AMGS]; Matlabas, N.W. Tvl [24.16S, 27.27E], 18.i.1981 (F.J. Herbst), 1 ♀ [AMGS]; GAUTENG: Pretoria [25.44S, 28.12E], 20.i.1919 (Brauns), 2 ♀♀ [1 ♀ SAMC; 1 ♀ SAMC ex NMBZ]; Vaal Dam [27.00S, 28.14E], 5.iii.1967 (Herbst), 1 ♀ [AMGS]. FREE STATE: Bothaville [now Kgotsong], 30.xii.1964 (D.J. Brothers), 1 ♀ [AMGS]. KWAZULU-NATAL: Sordwana [now Sodwana Bay] [27.32S, 32.41E], 16.iv.1965 (H.N. Empey), 1 ♀ [AMGS]; Sordwana Bay [now Sodwana Bay], 28.iii.1980 (F.J. Herbst), 1 ♂ [AMGS]; Mkuze Game Reserve (27.37S, 32.14E), 8–12.iii.1987(A.J. Weaving), 2 ♀♀ [AMGS]; False Bay, [Lake St Lucia] (27.58S, 32.23E), 24.ii.-4.iii.1990 (A. Weaving), 1 ♂ [AMGS]; False Bay, Lake St.Lucia, 2–21.ii.1991 (A. Weaving), 1 ♀ [AMGS]; Fanies Island, [Lake] St Lucia (28.06S, 32.26E), 4–5.iii.1987 (A.J. Weaving), 1 ♂ [AMGS].

Geographical distribution. From the records available this species appears to have a predominantly northern distribution (Fig. 9a), extending from the Free State and KwaZulu-Natal northwards to Ethiopia.

Flower associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix flavicincta* Turner**

http://species-id.net/wiki/Bembix_flavicincta

Fig. 8b

Bembex flavicincta Turner, 1912a: 414, ♂, ♀ (Syntypes, Zambia, Pakasa, Luangwa Valley; Malawi, W shore of Lake Malawi, in BMNH); Arnold 1929: 376 (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembex flavicincta Turner, Lohrmann 1948: 448 (member of the *fuscipennis* group); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae as *flavocincta*); Gess 1986: 153 (as *flavocincta,* prey); Pulawski 2013: 28 (in catalogue of world Sphecidae sensu lato).

Material examined. MALAWI: Domira Bay [13.35S, 34.27E], Lake Nyasa [Malawi], no date (J.B. Casey), 16 ♀♀; Salima Bay [13.47S, 34.26E], L. Nyasa, 5.xi.1943 (Nat. Museum S. Rhodesia), 2 ♀♀ [both SAMC ex NMBZ]. ZIMBABWE: Gwanda [20.57S, 29.02E], xi.1965 (Nat. Museum S. Rhodesia), 1 ♀; Sanyati Valley [17.57S, 29.18E], ix–x.1925 (R.H.R. Stevenson), 3 ♀♀; Sawmills [19.35S, 28.02E], 22.xii.1928 (Rhod. Museum), 2♀ ♀ [all SAMC ex NMBZ]. SOUTH AFRICA: Zululand [KwaZulu-Natal], Mfongosi [27.18S, 32.10E], iii.1914 (W. E. Jones), 1 ♀ [DMSA]; Limpopo, Ellisras [23.40S, 27.46E], 19.xii.1963 (H.N. Empey), 1 ♀ [AMGS].

Geographical distribution. Previously published records are from Malawi and Zimbabwe; the present records extend the distribution south of the Limpopo (Fig. 9b).

Floral associations. Unknown.

Nesting. Unknown.

Prey. Diptera: Bombyliidae and Sarcophagidae (*Sarcophaga* sp.).

***Bembix fraudulenta* Arnold**
http://species-id.net/wiki/Bembix_fraudulenta
Fig. 8c

Bembex fraudulenta Arnold, 1929: 367, figs 32, 32a, pl. 6, figs, 41, 42, ♂,♀ (Syntypes, South Africa, Durban, South Africa, in DMSA) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix fraudulenta Arnold, R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Gess 1986: 153 (flower visiting, prey); Gess and Gess 1988: 246–247, Fig. 14.19 (habitat); Gess and Gess 1998: 351, Fig. 22.18 (habitat); Pulawski 2013: 29 (in catalogue of world Sphecidae sensu lato).

Material examined. MOZAMBIQUE: Paradise Magoo, circa 20 km N. of Xai-Xai [24.59S, 33.58E], 2.vii.2012 (D.W. and G.M. Gess), 2 ♀♀, 1 ♂ [AMGS]; Inhaca Island [26.00S, 32.33E], 12.xii.1954 (E. McC. Callan), 1 ♀, 1 ♂ [AMGS]. SOUTH AFRICA: KWAZULU-NATAL: Umhlanga Rocks [29.43S, 31.06E], 1.i.1955 (E.McC. Callan), 1 ♂ [AMGS]; same locality, 4.i.1955 (E. McC. Callan), 1 ♀ (with prey: Mydidae: *Nomoneuroides natalensis* Hesse, ♂) [AMGS]; Durban (Bluff/2537) [29.54S, 31.02E], 27.iii.1920 (C.N. Barker), holotype ♂ (Red Type label of Arnold's) [DMSA]; same locality, accession number and collector, 19. iii.1920, ?Paratype ♀ (Red Type label of Arnold's) [DMSA]; same locality, accession number, date and collector, 1 ♀ (Paratype label attached by FWG) [SAMCC ex NMSR]; same locality, accession number and collector, 27.iii.1920, 1♀ (Paratype label attached by FWG) [AMGS];

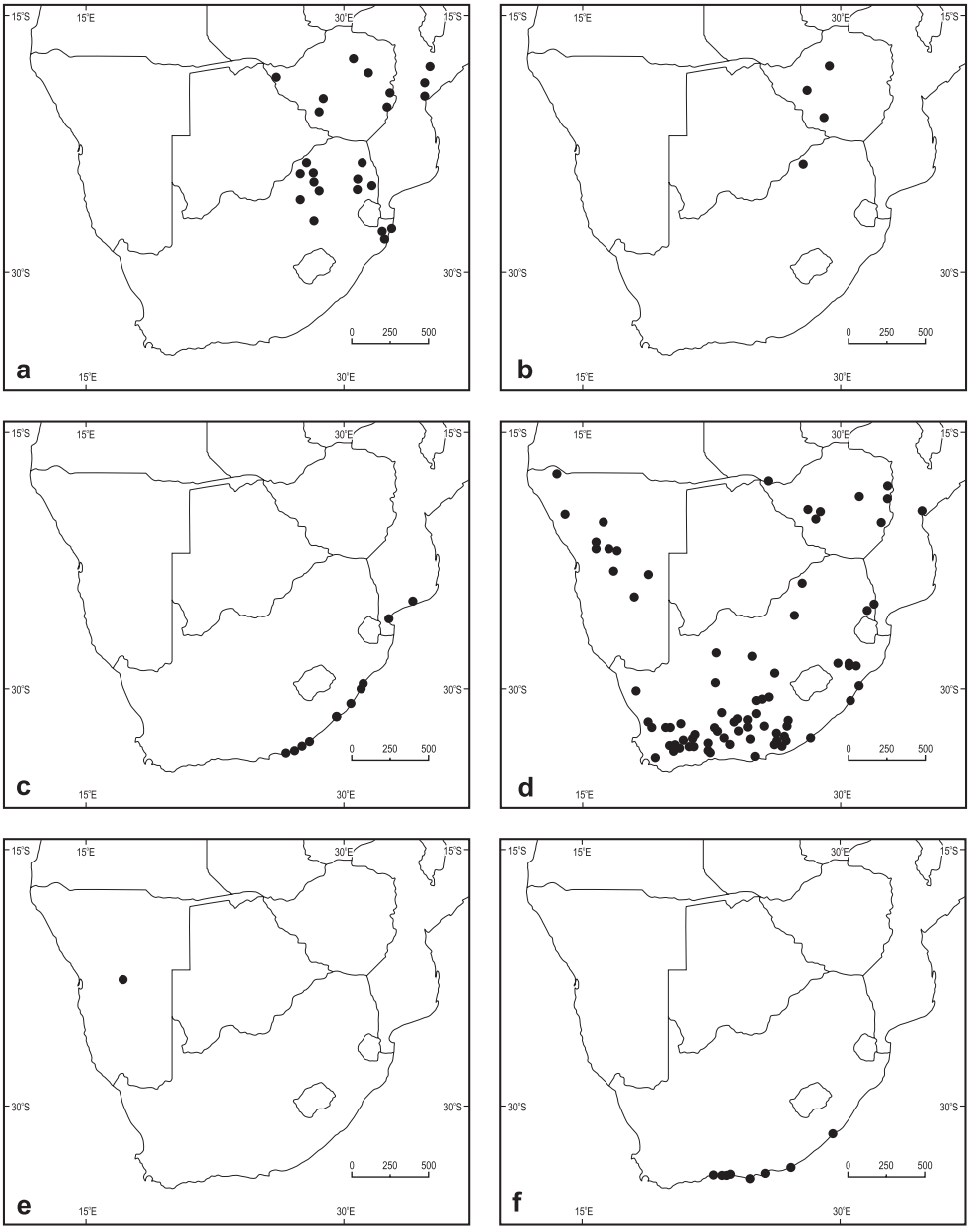

Figure 9. Distributions of collection records of *Bembix* species: **a** *diversipennis* **b** *flavicincta* **c** *fraudulenta* **d** *fuscipennis* **e** *gracilens* **f** *harenarum.*

same locality and collector [but accession number 2644 and date 26.iii.1921], 1 ♀ (Paratype label attached by FWG) [AMGS]; Durban (Beach B./2651), 30.iv.1921 (C.N. Barker), 1 ♀ [SAMC ex NMBZ]; Hillary, Durban [29.53S, 30.57E], no date (F. Herbst), 1 ♂ [AMGS]; Isipingo [Beach] [30.00S, 30.57E], 25.ii.1940 (L. Bevis), 1 ♀

[DMSA]; St.Michael's on Sea [30.50S, 30.23E], 14.i.1953 (E.McC. Callan), 2 ♀♀, 1 ♂ [AMGS]. EASTERN CAPE: Port St. Johns [31.38S, 29.33E], 12.ii.1970 (J.G.H. Londt), 1 ♀ [AMGS]; East London [33.03S, 27.55E], iv.1947 (S. Seagrief), 1 ♀ [AMGS]; same locality, 28.ii.1960 (E.McC. Callan), 1 ♂ [AMGS]; Hamburg [33.17S, 27.28E], 25–26.iii.1987 (F.W. and S.K. Gess), 2 ♀♀ [AMGS]; Rietrivier Mouth near Port Alfred [33.33S, 27.01E], 11.i.1984 (R.W. Gess), 1 ♂ (on flowers of *Ipomoea pes-caprae* (L.) R. Br. *brasiliensis* (L.) Ooststr., Convolvulaceae); same locality, 3.ii.1984 (F.W. Gess), 3 ♂♂ (2 ♂♂ visiting flowers of *Ipomoea pes-caprae* (L.) R. Br. *brasiliensis*); same locality and date (S.K. Gess), 1 ♂ (visiting flowers of *Ipomoea pes-caprae* (L.) R. Br. *brasiliensis*); Kenton-on-Sea [33.41S, 26.40E], 20.i.1984 (D.W. Gess), 1 ♀ (on flowers of white mesembs); Boknes (33.43S, 26.35E), 16.i.1984 (D.W. Gess), 1 ♂ (on flowers of *Phylohydrax carnosa* (Hochst.) Puff, Rubiaceae); same locality, 20.i.1984 (F.W. Gess), 2 ♂♂ (on flowers of *Phylohydrax carnosa* ; same locality and date (R.W. Gess), 1 ♀, 7 ♂♂ (1 ♀, 6 ♂♂ on flowers of *Phylohydrax carnosa*); same locality, 24.i.1984 (D.W. Gess), 1 ♀, 2 ♂♂ (1 ♂ on *Gazania* flowers); same locality and date (F.W. Gess), 2 ♀♀, 2 ♂♂ (on flowers of *Phylohydrax carnosa*); same locality and date (R.W. Gess), 2 ♀♀, 1 ♂ (on flowers of *Phylohydrax carnosa*); same locality, 27.i.1984 (F.W. Gess), 1 ♂ (on flowers of *Phylohydrax carnosa*); same locality, 12.iv.1984 (D.W. Gess), 1 ♀; same locality, 9.i.1986 (D.W. Gess), 4 ♂♂ (on flowers of *Phylohydrax carnosa*) [all AMGS].

Geographical distribution. The species appears to have a strictly coastal distribution (Fig. 9c). At present it is known from coastal Mozambique, Kwazulu-Natal and the Eastern Cape (to at least as far south as Boknes, 33.43S, 26.35E) coasts. At Rietrivier Mouth, Kenton-on-Sea and Boknes the species was found frequenting the first line of supra-littoral dunes and visiting the flowers of plants associated with these dunes.

Floral associations. Recorded from four plant families: Convolvulaceae (*Ipomoea pes-caprae* (L.) R. Br. *brasiliensis* (L.) Ooststr.); Rubiaceae (*Phylohydrax carnosa* (Hochst.) Puff); Asteraceae (*Gazania* sp.); and Aizoaceae (Mesembryanthema).

Nesting. Unknown but most likely nesting in the supra-littoral dunes.

Prey. Recorded taking one family of Diptera: Mydidae (one female captured with mydid prey, *Nomoneuroides natalensis* Hesse, 1969 (♂ Paratype)).

***Bembix fuscipennis* Lepeletier**
http://species-id.net/wiki/Bembix_fuscipennis
Fig. 8d, e

Bembex fuscipennis Lepeletier, 1845: 271, ♂, ♀ (Syntypes, "Cape of Good Hope", depository ?); F. Smith 1856 (in catalogue of Hymenoptera in British Museum); Taschenberg 1870: 19 (South Africa: Cape area); Handlirsch 1893: 850, pl. 3, figs 2, 25, pl. 7, fig. 29, ♂, ♀ (in revision of world Bembicini); Dalla Torre 1897: 505 (in catalogue of world Hymenoptera); Arnold 1929: 373, figs 36, 36a, 36b, pl. 6, fig. 30, ♂, ♀ (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Schouteden 1930: 96 (Zaire); Cuthbertson,

1939 (prey and nest parasite, *Craticulina tabaniformis* (Fabricius), Sarcophagidae); Berland 1950: 296 (Niger, Aïr area); Pagliano 2011: 121 (specimens in collection of Spinola, Torino).

Bembix fuscipennis Lepeletier, J. Parker 1929: 91(in revision of Stizini and Bembicini); Giordani Soika 1939: 105 (Eritrea: Keren); Guiglia 1943: 75 (Ethiopia: Gamo Gofa: Sagan – Omo Region); J. Parker 1942: 206, pl. 18, figs 15,18 (valid species); Lohrmann 1948: 448 (member of *fuscipennis* species group of *Bembix*); Guiglia 1950: 240 (Ethiopia: Gamo Gofa: Caschei); Arnold 1951: 138, figs 30, 30a (discussion of male genitalia); Leclercq 1955: 408 (Ruanda); de Beaumont 1967: 506 (South Africa, Natal); Gess 1981: 21 (South Africa: 18 km WNW Grahamstown, nesting in friable soil); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Casolari and Casolari Moreno 1980: 115 (specimens in M. Spinola collection); Gess 1981: 21 (nesting in friable soil); Gess 1986: 158 (prey); Guichard 1989: 145 (Saudi Arabia, Yemen); Gess and Gess 2003: 123 (flower visiting records); Gadallah and Assery 2004: 230 (in catalogue of Sphecidae of Saudi Arabia); Pulawski 2013: 30–31 (in catalogue of world Sphecidae sensu lato).

Bembex stevensoni J. Parker, 1929: 92, ♂, ♀ (Holotype, ♂, Zimbabwe, Bulawayo in USNM); Arnold 1931: 214, synonymised with *Bembex fuscipennis*; J. Parker 1942: 2006 (valid species); Arnold 1951: 138 (discussion of male genitalia).

Note. In this species there is a marked north-south variation in colouration. Specimens examined (as listed below under *Material examined*) from the north, Tanzania, Zambia, Zimbabwe and northern South Africa, are characterised by the entire clypeus brownish amber, whereas in specimens examined from the south only the anterior third to half of the clypeus is brownish amber, the rest of the clypeus is black. A certain degree of ovelap of the two colour forms is noted in specimens examined from the Free State and KwaZulu-Natal.

This observation is supported by the published descriptions: Parker (1929) in recording a female from Tabora (Tanzania) and a male from Bulawyo (Zimbabwe) stated that "The clypeus of the female before me is entirely ferruginous"; Arnold (1929) recording specimens from Zimbabwe and northern South Africa stated, "labrum and clypeus brownish amber yellow"; Handlirsch (1893) referring to specimens examined by him from "Transvaal", "Port Natal" and "Cape of Good Hope", that is from both the north and the south, noted, "Corpus nigrum, orbitus, magine apicali clipei (raro toto clipeo) et labro ferrugineo-luteis, ….". Lepeletier (1845) in his description of both sexes from the "Cap de Bonne-Espérance" stated inter alia, "Clypeus niger, margine antico ferrugineo, …".

Indeed, specimens from the north are altogether less melanistic than those from the south. The pale colouring of the streak on each side of the face, the spots behind the antennal sockets, the band of spots below the ocellar region, the flagellum, the yellow spot on the posterior angles of the epinotal dorsum and the pale bands on the tergites are all greatly reduced in specimens from the south as compared with specimens from the north.

Material examined. MALAWI: Domira B[ay] [13.35S, 34.27E], Lake Nyasa [now Lake Malawi], (alt.1760 [feet]), no date given (C.B. Casey), 1 ♀ [DMSA]. ZAMBIA: Abercorn [now Mbala] [8.50S, 31.24E], 19.vii.1945 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]. Z1MBABWE: Salisbury [now Harare] [17.48S, 31.03E], 27.x.1914 (J. O'Neil), 1 ♀; Sabi Valley [20.20S, 32.20E], iii.1939 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC]; Victoria Falls [17.55S, 25.50E], 1.i.1920 (G. Arnold), 1 ♀; same locality, 2.i.1920 (G. Arnold), 1 ♂ [SAMC ex NMBZ]; same locality, 16.xi.1942 (Nat. Museum S. Rhodesia) 1 ♂ [SAMC ex NMBZ]; Inyanga (4000') [18.16S, 32.43E], xii.1920 (Rhodesia Museum), 1 ♂ [SAMC ex NMBZ]; Bulawayo [20.07S, 28.32E], 30.ix.1923 (Rhodesia Museum), 1 ♀ [SAMC ex NMBZ]; same locality, 28.v.1923 (R. Stevenson), 1 ♂; same locality, 18.ii.1924 (R.H.R. Stevenson), 1 ♂ [SANC]; same locality, 10.xii.1924 (R.H.R. Stevenson), 1 ♀ [SAMC ex NMBZ]; same locality, 19. xii.1924 (R.H.R. Stevenson), 1 ♀ [SANC]; 7 m[iles] S of Chiturapodzi [??], Limpopo R[iver], 1.v.1968 (Nat.Mus. R. S. Exp), 1 ♂ [AMGS]; Sawmills [19.35S, 28.02E], 25.x.1919 (G. Arnold), 1♀ [SAMC ex NMBZ]; Same locality, 23.x.1922 (Rhodesia Museum), 1 ♂ [DMSA]; same locality, 22–27.xii.1923 (R.H.R. Stevenson), 1 ♀ [SAMC ex NMBZ]; same locality, 25.xii.1925 (Rhod. Museum), 1 ♀ [AMGS]; 1 ♀ [AMGS]; Umtali [18.57S, 32.40E], 17.iv.1923 (Nat. Museum S. Rhodesia), 2 ♂♂ [SAMC ex NMBZ]; Turk Mine [19.44S, 28.48E], 10.xi.1957 (Nat.Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]. MOZAMBIQUE: Dondo [19.41S, 34.45E], 3. ii.1924 (R.H.R. Stevenson), 1 ♀ [DMSA]. NAMIBIA: circa 13 km E of Okongwati, Opuwa road (17.31S, 13.22E), 24.iii.2004 (F.W. and S.K. Gess), 1 ♀ (at water) [AMGS]; 7 km N of Palmwag (19.51S, 13.54E), 26.iii.2004 (F.W. and S.K. Gess), 1 ♀ (at water) [AMGS]; near Two Palms, Uniab River (19.53S, 13.54E), 27.iii.2004 (F.W. and S.K. Gess), 1 ♀ (at water) [AMGS]; 20 km E of Outjo (20.17S, 16.09E), 6.iv.1998 (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers of *Geigeria pectidea* (DC) Harv., Asteraceae) [AMGS]; 32 km W of Omaruru on road 2315 (21.29S, 15.43E), 2.iv.1998 (F.W. and S.K. Gess), 1 ♀ [AMGS]; between Omaruru and Wilhelmstal (21.31S, 16.03E), 3.iv.1998 (F.W. and S.K. Gess), 12 ♀♀, 1 ♂ (11 ♀♀, 1 ♂ visiting deep pink flowers of *Hermbstaedtia odorata* (Burch.) T. Cooke, Amaranthaceae) [AMGS]; Otjitundu River 42 km by road west of Okahandja (21.54S, 16.31E), 2.iv.2004 (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers of *Nidorella resedifolia* DC., Asteraceae) [AMGS]; 15 km W of Karibib on road to Usakos (21.56S, 15.42E), 5.iv.1998 (F.W. and S.K. Gess), 2 ♀♀ (1 ♀ visiting yellow flowers of *Osteospermum* sp., Asteraceae) [AMGS]; Okahandja [21.59S, 16.55E], 27.xii.1977 (Empey), 1 ♀ [AMGS]; 18 km W of1237/C26 junction (23.09S, 16.42E), 11.iii.1999 (F.W. and S.K. Gess), 1 ♀ (visiting deep pink flowers of *Hermbstaedtia* sp., Amaranthaceae) [AMGS]; Mariental [24.38S, 17.58E], 28.iii.1977 (Empey), 3 ♀♀ [AMGS]; G[rea]t Karas Mountains, xi.1936 (Mus. Staff), 1 ♂ [SAMC]. SOUTH AFRICA: LIMPOPO: Afguns, Ellisras [now Lephalale] [23.50S, 27.41E], 3.iv.1972 (Empey), 1 ♂ [AMGS]. MPUMALANGA: Kruger National Park, Onder Sabie [25.7S, 31.55E], 22.v.1969 (M.W. Strydom), 1 ♀ [SANC]; same locality, 2.vi.1969 (M.W. Strydom), 1 ♂ [SANC]; Kruger National Park, Malelane [25.28S, 31.31E], 30.v.1969 (M.W. Strydom), 1 ♀ [SANC]. NORTH

WEST PROVINCE: Crystal Waters, Breedtsnek [circa 25.45S, 27.15E], 8.xi.1962 (H.N. Empey), 1 ♂ [AMGS]. FREE STATE: Bloemfontein [29.06S, 26.07E], 20. ii8i.1931 (C. Jacot-Guillarmod), 1 ♀. KWAZULU-NATAL: Umbilo [29.54S, 30.59E], 17/x.1915 (L. Bevis) 1 ♂ [DMSA]; Durban [29.49S, 31.01E], 7.iv.1913 (W. Haygarth), 2 ♀♀ [DMSA]; same locality, ii.1914 (W. Haygarth), 1 ♀ [SAMC]; same locality, 10.iii.1914 (W. Haygarth), 1 ♂ [DMSA]; same locality, 1.iii.1959 (C. Booth), 1 ♀ [SAMC]; Berea, Durban [29.51S, 30.60E], 27.xi.1958 (Empey), 1 ♂ [AMGS]; Tugela Ferry [28.44S, 30.27E], 13.xi.1971 (Empey), 1 ♀ [AMGS]; Ladysmith [28.32S, 29.46E], 21.iii.1963 (H.N. Empey), 1 ♀ [AMGS]; Umtentweni [30.42S, 30.28E], 5. xi.1972 (Empey), 1 ♀ [AMGS]; Mfongosi [28.43S, 30.48E], iii.1914 (W.E. Jones), 1 ♂ [SAMC]; same locality, iv.1916 (W.E. Jones), 1 ♀ [SAMC]; same locality, 1923 ([The] Misses Jones), 1 ♀, 1 ♂; Stella B[ush], i.1915 (Marley), 1 ♀ [SAMC]. NORTHERN CAPE: Olifantshoek [27.57S, 22.42E], 10.xii.1978 (Empey), 1 ♂ [AMGS]; Prieska [29.40S, 22.42E], 1.i.1978 (Empey), 1 ♀ [AMGS]; Namaqualand, Kamiesberg to Sors Sors (30.10S, 18.01E), 1 ♂ (visiting blue flowers of *Anchusa capensis* Thunb., Boraginaceae) [AMGS]; Colesburg/Norvalspont, Vanwyksfontein farm (30.39S, 25.23E), 23.ii.2000 (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers of *Tribulus terrestris* L., Zygophyllaceae) [AMGS]; Vanwyksfontein [farm], 5 m[iles] W of Norvalspont [30.39S, 25.23E], 7.v.1980 (F.W. and S.K. Gess), 4 ♀♀ [AMGS]; Vanwyksfontein [farm], 8 km W of Norvalspont [30.39S, 25.23E], 14–19.iv.1982 (F.W. Gess), 1 ♀ [AMGS]; Vanwyksfontein [farm], 8 km W of Norvalspont, 15.i.1985 (D.W. Gess), 1 ♂ (on flowering *Acacia karroo* Hayne, Fabaceae, Mimosoideae); same locality and collector, 17.i.1985, 1 ♂ (on flowering *Acacia karroo*); same locality and collector, 24.i.1985, 2 ♀♀ [AMGS]; Vanwyksfontein [farm], 8 km W of Norvalspont, 28–30.xi.1988 (R.W. Gess), 3 ♂♂; same locality and dates (F.W. and S.K. Gess), 1 ♀, 3 ♂♂ [AMGS]; Thee Kloof, Fraserburg Div[ision] [32.05S, 20.41E], xi.1935 (Mus. Staff), 9 ♂♂ [SAMC]; Tanqua Karoo, Renoster Riv. [circa 32.16S, 20.05E], xi.1952 (Mus. Expd.), 1 ♂ [SAMC]; Tankwa Karoo [circa 32.15S, 19.45E], i.1949 (Zinn-Hesse Mus. Exp.), 1 ♀ [SAMC]; Warrenton [28.09S, 24.47E], x.1939 (Mus. Staff), 1 ♂ [SAMC]; Van Schalkwyks Kraal, Venterstad Div[ision], x.1935 (Mus.Staff), 1 ♂ [SAMC]; Colesberg [30.45S, 25.05E], 12.iii.1969 (M.W. Strydom), 1 ♀ [SANC]; same locality and date (L.C. Starke), 1 ♀ [SANC]; Victoria West [31.25S, 23.04E], 10.i.1965 (H.N. Empey), 3 ♀♀, 1 ♂ [AMGS]; EASTERN CAPE: Middelburg [31.30S, 25.00E], 2.xi.1972 (E. Holm), 1 ♀ [AMGS]; Middelburg Div[ision] [circa 31.30S, 25.00E], xi.1935(Mus. Staff), 4 ♂♂ [SAMC]; Resolution, Grahamstown [33.08S, 26.37E], 1930 (Miss Walton), 1 ♀ [SAMC]; Nieu Bethesda [31.51S, 24.34E], 30.i.2002 (F.J. Herbst), 1 ♂ [AMGS]; Mountain Zebra Park (32.15S, 25.27E), 12–16.ii.1988 (A.J. Weaving), 2 ♀♀, 1 ♂ [AMGS]; same locality, 23–29.iii.1988 (A.J. Weaving), 1 ♂ [AMGS]; Graaff- Reinet [32.13S, 24.32E], 3.i.1978 (Empey), 2 ♂♂ [AMGS]; Ecca Pass, Grahamstown [33.13S, 26.37E], 25.i.1974 (R. Bayliss), 1 ♀ [AMGS]; Whittlesea [32.10S, 26.50E], 21.ii.1971 (Empey), 1 ♀ [AMGS]; Kudu Reserve, Double Drift [33.06S, 26.47E], 15.iii.1984 (A.J. Weaving), 2 ♂♂ [AMGS]; Aberdeen [32.28S, 24.02E], xi.1935 (Mus. Staff), 1 ♀, 3 ♂♂ [SAMC]; Gardiner's Drift, Adelaide [circa

32.42S, 26.18E], iii.1954 (S. A. Museum), 8 ♀♀, 4 ♂♂ [SAMC]; Fort Beaufort, Umdala [Mdala] [32.48S, 26.41E], iii.1954 (S. A. Museum), 1 ♂ [SAMC]; Hendrik Verwoerd [now Gariep] Dam [30.30S, 25.45E], 12.iii.1969 9.l. (L.C. Starke), 1 ♀; same locality and date (M.W. Strydom), 1 ♀ [SANC]; Jeffreys Bay [34.2S, 24.55E], 17.iii.1970 (L.C. Starke), 1 ♀ [SANC]; Graaff-Reinet [32.13S, 24.32E], 14.iii.1969 (L.C. Starke), 2 ♂♂ [SANC]; Jansenville [32.57S, 24.40E], 13.iii.1970 (L.C. Starke),1 ♂ [SANC]; Carlisle Bridge [33.05S, 26.14E], 14.i.1965 (H.N. Empey), 1 ♂ [AMGS]; Queenstown [31.52S, 26.52E], 1951 (S. Straw), 2 ♀♀; same locality, 13.xi.1999 (F.J. Herbst), 1 ♂ [AMGS]; Bedford [32.40S, 26.10E], iii.1960 (Langridge), 1 ♀ [AMGS]; [west of] Riebeek East, Swartwaterspoort [33.11S, 25.59E], i.1988 (R.W. Gess), 1 ♀ (with prey: Bombyliidae) [AMGS]; Grahamstown [33.19S, 26.31E], 21.ix.1952 (N. Gane), 1 ♀; Middelburg [31.30S, 25.00E], 3.ii.1957 (E.McC. Callan), 2 ♀♀, 1 ♂; Willowmore [33.15S, 23.30E], i.1914 (Rhodesia Museum), 1 ♀ [SAMC ex NMBZ]; Willowmore, 12.i.1965 (H.N. Empey), 2 ♂♂ [AMGS]; Alicedale [33.15S, 26.04E], 2.xii.1970 (F.W. Gess), 1 ♀, 3 ♂♂; same locality, 2.xii.1970 (J.G.H. Londt), 2 ♂♂ [AMGS]. WESTERN CAPE: Caledon Dist[rict], Nuweberg Forest Stat[ion] [34.04S, 19.08E], 5.i.1990 (P. Goldblatt), 2 ♀♀ (on open flowers of *Micranthus plantagineus* [*Micranthus alopecuroides* (L.) Rothm.)] Iridaceae) [AMGS]; Prince Albert Dist[rict], Tierberg (Study Site) (33.10S, 22.16E), 26.xi.-5.xii.1987 (F.W., S.K. and R.W. Gess), 3 ♂♂ (on cream flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae) [AMGS]; Prince Albert Dist[rict], Tierberg (Res. Stat.) (33.08S, 22.16E), 26.xi.- 5. xii.1987 (F.W., S.K. and R.W. Gess), 2 ♀♀, 1 ♂ [AMGS]; Oudtshoorn, Onverwacht (33.38S, 22.14E), (R.W. Gess), 1 ♀, 1 ♂ (on flowers of *Acacia caffra* (Thunb) Willd., Fabaceae) [AMGS]; Oudtshoorn, Zebra [33.46S, 22.19E], x.1951 (Mus. Exped.), 1 ♀ [SAMC]; Touwsrivier [33.20S, 20.02E], 9.i.1975 (Empey), 1 ♀, 1 ♂ [AMGS]; Ouberg Pass, by road 27 km NE of Montagu (33.40S, 20.16E), 3.xii.1986 (S.K. Gess), 1 ♀, 1 ♂ [AMGS]; Rietbron [32.54S, 23.08E], 11.i.1965 (H.N. Empey), 2 ♀♀, 1 ♂ [AMGS]; Rietbron [32.54S, 23.08E], 19.ii.1971 (Empey), 2 ♀♀, 3 ♂♂ [AMGS]; 16.5 km from Clanwilliam on old road to Citrusdal [32.16S, 18.57E], 13.x.1990 (F.W. and S.K. Gess), 1 ♂ [AMGS]; Bergsoom Farm, Citrusdal, 17 &18.i.2009 (D.W. and G.M. Gess), 1 ♀, 3 ♂♂ (on *Acacia karroo* Hayne, Fabaceae) [AMGS]; Clanwilliam District, Klein Alexandershoek (32.20S, 18.46E), 6.x.1988 (D.W. Gess), 1 ♂ [AMGS]; Bulshoek, Cl[an]w[illiam] [32.00S, 18.47E], xii.1956 (S. A. M.), 2 ♂♂ [SAMC]; Merweville Distr[ict] [32.40S, 21.31], i.-ii.1947 (H. Zinn), 13 ♀♀[SAMC]; Merweville, Laingsburg Distr[ict] [32.40S, 21.31E], i.1959 (H. Zinn), 1 ♀♀, 3 ♂♂ [SAMC]; Dikbome, Merweville, Koup [32.54S, 21.22E], i.1953 (H. Zinn), 4 ♀♀, 13 ♂♂ [SAMC]; Beaufort West Dist[rict] [circa 32.18S, 22.36E], ii.1958 (S. A. M. sic [South African Museum]), 6 ♀♀, 8 ♂♂ [SAMC]; Beaufort West, Oukloof [circa 32.18S, 22.36E], i.1949 (Zinn-Hesse Mus,Exp.), 2 ♀♀[SAMC]; Nieuveld Escarpment, Rietvlei [32.20S, 21.30E], i.1949 (Zinn-Hesse Mus. Exp.), 2 ♀♀ [SAMC]; Murraysburg Disr[rict] [circa 31.58S, 23.47E], iii.1931 (Museum Staff), 18 ♀♀, 20 ♂♂ [SAMC], same locality, xi.1935 (Museum Staff), 20 ♀♀, 25 ♂♂ [SAMC]; Constable [33.16S, 20.17E], ii.1958 [Hesse et al.], 2 ♀♀, 1 ♂ [SAMC]; Koup, Laingsburg Dist[rict][circa 33.24S, 21.07E],

ix.1937 (Museum Staff), 1 ♀ [SAMC]; Seven Weeks Poort [33.22S, 21.25E], ii.1935 (K.H. Barnard], 1 ♀ [SAMC]; Spitzkop. Meirings Poort [32.3S, 22.49E]. i.1935 (Museum Staff), 2 ♀♀ [SAMC]; Richmond Dist[rict] [circa31.23S, 23.56E], iii.1931 (Museum Staff), 1 ♀♀, 5 ♂♂ [SAMC]; Spitzkop, Laingsburg Dist. [33.3S, 20.35E],iii.1938 (Mus. Staff), 1 ♂ [SAMC]; Moordenaars Karroo, Laingsberg Div. [circa 32.58S, 20.49E], iii.1937 (Mus. Staff), 2 ♀♀, 1 ♂ [SAMC].

Geographical distribution. Widespread in southern Africa (Fig. 9d), extending northwards to Ethiopia in the northeast and Zaire in the northwest.

Floral associations. Recorded from seven plant families: Asteraceae (*Geigeria pectidea* (DC) Harv., *Osteospermum* sp., *Nidorella resedifolia* DC.); Amaranthaceae (*Hermbstaedtia odorata* (Burch.) T. Cooke); Boraginaceae (*Anchusa capensis* Thunb.); Zygophyllaceae (*Tribulus terrestris* L.); Fabaceae (Mimosoideae, *Acacia Karroo* Hayne, *A. caffra* (Thunb) Willd.); Apocynaceae (formerly Asclepiadaceae, *Gomphocarpus filiformis* (E. Mey.) D. Dietr); Iridaceae (*Micranthus alopecuroides* (L.) Rothm.).

Nesting. Unknown.

Prey. Recorded taking seven families of Diptera: Tabanidae, Bombyliidae, Syrphidae, Muscidae, Calliphoridae, Sarcophagidae, and Tachinidae.

Bembix gracilens J. Parker

http://species-id.net/wiki/Bembix_gracilens

Bembix gracilens J. Parker, 1929: 143, pl. 9, fig. 109, ♀ (Holotype, ♀, South West Africa [Namibia], no locality, in ZMHB); Arnold 1931: 217 (original description copied); Lohrmann 1948: 448 (member of *fuscipennis* species group); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Pulawski 2013: 33 (in catalogue of Sphecidae sensu lato).

Material examined. NAMIBIA: Windhoek [22.35S, 17.04E], 29.xii.1966 (H. Empey) ♀ [AMGS].

Geographical distribution. Recorded from Namibia (Fig. 9e).

Floral associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

Bembix harenarum Arnold

http://species-id.net/wiki/Bembix_harenarum

Fig. 8f

Bembex harenarum Arnold, 1929: 371, figs 35, 35a, pl. 6, figs 28, 29, ♂, ♀ (Syntypes, South Africa, Plettenberg Bay, in TMSA) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix harenarum Arnold, Lohrmann 1948: 448 (member of *fuscipennis* species group of *Bembix*); Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Gess and Gess 1998: 351, Fig. 22.18 (habitat); Pulawski 2013: 34 (in catalogue of world Sphecidae sensu lato).

Material examined. SOUTH AFRICA: EASTERN CAPE: Port St. Johns [31.38S, 29.33E], xii.1961 (F. W. and S. K. Gess), 6 ♀♀, 8 ♂♂ [SAMC]; same locality and collectors, iii.1967, 11 ♀♀, 4 ♂♂ [SAMC]; Rietrivier Mouth near Port Alfred [33.33S, 27.01E], 28.i.1973 (F.W. Gess), 1 ♀; same locality, 19.ii.1978 (D.W. Gess), 1 ♀; Zwartkops [now Swartkops] [33.52S, 25.36E], Algoa Bay, ii.1919 (C. B. Krüger), 1♀ (seashore dunes); Klipbaai [circa 34.11S, 24.43E], between Oyster and Cape St Francis bays, 9–12.i.1988 (R.W. Gess and W. Archer), 6 ♀♀ (1 ♀ with prey: Tabanidae). WESTERN CAPE: Grootrivier [Nature's Valley], Knysna Dist.[33.59S, 23.34E], i.1955 (P.M.D. Martin), 1 ♂; same locality, 1.1958 (P.M.D. Martin), 1 ♀; Nature's Valley, 8.iii.1970 (L.C. Starke), 1 ♀ [SANC]; Nature's Valley, Tsitsikama Forest, 28.xii.1966 (C. Jacot-Guillarmod), 7 ♂♂, 2 ♀♀ (1 ♂ bearing pollinia of Asclepiadaceae on all its claws); Wilderness [33.59S, 22.35E], George, 25.i.1922 (Brauns), 1 ♂; Plettenberg Bay [34.03S, 23.22E], i.1920 (Brauns),1 ♀ ("See Strand") [SAMC]; Brenton-on-Sea [34.04S, 23.01E]), Knysna, iv.1977 (F.W. Gess), 1 ♀ (littoral zone) – [all AMGS unless otherwise indicated].

Additional records extracted from database of specimens in collection of SAMC are from Plettenberg Bay and Bredasdorp, no sexes or determiners given.

Geographical distribution. The species appears to have a strictly coastal distribution (Fig. 9f). Known from Port St Johns to Brenton-on-Sea near Knysna and, if the unconfirmed record from SAMC is included, Bredasdorp.

Floral associations. Recorded from one plant family Apocynaceae (formerly Asclepiadaceae, based on pollinia carried on claws).

Nesting. Unknown, probably in the supra-littoral dunes.

Prey. Recorded taking one family of Diptera: Tabanidae (one female captured with tabanid prey).

***Bembix karrooensis* Gess**
http://species-id.net/wiki/Bembix_karrooensis
Fig. 11a

Bembix karrooensis Gess, 1986: 144, figs 20–24, ♂,♀ (Holotype, ♂, South Africa, Laingsburg Disrict, Merweville, in SAMC); Gess and Gess 2003: 124 (flower visiting records); Pulawski 2013: 38 (in catalogue of world Sphecidae sensu lato).

Material examined. NAMIBIA: Two Palms, Uniab River (19.53S, 13.54E), 27.iii.2004 (F.W. and S.K. Gess), 1 ♀, 1 ♂ (at water) [AMGS]; same locality, 28.iii.2004 (F.W. and S.K. Gess), 1 ♀ (visiting white flowers [of] *Boerhavia hereroensis* Heimerl., Nyctaginaceae) [AMGS]; road D2344 WNW [of] Omatjete (20.57S, 15.14E), 15.iii.2004 (F.W.

and S.K. Gess), 1 ♀; Barby 26, Bethanie (SE2516DC) [25.51S, 16.33E], 2–7.x.1972 (collector ?) (F9244), 1 paratype ♂ [NMNW]; 36 km on [road] C13 from Helmeringhausen (26.05S, 16.38E), 9.iii.1999 (F.W. and S.K. Gess), 1 ♀, 1 ♂ (both visiting yellow flowers of *Deverra denudata* (Viv.) Pfisterer & Podl., Apiaceae) [AMGS]; 18 km from Ariamsvlei on road to Aroab [circa 28.00S, 19.43E], 14.v.1973 (C.F. Jacot-Guillarmod), 1 Paratype ♀ [AMGS]. SOUTH AFRICA: NORTHERN CAPE: on road to Richtersveld National Park bet[ween] Annis and Dabie rivers (28.20S, 16.55E), 20.ix.1997 (F.W. and S.K. Gess), 1 ♀, 5 ♂♂ (4 ♂♂, of which 1 stylopized, visiting deep pink flowers of *Hermbstaedtia glauca* (Wendl.) Reichb. ex Steud., Amaranthaceae) [AMGS]. WESTERN CAPE: Merweville Distr[ict] [32.40S, 21.31], ii.1948 (H. Zinn), 1 paratype ♂ [SAMC]; Dikbome, Merweville, Koup [32.54S, 21.22E], x.1952 (Mus. Exped.), 2 paratype ♂♂ [AMGS] ; Merweville, Laingsburg Distri[ct], i.1959 (H. Zinn), Holotype ♂, 1 paratype ♀ [SAMC]; Prince Albert Dist., Tierberg (Study Site) (33.10S, 22.16E), 16.xi.1994 (F.W. and S.K. Gess), 1 ♂ (claws bearing pollinia of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae) [AMGS].

Geographical distribution. The Nama-Karoo of the Northern Cape and Namibia (Fig. 12a).

Floral associations. Recorded from four plant families: Amaranthaceae (*Hermbstaedtia glauca* (Wendl.) Reichb. ex Steud.); Apiaceae (*Deverra denudata* (Viv.) Pfisterer & Podl .); Apocynaceae (formerly Asclepiadaceae, *Gomphocarpus filiformis* (E. Mey.) D. Dietr.; Nyctaginaceae (*Boerhavia hereroensis* Heimerl.).

Nesting. Unknown.

Prey. Unknown.

***Bembix liturata* R.Turner**
http://species-id.net/wiki/Bembix_liturata
Fig. 11b

Bembex liturata R. Turner, 1917a: 440, ♂, ♀ (Syntypes, South Africa, Eastern Cape, Willowmore, in BMNH); Arnold 1929: 370, figs 34, 34a–c, pl. 6, figs 26, 27, ♂, ♀ (in revision of southern Africa Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Guiglia 1931: 157 (Eritrea, Dankalia, Gaarre N Assaab).

Bembix liturata R. Turner, R. Bohart & Menke, 1976: 547 (in checklist of world Sphecidae); Pulawski 2013: 41 (in catalogue of world Sphecidae sensu lato).

Note. This species was described by Turner from Willowmore and recorded from the same locality by Arnold.

In the females the sixth tergite is not always black (as stated in Arnold's key) but may be ferruginous or even yellow at the apex, in which case the general appearance ia much like that of *B. capensis*. Such specimens are, however, distinguishable by the pale markings on the tergite being yellowish white (not yellow), by the greater amount of yellow and lesser amount of ferruginous (if any) on the sterna, by the shape of the black mark on the clypeus, by the more gracile form of the second flagellar segment, and by

the fact that the labrum at the baso-lateral angles (and sometimes laterally) is finely but distinctly pilose (almost glabrose in *capensis*).

The subspecies *flavopicta* Arnold cannot be upheld as the material examined shows that the species may vary considerably in the degree of development of the light markings. Specimens from Willowmore are usually melanistic, *flavopicta* has the light markings well developed, specimens from Merveville are intermediate.

Material examined. ZIMBABWE: Matetsi [18.15S, 25.55E], 7.ix.1934 (R.H.R. Stevenson), 1 ♂; same locality and collector, 9.ix. 1934, 1 ♂; same locality and collector, 12.ix.1934, 1 ♀; same locality and collector, 28.x.1934, 1 ♀. NORTHERN CAPE: ?.... Kloof, Fraserburg [31.55S, 21.31E], xi.1935 (Mus. Staff), 1 ♂ [SAMC]. WESTERN CAPE: Liebendal [Station] [31.36S, 18.24E], xi.1953 (S.A.M.), 1 ♀ [SAMC]; Murraysburg Dist[rict] [circa 31.58S, 23.47E], xi.1935 (Mus. Staff), 2 ♂♂ [SAMC]; Bushmans Riv[er], Letjiesbosch, Koup [32.34S, 22.16E], xi.1935 (Mus. Staff), 1 ♀ [SAMC]; Merweville Distr[ict] [32.40S, 21.31], i-ii. 1947 (H. Zinn), 3 ♀♀, 2 ♂♂ [SAMC]; Dikbome, Merweville, Koup [32.54S, 21.22E], i.1953 (H. Zinn), 7 ♀♀, 6 ♂♂ [SAMC]; Rietbron [32.54S, 23.08E], 11.i.1965 (H.N. Empey), 1 ♀ [AMGS]; Nieuveld Escarpment, Rietvlei [32.20S, 21.30E], i.1949 (Zinn-Hesse Mus. Exp.), 1 ♂ [SAMC]; Rooinek [Pass], Laingsberg Distr. [33.20S, 20.52E], i.1949 (Zinn-Hesse Mus. Exp.), 1 ♀, 1 ♂ [SAMC]; 43 km ENE of Ceres on road to Sutherland [33.12S, 19.44E], 2–3. xii.1989 (R.W. Gess), 2 ♂♂ (1 ♂ on flowers of *Athanasia* spp., Asteraceae); same locality and dates (H.W. Gess), 1 ♀ [AMGS]; Oudtshoorn, Onverwacht (33.37S, 22.14E), 9.-12.xii.1986 (F.W. Gess), 3 ♀♀; same locality and dates (R.W. Gess), 2 ♂♂ (on flowers of *Acacia caffra* (Thunb.) Willd., Fabaceae) [AMGS]; EASTERN CAPE: Aberdeen [32.28S, 24.02E], xi.1935 (Mus. Staff), 1 ♀ [SAMC]; Willowmore [33.15S, 23.30E], 1.xi.1899 (Brauns), 1 ♂ [SAMC ex NMBZ]; same locality and collector, 10.i.1900, 1 ♀ [DMSA], 17.xi.1916, 1 ♀ [SAMC ex NMBZ], no date, 1 ♂ [SAMC ex NMBZ].

Geographical distribution. Known principally from the southern Nama-Karoo of South Africa. The single record from Zimbabwe suggests that further records are required to establish the distribution pattern. (Fig. 12b)

Floral associations. Recorded from two plant families: Asteraceae (*Athanasia* spp.); and Fabaceae (Mimosoideae, *Acacia caffra* (Thunb.) Willd.).

Nesting. Unknown.

Prey. Unknown.

***Bembix loupata* J. Parker**
http://species-id.net/wiki/Bembix_loupata
Fig. 11c

Bembix loupata J. Parker, 1929: 73, pl. 10, figs 123–126, ♂, ♀ (Holotype, ♂, Tanganyika [Tanzania], Kanoga, in ZMHB); Lohrmann 1948: 448 (member of *mediterranea* species group; R Bohart and Menke 1976: 547 (in checklist of world Sphecidae); Pulawski 2013: 42 (in catalogue of world Sphecidae sensu lato).

Bembex loupata Parker & Arnold, 1931: 211, figs 47, 47a, 47b (original description copied).

Material examined. ZIMBABWE: Sawmills [19.35S, 28.02E], 31.x.1919 (G. Arnold) 1 ♂ [AMGS]; Sawmills, 12.xii.1926 (Rhodesian Museum) 1 ♂; Victoria Falls [17.55S, 25.50E], 19.xi.1920 (G. Arnold) 1 ♂ [both SAMC ex NMBZ].

Geographical distribution. Known from Tanzania (Kanoga and Ukerewe Island) and Zimbabwe (Fig. 12c). Clearly more records are required to establish a distribution pattern.

Flower associations. Unknown.

Nesting. Unknown.

Prey. Diptera: Bombyliidae and Sarcophagidae (*Sarcophaga* sp.).

Bembix massaica Cameron

http://species-id.net/wiki/Bembix_massaica
Fig. 10

Bembex massaica Cameron, 1908: 290, ♂, ♀ (Syntypes, Tanzania, Mt Meru lowlands, Ngare na nyuki, and Tanganyika [Tanzania], Usambara Mts, Mombo, in NMBZ); Turner 1917a: 439 (as synonym of *Bembex forcipata*); Arnold 1929: 365 (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Arnold 1933: 359 (Ethiopia).

Bembix massaica Cameron & Guiglia, 1943: 75 (Ethiopia, Gamo Gofa, Caschei); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae, as synonym of *Bembex forcipata*); Pulawski 2013: 44 (in catalogue of world Sphecidae sensu lato, as valid species).

Note. Described by Cameron (1908) from Tanganyika [Tanzania]. Arnold (1929) recorded the species from East Africa and Rhodesia [Zimbabwe] and (1951) from Ethiopia.

Material examined. KENYA: Luvia Island, Lake Victoria, 14.iv.1952 (Nat. Museum S. Rhodesia) 2 ♀♀. DEMOCRATIC REPUBLIC OF THE CONGO (DRC): Lake Mweru [9.10N, 28.30E], Lunchinda River, 15.ii.1953 (H.D. Brown) 1 ♀ [AMGS]. ZIMBABWE: Balla-Balla [Mbalabala] [20.45S, 29.05E], 1.iv.1945 (Nat. Museum S. Rhodesia) 1 ♀; Bembesi 20.00S, 28.56E], 4.i.1913 (G. Arnold) 2 ♀♀; Bulawayo [20.07S, 28.32E], 20.vi.1923 (R. Stevenson) 1 ♀, 28.x.1923 (R. Stevenson) 1 ♀, 27.xii.R.H.R. Stevenson) 1 ♀, 28.xii.1924 (R.H.R. Stevenson) 1 ♀ [all SAMC ex NMBZ]; Redbank [20.1S, 27.46E], 3.xii.1917 (G. Arnold) 1 ♂; Salisbury [now Harare] [17.48S, 31.03E], ii.1932 (Dept. Agric.) 1 ♂; Sawmills [19.35S, 28.02E], 11.iv.1941 (Rhodesia Museum) 1 ♂; Selukwe [19.41S, 29.59E], xii.1940 (??) 1 ♂, 2.i.1941 (??) 1 ♂; Turk Mine [19.44S, 28.48E], xi.1958 (Nat. Museum S. Rhodesia) 2 ♂♂, 2 ♀♀, 24.xi.1958 (Nat. Museum S. Rhodesia) 2 ♂♂, 1 ♀; Umguza R. [20.1S, 30.51E], 24.v.1923 (Swinburne and Stevenson) 2 ♂♂; Umtali [Mutare] [18.57S, 32.40E], ii.1917 (Rhodesia Museum) 1 ♂ [all SAMC ex NMBZ].

Geogrphical distribution. Known from Ethiopia and the DRC in the north to Zimbabwe. Not recorded south, east or west of Zimbabwe.

Flower associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

Figure 10. *Bembix massaica*, female, male. (approximate length of female: 15.5 mm).

***Bembix melanopa* Handlirsch**
http://species-id.net/wiki/Bembix_melanopa
Fig. 11d

Bembex melanopa Handlirsch, 1893: 797, pl. 2, fig. 10, pl. 7, fig. 7, ♂, ♀ (Syntypes, Mozambique, Delagoa Bay [Maputo], in ZMHB; Natal [KwaZulu-Natal], South Africa, in MHNG); Bingham 1902: 211 (South Africa and Malawi); Dalla Torre 1897: 508 (in catalog of world Hymenoptera); Kohl 1906: 212 (Socotra Island, Yemen); Arnold 1929: 354, figs 21, 21a-c, pl. 6, figs 16, 17, ♂, ♀ (in revision of southern African *Bembix*); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix melanopa Handlirsch & Parker, 1929: 115 (in revision of Stizini and Bembicini); Cuthbertson 1939: 1 (prey and nest parasite, *Craticulina tabaniformis* (Fabricius), Sarcophagidae); 115; Lohrmann 1939: 142 (member of *melanopa* group); Ulleyt and De Vries 1940 (prey); Guiglia 1943: 75 (Ethiopia); 1950: 239 (Ethiopia); Leclercq 1955: 407 (Rwanda); R. Bohart and Menke 1976: 547 (in checklist of world Sphecidae); Gess 1981: 21 (nesting and prey); Gess 1986: 153–154, 158 (plants visited, nesting and prey); Gess and Gess 1988: 246–247, Fig. 14.19 (habitus, habitat); Gess and Gess 1998: 351, Fig. 22.18, 22.13 (habitus, habitat); Gess and Gess 2003: 124 (flower visiting records); Pulawski 2013: 46 (in catalogue of world Sphecidae sensu lato).

Material examined. KENYA: Malindi, Casuarina Point (03.14S, 40.00E), 7–20.i.1987 (A.J. Weaving), 2 ♀♀ [AMGS]; Malindi (03.14S, 40.06E), 25.x.- 16.xi.1989 (A. Weaving), 1 ♀ [AMGS]. MALAWI: Salima Bay [13.47S, 34.26E], Lake Nyasa, 5.xi.1943 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]. ZIMBABWE (SOUTHERN RHODE-

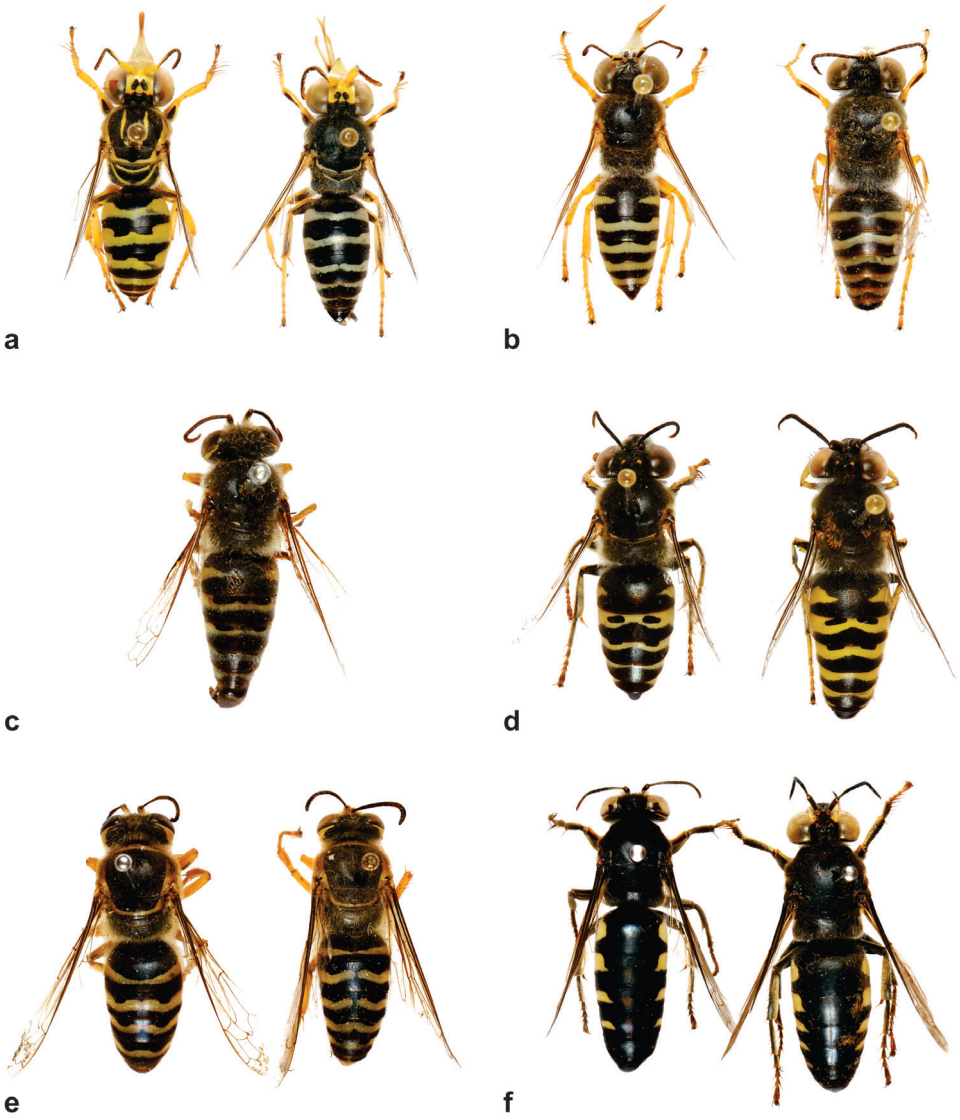

Figure 11. *Bembix* spp.: **a** *karroensis*, female, male **b** *liturita*, female, male **c** *loupata,* male **d** *melanopa*, female, male **e** *moebii*, female, male **f** *monedula*, female, male. (approximate lengths of – females: **a** 15.5 mm; **b** 16 mm; **d** 15.5 mm; **e** 21 mm; **f** 24 mm – male: **c** 15 mm).

SIA): Chigudu Farm, Myurwi (1630DD) [16.58S, 30.55E], 14.i.1985 (A.J. Weaving), 1 ♀ [AMGS]; T[relawney] R[esearch] S[tation], Harare [17.32S, 30.28E], 21.xii.1953 (N.J. Myers), 1 ♀; same locality and collector, 6.i. 1954, 1 ♀, 22.i. 1954, 1 ♀, 2 ♂♂ [AMGS]; S[alis]b[ur]y [17.48S, 31.03E], i.1954 (D. Evans), 1 ♀ [AMGS]; Lake McIlwaine, Salisbury [17.55S, 30.46E], 26.xii.1953 (A.D. Caley), 1 ♀ [AMGS]; Sanyati Valley [17.58S, 29.17E], ix-x.1925 (R.H.R. Stevenson), 1 ♂ [SAMC ex NMBZ]; Inyanga

[18.16S, 32.43E], xii.1920 (Rhodesia Museum), 1 ♂ [SAMC ex NMBZ]; Dett [18.37S, 26.50E], 21.xi.1930 (Rhodesia Museum), 1♀ [AMGS]; Gwaai [= Gwai] [19.17S, 27.43E], 14.x.1926 (R.H.R. Stevenson), 1 ♀ [SAMC ex NMBZ]; Sawmills [19.35S, 28.02E], 10. xi.1920 (Rhodesia Museum), 1 ♂ [AMGS]; same locality, 1.iv.1923 (Roy Stevenson), 1 ♂ [AMGS], 14.xi.1924 (R.H.R. Stevenson), 1 ♂, [AMGS], 21.iii.1937 (collector ?), 1 ♀ [SAMC ex NMBZ]; Umguza R[iver] [19.42S, 28.25E], 24.v.1923 (Swinburne and Stevenson), 1 ♂ [SAMC ex NMBZ]; Bulawayo [20.07S, 28.32E], 28.iii.1923 (R. Stevenson), 1 ♀ [AMGS]; same locality and collector, 29.x.1923, 1 ♀ [AMGS]; Khami [20.15S, 28.28E], 28.x.1928 (Rhodesia Museum), 1 ♀ [SAMC ex NMBZ]; Matopos [20.35S, 28.30E], 11.xi.1924 (Rhodesia Museum), 1 ♀ [SAMC ex NMBZ]. LESOTHO: Mamathes, ii.1940 [29.08S, 27.51E], 1 ♀ [AMGS]. SOUTH AFRICA: NORTH WEST PROVINCE: Vryburg [26.55S, 24.45E], 29.ii.1980 (Empey), 1 ♀ [AMGS]; Schweitzer-Reneke [27.11S, 25.18E], 27.ii.1979 (F. Herbst), 2 ♀♀ [AMGS]; Buffelspoort Dam, Western Transvaal [25.47S, 27.29E], 7.xii.1968 (F.J. Herbst), 1 ♀, 1 ♂ [AMGS]; Buffelspoort Dam, Western Transvaal [25.46S, 27.29E], 27.xii.1970 (Empey), 1 ♀, 5 ♂♂ [AMGS]; Buffelspoort Dam, 7.i.199 (F.J. Herbst), 1 ♂ [AMGS]. LIMPOPO. Messina [now Musina] [22.20S, 30.05E], 17.vii.1962 (Empey), 1 ♂[AMGS]; Sabie Riv. Bung. [circa 25.10S, 30.48E], 30.xii.1962 (Empey), 1 ♀, 3 ♂♂ [AMGS]; Afguns, Ellisras [now Lephalale] Distr. [23.50S, 27.41E], Nylstroom [now Modimolle] [24.42S, 28.22E], 16–31.xii.1921 (G.P.F.v. ?); Ellisras [now Lephalale] [23.40S, 27.46E], 17.xi.1962 (Empey), 1 ♀, 1 ♂ [AMGS]; Ellisras [now Lephalale] [23.40S, 27.46E], 24.xii.1973 (Empey), 2 ♀♀ [AMGS]; Afguns, Ellisras [now Lephalale] Distr. [23.50S, 27.41E], 3.iv.1972 (Empey), 2 ♂♂[AMGS]; Hope, Ellisras [now Lephalale] [23.40S, 27.45E], 11.xi.1967 (F.J. Herbst), 1 ♀ [AMGS]; Hope, Ellisras [now Lephalale], 3.iv.1972 (Empey), 1 ♂ [AMGS]; NW [of] Ellisras [now Lephalale] [circa 23.40S, 27.46E], 17.xi.1962 (Empey), 3 ♂♂ [AMGS]; Rust de Winter [25.12S, 28.37E], 8.ii.1975 (Empey), 1 ♀, 1 ♂ [AMGS]; Naboomspruit [24.32S, 28.40E], 8.i.1964 (Empey), 1 ♂ [AMGS]. MPUMALANGA: Komatipoort [25.25S, 31.55E], 11.x.1971 (E. Holm), 1 ♀ (Malaise trap) [AMGS]. GAUTENG: Pretoria North sandpits [25.44S, 28.07E], 26.x.1947 (C. Jacot-Guillarmod), 3 ♀♀, 5 ♂♂ (1 ♀, 5 ♂♂ with pollinia of Asclepiadaceae on claws); Pretoria North [25.40S, 28.10E], 29. xi. 1964 (Empey), 1 ♀; Johannesburg West [26.13S, 28.02E], 11.i.1959 (Empey), 1 ♀; Benoni [26.11S, 28.18E], 17.xii.1962 (Empey), 2 ♀♀, 4 ♂♂; Randburg [26.04S, 27.58E], 17.xii.1962 (Empey), 1 ♂; Florida [26.11S, 27.55E], 14.ii.1959 [Herbst], 1 ♀; Strubens Valley, Florida [26.31S, 29.57], 17.ii.1962 (Empey), 1 ♀, 1 ♂; Florida Hills [26.10S, 27.56E], 19.iii.1960 (Empey), 4 ♀♀; Florida Hills, 10.iii.1961 (Empey), 2 ♀♀; Florida Hills, 2.iv.1961 (Empey), 1 ♀; Olifantsfontein [25.58S, 28.14E], 3.i.1970 (Empey), 1 ♀. KWAZULU-NATAL: Ndumu Game Reserve Rest Camp (2632Cd) [26.04S, 32.26E] (95m), 23–29.xi.1977 (Brothers and Guillarmod), 1 ♀; Lake Sibaya [27.23S, 32.41E], 13–25.iii.1968 (D.J. Brothers), 1 ♀ 3 ♂♂; Lake Sibaya (27.23S, 32.41E), 4–8.ii.1991 (A. Weaving), 3 ♀♀, 1 ♂; Mkuze Reserve (2732 Cb) [circa 27.39S, 32.15E], 3–11.x.1977 (J.G.H. Londt), 1 ♀; Mkuze Game Reserve, 1–2. iv.1984 (A.J. Weaving), 1 ♀; False Bay, [Lake St Lucia] (27.56S, 32.23E), 24.ii-4.iii.1990 (A. Weaving), 2 ♂♂; False Bay, Lake St Lucia, 2–21.ii.1991 (A. Weaving), 1 ♀, 2 ♂♂; same locality, 27.i.-2.ii.93 (A. Weaving),

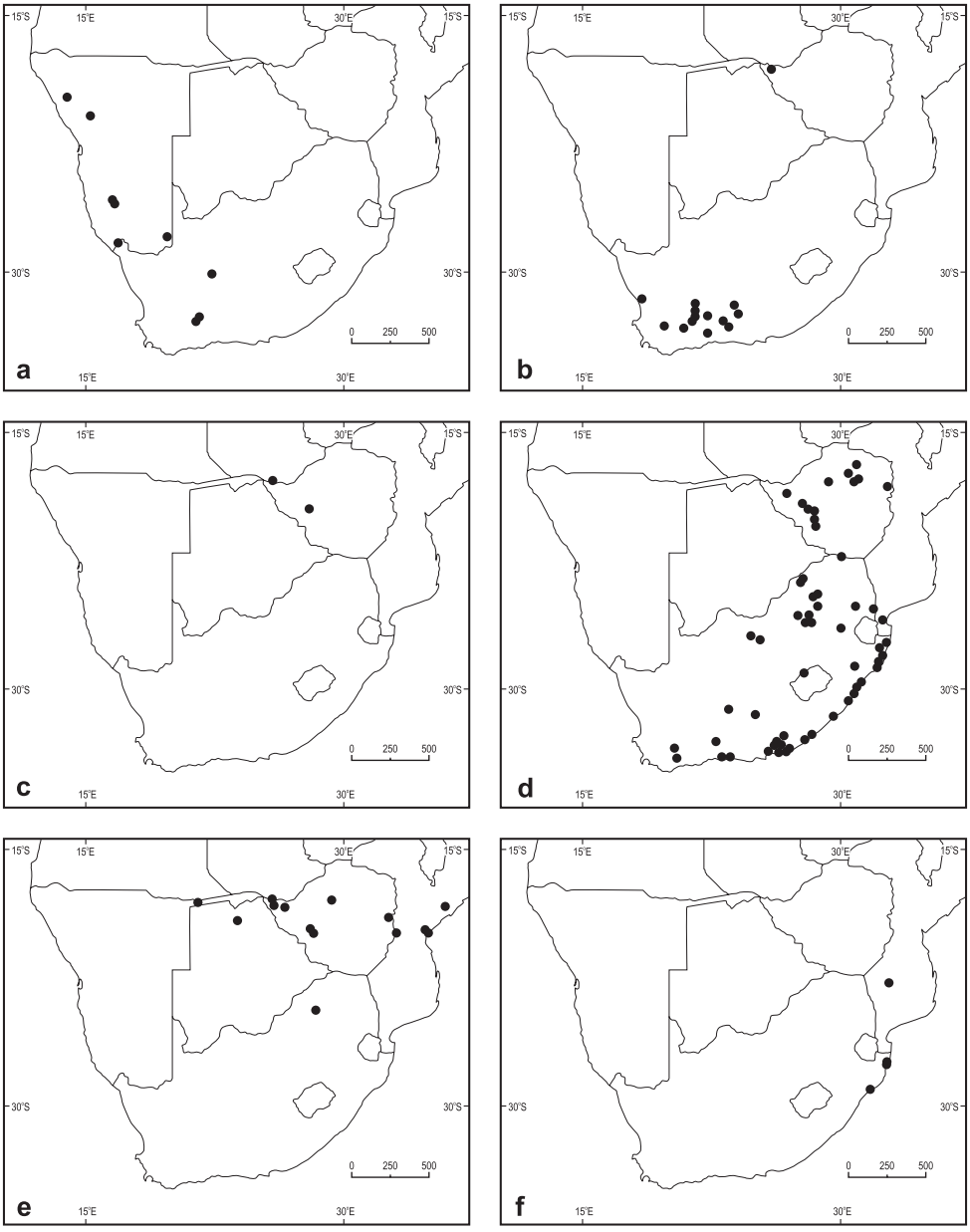

Figure 12. Distributions of collection records of *Bembix* spp: **a** *karroensis* **b** *liturata* **c** *loupata* **d** *melanopa* **e** *moebii* **f** *monedula*.

2 ♀♀; Fanies Is[land], [Lake St Lucia] (28.06S, 32.26E), parkland, 16–19.iii.1990 (A. Weaving), 2 ♂♂; same locality, 20–24.ii.1990 (A. Weaving), 1 ♀; Fanies Isl[and], Lake St Lucia, 30.i-2.ii.1991 (A. Weaving), 1 ♀; Umfolosi R. Bridge, 7 km SW Mtubatuba [28.27S, 32.09E], 1.xii.1977 (Brothers & Guillarmod), 2 ♂♂; Mfongosi [28.43S, 30.48E],

3.iii.1914 (W.E. Jones), 1 ♂; Richardsbaai [28.48S, 32.06E], 15.ii.1972 (A. Prinsloo), 1 ♀; Umhloti [29.39S, 31.07E], 5.x.1947 (C. Jacot-Guillarmod), 1 ♂; Umhlanga [29.43S, 31.06E], iv.1941 (Nat. Museum S. Rhodesia), 1 ♀; [AMGS], 1 ♂ [SAMC]; Mayville, Durban [29.51S, 30.59E], 14.x.1972 (F. Herbst), 2 ♂♂; same locality, 12.xi.1972 (F. Herbst), 1 ♂; Manor Gardens, Durban [29.53S, 31.03E], 5.xi.1968 (F.J. Herbst), 2 ♀♀; Hillary, Durban [29.53S, 30.57E], no date [F. Herbst], 1 ♀, 1 ♂; Umbilo, Durban [29.54S, 30.59E], 8.iv.1952 (C. Jacot-Guillarmod), 1 ♂; same locality, 19.x.1955 (C. Jacot-Guillarmod), 1 ♂; Stainbank N[ature] Reserve, Durban [29.55S, 30.57E], i.1975 (F. Herbst), 1 ♂; Point, Durban [29.55S, 31.01E], 5.xi.1972 (F.J. Herbst), 1 ♀; Isipingo [30.00S, 30.57E], 5.ii.1976 (D.J. Brothers), 2 ♀♀; 2 km S [of] Isipingo, 18.xii.1975 (D.J. Brothers), 5 ♀♀; Amanzimtoti [30.02S, 30.58E], 15.iii.70 (F.J. Herbst), 1 ♀; Widenham [30.13S, 30.48E], 4.iv.1982 (A. Weaving), 2 ♀♀; same locality, 7.iv.1982 (A. Weaving), 1 ♀, 25.iii.1984 (A. Weaving), 1 ♀, 2 ♂♂, 7–8.iv.1984 (A. Weaving), 2 ♀♀, 27.ii.-1.iii.1985 (A. Weaving), 1 ♂; Scottburgh [30.15S, 30.47E], 11.xi.1972 (F. Herbst), 1 ♀; Umtentwini [30.42S, 30.28E], 20.iv.1973 (Empey), 6 ♂♂; Port Shepstone [30.44S, 30.28E], 15. ii.1972 (Empey), 1 ♀; St. Michaels [30.50S, 30.23E], 14.i.1953 (E.McC. Callan), 2 ♀♀, 1 ♂ [all AMGS unless otherwise indicated]. EASTERN CAPE: Middelburg [31.30S, 25.00E], 3.ii.1957 (E.McC. Callan), 2 ♀♀ [AMGS]; Port St. Johns [31.38S, 29.33E], iii.1967 (F.W. and S.K. Gess), 2 ♀♀, 5 ♂♂ [SAMC]; Morgan's Bay [32.42S, 28.20E], 30.iii. - 4.iv.1989 (F.W. and S.K. Gess), 1 ♀; Fort Beaufort [32.46S, 26.40E], 20.i.1960 (C. Jacot-Guillarmod), 3 ♀♀, 1 ♂ (1 ♀ with prey: Muscidae, Diptera); East London [33.00S, 27.55E], 10.xii.1975 (F.J. Herbst), 2 ♂♂; Carlisle Bridge [33.05S, 26.14E], 14.i.1961 (Empey), 1 ♀, 3 ♂♂; Gxulu River, E[ast L[ondon] [33.07S, 22.44E], 15. xii.1970 (F.W. Gess), 2 ♀♀; Kransdrift, Grahamstown [33.09S, 26.32E], 8.ii.1981 (D.W. Gess), 1 ♀; Willowmore [33.15S, 23.30E], i.1922? (Brauns), 1 ♂; Alicedale [33.15S, 26.04E], 2.xii.1970 (F.W. Gess], 1 ♀; Hilton, Grahamstown [33.15S, 26.20E], 2.xii.1977 (D.W. Gess), 1 ♀; same locality, 20.xii.1977 (D.W. Gess), 2 ♀♀, 2.i.1978 (D.W. Gess), 2 ♀♀, 1 ♂, (R.W. Gess), 1 ♀, 10.i.1978 (D.W Gess), 1 ♂, 12.i.1978 (D.W. Gess), 1 ♀, 13.i.1978 (D.W. Gess), 2 ♀♀, (F.W. Gess), 1 ♂, 17.i.1978 (D.W. Gess), 1 ♀, 18.i.1978 (D.W. Gess), 1 ♂, 24.i.1978 (D.W. Gess), 1 ♂, 9.ii.1978 (F.W. Gess), 1 ♂, 16.ii.1978 (F.W. Gess), 1 ♀; Grahamstown [33.19S, 26.31E], 8.viii.1957 (A.M. Bennett), 1 ♂; Belmont Valley, Grahamstown [33.19S, 26.35E], 17–25.i.1970 (J.G.H. Londt), 1 ♀ (on flowering *Foeniculum vulgare* Mill., Apiaceae); same locality, 20.i.1970 (F.W. Gess), 1 ♀ (on flowering *Foeniculum vulgare*); same locality, 23.i.1970 (F.W. Gess), 1 ♂ (on flowering *Foeniculum vulgare*); Riet River Mouth, near Port Alfred [33.33S, 27.01E], 19. ii.1978 (D.W. Gess), 1 ♂; same locality, 5. iii.1972 (F.W. Gess), 1 ♀; same locality, 28.i.1973 (F.W. Gess), 3 ♂♂; same locality, 4.iii.1973 (F.W. Gess), 2 ♀♀; Port Alfred [33.36S, 26.55E], 5.iv.1958 (E.McC. Callan), 1 ♀; same locality, 27.iv.1958 (E.McC. Callan), 1 ♀; Salt Vlei, Port Alfred [33.37S, 26.52E], 31.i.1960 (E.McC. Callan), 1 ♀; same locality, 16–17.iv.1979 (E.McC. Callan), 2 ♀♀; 5 km N of Alexandria on road to Salem [33.37S, 26.24E], 16.i.1984 (D.W. Gess), 2 ♀♀ (on flowering *Foeniculum vulgare*); Kasouga Dunes [33.39S, 26.44E], xii.[19]54 (Cooke), 1 ♂; Cannonvale (33.40S, 25.47E), 18.xii.1987 (A.J. Weaving), 1 ♂; Alexandria Forest [33.41S, 26.23E], 16.i.1981 (F.W. Gess), 1 ♂;

Kenton-on-Sea [33.42S, 26.38E], 21.xii.1979 (Empey), 1 ♀, 4 ♂♂; Boknes (33.43S, 26.35E), 9.i.1986 (F.W., D.W. and R.W. Gess), 3 ♀♀; Alexandria Forest to Cannon Rocks, sandbank on roadside [33.45S, 26.24E], 16.i.1984 (F.W. Gess), 1 ♀ [all AMGS]. WESTERN CAPE: Natures Valley, Tsitsikama Forest [33.59S, 23.34E], 28.xii.1966 (A Jacot-Guillarmod), 1 ♂; Natures Valley, Tsitsikama Forest [33.59S, 23.34E], 28.xii.1966 (C. Jacot-Guillarmod), 4 ♀♀ (1 ♀ with prey: *Philoliche* (*Phara*) *flavipes* (Macq.) 1 ♀, Tabanidae); Knysna, Leisure Island Beach (34.02S, 23.03E), 14.xii.1980 (P.M. Croeser), 1 ♂; 7 km S [of] Swellendam, Bontebok National P[ar]k (3420Ab) [34.04S, 20.27E], 9.iii.1979 (L. Braak),1 ♀ ("ex Springbok carcass") [undoubtedly hunting flies at the carcass –FWG]; Bloutoring (33.29S, 20.19E), 3.xii.1986 (S.K. Gess), 1 ♂ (on flowers of white "mesem", Aizoaceae, Mesembryanthema).

Geographical distribution. A widespread species known from Kenya south to the southern Eastern Cape. Coming down to the coastal dunes but not restricted to the coast (Fig. 12d).

Floral associations. Recorded from four plant families: Apiaceae (*Foeniculum vulgare* Mill.); Apocynaceae (formerly Asclepiadaceae); Asteraceae (*Athanasia trifurcata* (L.) L.); and Aizoaceae (Mesembryanthema, " mesem").

Nesting. . Three nests recorded at Hilton, near Grahamstown, Eastern Cape - all single celled, sloping burrows in sloping friable soil, the main shaft ended in a spur.

Prey. Recorded taking seven families of Diptera: Tabanidae, Bombyliidae, Syrphidae, Muscidae, Calliphoridae, Sarcophagidae, and Tachinidae.

***Bembix moebii* Handlirsch**
http://species-id.net/wiki/Bembix_moebii
Fig. 11e

Bembex möbii Handlirsch, 1893: 775, pl. 2, fig. 2, pl. 7, fig. 1, ♂, ♀, (Syntypes, Mozambique, Delagoa Bay [Maputo], in ZMHB); Dalla Torre 1897: 508 (in catalogue of world Hymenoptera).

Bembex moebii Handlirsch & Arnold, 1929: 343, figs 13, 13a, pl. 6, fig. 7, ♂, ♀ (nesting situation) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix mobii (sic) Handlirsch & Parker, 1929: 83 (in revision of Stizini and Bembicini), ♂.

Bembix moebii Handlirsch & Giordani Soika, 1939: 105 (Mai Daro, Eritrea); R. Bohart and Menke 1976: 547 (listed in checklist of world Sphecidae); Gess 1986: 154,158 (prey); Pulawski 2013: 49 (in catalogue of world Sphecidae sensu lato).

Bembex testaceicauda Cameron, 1910: 144, ♀ (Holotype or syntype, South Africa, former Transvaal, no locality, in TMSA); Brauns 1911: 241 (synonymised with *Bembix moebii*).

Note. This species was described by Handlirsch (1893) from Delagoa Bay (Mozambique). Arnold (1929) recorded the species from Delagoa Bay and from four localities

in Rhodesia (now Zimbabwe): Victoria Falls, Sawmills, Sabyati Valley and Umtali. Parker (1929) doubtfully referred to this species a specimen labelled "Bosum, 22-4-14, Tessman". The synonym, *B. testaceicauda*, was described by Cameron (1910) from the neighbourhood of Pretoria (Gauteng).

Material examined. TANZANIA: Old Shinyanga [3.34S, 33.24E), 7.xii.1954 (E. Burtt), 1 ♀ [SAMC ex NMBZ]. ZAMBIA: Abercorn [now Mbala] [8.50S, 31.24E], x.1943 (Nat.Museum S. Rhodesia), 1 ♀, 1 ♂ [SAMC ex NMBZ]; same locality, viii.1945 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Kafue Hoek (*sic*), [15.44S, 28.10E], 15.xii.1955 (C.B. Cottrell), 1 ♀ [AMGS]. ZIMBABWE: Victoria Falls [17.55S, 25.50E], 15.xi.1920 (G. Arnold), 1 ♀ [SAMC ex NMBZ]; same locality, 18.xi.1920 (Rhodesia Museum), 1 ♂ [AMGS]; Katambora, Zambesi R. [?], ix.1957 (Nat.Museum S. Rhodesia), 2 ♂♂ [1 ♂ SAMC ex NMBZ; 1 ♂ AMGS]; Sanyati Valley [17.58S, 29.17E], ix.-x.1925 (R.H.R. Stevenson), 5 ♂♂ [2 ♂♂ SAMC ex NMBZ; 3 ♂♂ AMGS]; same locality, ix.-xii.1925 (R.H.R. Stevenson), 2 ♂♂ [1 ♂ AMGS, 1 ♂ SAMC ex NMBZ]; Matetsi [18.15S, 25.55E], x.1933 (R.H.R. Stevenson), 1 ♀ [SAMC ex NMBZ]; same locality, xii.1935 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ];Wankie [18.20S, 26.30E], 24.xii.1946 (collector undecipherable), 1 ♀ [AMGS]; Umtali [18.57S, 32.40E], 19.x.1939 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Sawmills [19.35S, 28.02E], 10.xii.1926 (R.H.R. Stevenson), 1 ♀ [SAMC ex NMBZ]; same data but 11.xii.1926, 1♀ [SAMC ex NMBZ]; same locality, 12.xii.1926 (Rhod. Museum), 1 ♂ [SAMC ex NMBZ]; Sawmills Rd, Nyamandhlovu [19.52S, 28.15E], 27.xi.1960 (Nat. Museum S. Rhodesia), 1♀ [SAMC ex NMBZ]; Nyamandhlovu [19.52S, 28.15E], xi.1966 (Nat.Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]. ANGOLA: Sambo (SE 1216 Cc) [13.03S, 16.08E], 10.x.1972 (no collector recorded), 1 ♀ [NMNW]. BOTSWANA: Khwaai R., 3000' [feet], (19.08S, 23.48E), 80 m[iles] N. of Maun, 10.xii.1968 (Pinhey-Falc. Exp., Nat. Mus. Bulawayo), 1 ♀ [SAMC ex NMBZ]; same data except date 12.xii.1968, 1 ♀. MOZAMBIQUE: Salone Forest, 25 m[iles] S [of] Marromeu [18.20S, 35.56E], 10.xi.1967 (E. Pinhey, Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Dondo [19.41S, 34.45E], xii.1960 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]; Dondo Forest, 27.x.1963 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]; Dondo Forest, 28.x.1963 (Nat, Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Dondo Forest, Dondo, 13.xi.1967 (E. Pinhey, Nat. Mus. Bulawayo), 1 ♀ [SAMC ex NMBZ]; Beira [19.49S, 34.52E], xii.1960 (Nat. Museum S. Rhodesia), 1 ♀, 1 ♂ [SAMC ex NMBZ]; Hmselezwe River [co-ordinates ?], 23.xi.1939 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Msappa R. [co-ordinates ?], 6.x.1950 (Nat. Museum S. Rhodesia), 2 ♀♀, (1 ♀ partial gynandromorph: antennae ♂; body ♀), [SAMC Old Shinyanga ex NMBZ], 3 ♂♂ [AMGS]; Msappa R.(co-ordinates ?) Chimanimani Mts [circa 19.52S, 33.06E], 6.x.1950 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]. NAMIBIA: Andara, Kavango (SE 1821 Ab) [18.04S, 21.29E], 20–25.vii.1971 (no collector recorded), 3 ♂♂ [NMNW]; Popa Falla, Kavango (18.07S, 21.33E) 26–31. vii.1971 (no collector recorded), 4 ♂♂ [NMNW]. SOUTH AFRICA: LIMPOPO: Waterberg Dist. [24.22S, 28.24E], 1898–99 (v. Jutrzencka), 2 ♀♀ [AMGS]; KWAZULU–NATAL: Ngwxala Hill [? co-ordinates], no date (no collector recorded), 1 ♀ [DMSA].

Geographical distribution. A widespread species in northern southern Africa (Fig. 12e) northwards to Tanzania and recorded from Ethiopia in northeast Africa but not from northwest Africa.

Floral associations. *Unknown.*

Nesting. Nests in shady situations such as "ant-bear" holes and sandy ground under dwellings built on piles.

Prey. Recorded taking one family of Diptera: Tabanidae.

***Bembix monedula* Handlirsch**

http://species-id.net/wiki/Bembix_monedula
Fig. 11f

Bembex monedula Handlirsch, 1893: 789, pl. 2, fig. 8, ♂, ♀ (Syntypes, Delagoa Bay [Maputo], Mozambique, ZMHB); Dalla Torre 1897: 508 (in catalogue of world Hymenoptera); Arnold 1929: 352, fig. 19, pl. 6, fig. 11 (original description translated into English); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix monedula Handlirsch, R. Bohart and Menke 1976: 547 (in checklist of world Sphecidae); Pulawski 2013: 49 (in catalogue of world Sphecidae sensu lato).

Material examined. MOZAMBIQUE: Rikatla [25.48S, 32.51E], v-vi.1963 (F.W. Gess), 1 ♀ [SAMC]. SOUTH AFRICA; KWAZULU-NATAL: Mtunzini [28.57S, 31.45E], 12.ii.1978 (F.J. Herbst), 1 ♀, 6 ♂♂; Sordwana Bay [now Sodwana Bay] [27.32S, 32.41E], 29.iii.1980 (F.J. Herbst), 1 ♂; same locality, 30.iii.1980 (F.J. Herbst), 1 ♀, 1 ♂; Lake Sibayi [now Sibaya] [27.23S, 32.41E], 13–25.iii.1968 (D.J. Brothers), 1 ♀; 5 ♂♂ [all AMGS].

Geographical distribution. From the known records this species seems to be restricted to Mozambique and neighbouring northern KwaZulu-Natal (Fig. 12f), suggesting an eastern semi-tropical distribution.

Floral associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix namibensis* Gess**

http://species-id.net/wiki/Bembix_namibensis
Fig. 13a

Bembix namibensis Gess 1986: 138, figs 1–8, male (Holotype, ♂, Namibia, Namib Plain, 15 m[iles] E.[of] Natab, in AMGS); Gess and Gess 2003: 124 (flower visiting records); Pulawski 2013: 50 (in catalogue of world Sphecidae sensu lato).

Female. (hitherto undescribed): Generally very similar to male in puncturation and setation but differing in coloration in that: streak on mesonotum flanking tegula is more

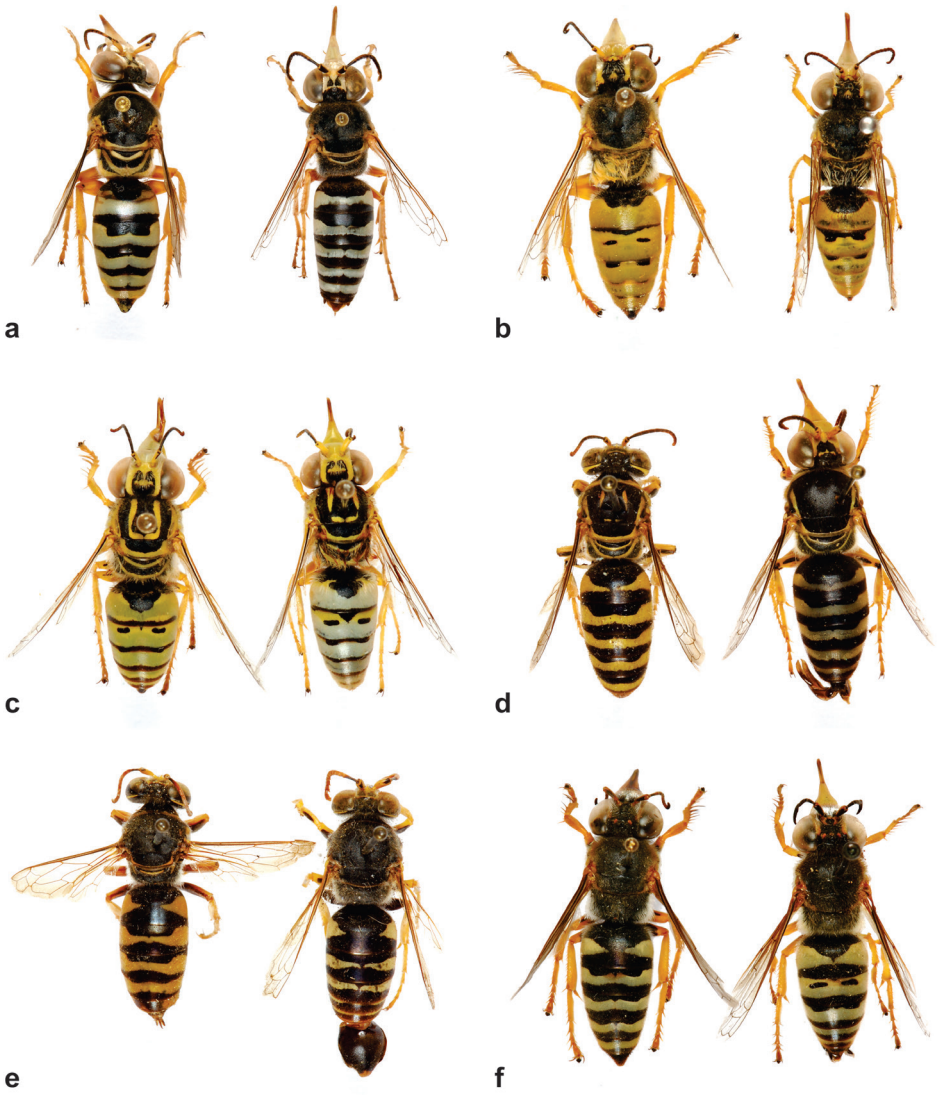

Figure 13. *Bembix* spp.: **a** *namibensis*, female, male **b** *ochracea*, female, male **c** *olivata*, female, male **d** *regnata*, female, male **e** *scaura*, female, male **f** *sibilans*, female, male. (approximate lengths of females: **a** 20.5 mm; **b** 16.5 mm; **c** 15.5 mm; **d** 18 mm; **e** 20 mm; **f** 19.5 mm)

pronounced; mesopleuron, metapleuron and side of propodeum are almost completely yellow; the bands margining scutellum and metanotum are wider and a V-shaped band is present on the dorsum and declivity of the propodeum. Fore tarsus unmodified; sand rake composed of nine long, stiff spines on first tarsomere, two on the second and third tarsomeres and one on the fourth; antennae unmodified (as in male with first flagellomere slightly more than twice length of second).

Length: 23 mm; length of front wing13 mm; hamuli circa 33.

Material examined. NAMIBIA: near Two Palms, Uniab River (19.53S, 13.54E), 27 & 28.iii.1994, 4 ♂♂ (visiting yellow flowers of *Hirpicium gazanioides* (Harv. Roessler, Asteraceae); circa 17km W [of] Khorixas (20.28S, 14.51E), 16.iii.2004, 1 ♂ (visiting pink flowers of *Hermbstaedtia* sp., Amaranthaceae); Uis to Omaruru (21.14S, 15.00E), 14.iii.2004, 5 ♂♂ (visiting white flowers of *Heliotropium tuberosum* E. Mey. ex Benth., Boraginaceae); 24 km SW [of] Usakos (22.02S, 15.17E), 22.iii.1997, 1 ♀ (visiting blue/violet flowers of *Blepharis obmitrata* C. B. Cl., Acanthaceae); SW [of] Gibeon, 41 km on [road] 1089 (25.20S, 17.29E), 8.iii.1999, 1 ♂ (visiting yellow flowers of *Tribulus* sp., Zygophyllaceae); 32 km SW [of] Helmeringhausen (26.06S, 16.36E), 15.iii.1997, 1 ♂ (visiting white flowers of *Psilocaulon glareosum* (Berger) Dinter & Schwantes, Aizoaceae: Mesembryanthema) – (all F.W. and S.K. Gess) [all AMGS]; Namib Plain, 15 m[iles] E.[of] Natab [circa 23.36S, 15.05E], 29.iv.1969 (H.D. Brown), holotype ♂, paratype ♂ [AMGS]; Awasib Mains, Diamond Area No. 2 [25.18S15.39E], 14.v.1969 (H.D. Brown), paratype ♂ [SANC].

Geographical distribution. At the time of description the provenance of the limited material was from the south-western Namib, suggesting that it might be limited to that region. The records now available indicate a much more extensive distribution in the desertic to semi-desertic western parts of Namibia (Fig. 14a).

Floral associations. Recorded from six plant families: Acanthaceae (*Blepharis obmitrata* C. B. Cl.); Aizoaceae (Mesembryanthema, *Psilocaulon glareosum* (Berger) Dinter & Schwantes); Amaranthaceae (*Hermbstaedtia* sp.); Asteraceae (*Hirpicium gazanioides* (Harv.) Roessler; Boraginaceae (*Heliotropium tuberosum* E. Mey. ex Benth.); Zygopyllaceae (*Tribulus pterophorus* Persl.).

Nesting. Unknown.

Prey. Unknown.

Bembix ochracea Handlirsch

http://species-id.net/wiki/Bembix_ochracea

Fig. 13b

Bembex ochracea Handlirsch, 1893: 864, pl. 3, fig. 10, ♂ (Holotype, ♂, South Africa, former Transvaal, no locality, in MHNG); Dalla Torre 1897: 509 (in catalogue of world Hymenoptera); Bingham 1902: 211 (South Africa); Arnold 1929: 386, figs 33, 33a–c, pl. 6, fig. 25, ♂, ♀ (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix ochracea Handlirsch & Parker, 1929: 118, pl. 11, figs 146–148, ♂ (in revision of Stizini and Bembicini); R. Bohart and Menke 1976: 546 (in checklist of world Sphecidae); Gess and Gess 2003: 124 (flower visiting records); Pulawski 2013: 53 (in catalogue of world Sphecidae sensu lato).

Bembex opima Turner, 1917a: 440, ♂, ♀ (Syntypes, South Africa, Eastern Cape, Willowmore, in BMNH); Arnold 1929, synonymised with *B. ochracea* (in revision of southern African Sphecidae); R. Bohart and Menke 1976: 548 (in checklist of world Sphecidae).

Note. *Bembix ochracea* Handlirsch was described from a single damaged specimen "aus Transvaal". Parker referred to a specimen from "Cap", while Arnold recorded it from Willowmore. *Bembix opima* Turner, sunk into synonymy by Arnold, was described from Willowmore (January and February, Dr. H. Brauns).

Material examined. NAMIBIA: Otjinungwa (SE 1712 Ab) [= 17.17S, 12.26E], 17–22.xi.1970 (collector ?), 2 ♀♀ [NMNW]; Marienfluss, 4–8 km S [of] Otjinungwa (SE 1712 Ac) [17.20S, 12.25E], 21–22.xi.1970 (collector ?), 1 ♀, 1 ♂ [NMNW]; near Two Palms, Uniab River (19.53S, 13.54E), 28.iii.2004 (F.W. and S.K. Gess), 1 ♂ (visiting white flowers of *Heliotropium* sp. not *tubulosum,* Boraginaceae) [AMGS]; circa 17 km W [of] Khorixas (20.28S, 14.51E), 16.iii.2004 (F.W. and S.K. Gess), 3 ♂♂ (2 ♂♂ visiting pink flowers of *Hermbstaedtia* sp., Amaranthaceae, 1 ♂visiting yellow flowers of *Geigeria* sp., Asteraceae) [AMGS]; Uis to Khorixas (20.54S, 15.05E), 15.iii.2004 (F.W. and S.K. Gess), 1 ♀ [AMGS]; Uis to Omaruru (21.14S, 15.00E), 14.iii.2004 (F.W. and S.K. Gess), 7 ♀♀ [AMGS]; Uis to Henties Bay (21.26S, 14.45E), 18.iv.2002, (F.W. and S.K. Gess), 2 ♀♀ [AMGS]; Uis/Henties Bay (21.27S, 14.45E), 17.iv.2002 (F.W. and S.K. Gess), 5 ♀♀ (1 ♀ visiting violet flowers of *Monechma genistifolium* (Engl.) C.B. Clarke, Acanthaceae) [AMGS]; 81 km on road from coast to Uis Mine (21.32S, 14.43E), 17. iii.2000 (F.W. and S.K. Gess), 1 ♂ [AMGS]; NW of Cape Cross (21.44S, 13.59E), 14.iii.1999 (F.W. and S.K. Gess), 1 ♀, 2 ♂♂ visiting white flowers of *Brownanthus kuntzei* (Schinz) Ihlenf. & Bittrich, Aizoaceae: Mesembryanthema) [AMGS]; 110 km NW of Swakopmund (21.50S, 14.05F), 15.iii.1999 (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers of *Galenia papulosa* (Eckl. & Zeyh.) Sond., Aizoaceae: non-Mesembryanthema) [AMGS]; Henties Bay to Usakos via Spitzkoppen (21.54S, 14.58E), 19.iv.2002 (F.W. and S. K. Gess), 1 ♀ [AMGS]; 15 km W of Karibib on road to Usakos (21.56S, 15.42E), 5. iv.1998 (F.W. and S.K. Gess), 8 ♀♀, 1 ♂♂ (1 ♀ visiting deep pink flowers of *Hermbstaedtia* sp., Acanthaceae; 1 ♂ visiting violet flowers of *Monechma genistifolium* (Engl.) C.B. Cl., Acanthaceae) [AMGS]; 10 km W of Usakos, Swakopmund r[oa]d (21.59S, 15.30E), 13.iii.2004 (F.W. and S.K. Gess), 1 ♀[AMGS]; Okahandja [21.59S, 16.55E], 27.xii.1977 (Empey), 1 ♀ [AMGS]; Swakopmund 117 km on road to Usakos (22.02S, 15.17E), 16.iii.2000 (F.W. and S.K. Gess), 2 ♀♀ [AMGS]; 37 km from Usakos [on road] to Swakopmund (22.03S, 15.16E), 1.iv.2004 (F. W. and S.K. Gess), 2 ♀♀ (1 ♀ visiting yellow flowers of Asteraceae) [AMGS]; Swakopmund 33 km on road to Usakos (22.34S, 14.49E), 15.iii.2000 (F.W. and S.K. Gess), 1 ♀ (visiting cream flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae [AMGS]; Swakopmund/Usakos near Rössing Mine (22.34S, 14.49E), 5 ♀♀ (F.W. and S.K. Gess) [AMGS]; Swakop River bed on road to Goanikontes (22.41S, 14.35E), 11.iv.1998 (F.W. and S.K. Gess), 1 ♂ (visiting white flowers of *Psilocaulon salicornioides* (Pax) Schwantes, Aizoaceae: Mesembryanthema) [AMGS]; Plains south of Goanikontes (22.42S, 14.47E), 16.iv.2002 (F.W. and S.K. Gess), 17 ♀♀ [AMGS]; Kuiseb River bed at Rooibank (23.11S, 14.39E), 10.iv.1998 (F.W. and S.K. Gess), 6 ♀♀, 1 ♂ (3 ♀♀ visiting yellow flowers of bushy *Geigeria* sp., Asteraceae) [AMGS]; Rooibank [23.11S, 14.39E], 19.xii.1978 (Empey), 5 ♀♀ [AMGS]; between Kuiseb and Gaub passes (23.24S, 15.50E), 23.iii.1999 (F.W. and S.K. Gess), 1 ♀ [AMGS]; Gaub River bed in Gaub Pass (23.29S, 15.46E), 14.iv.1998 (F.W. and S.K. Gess), 2 ♀♀,

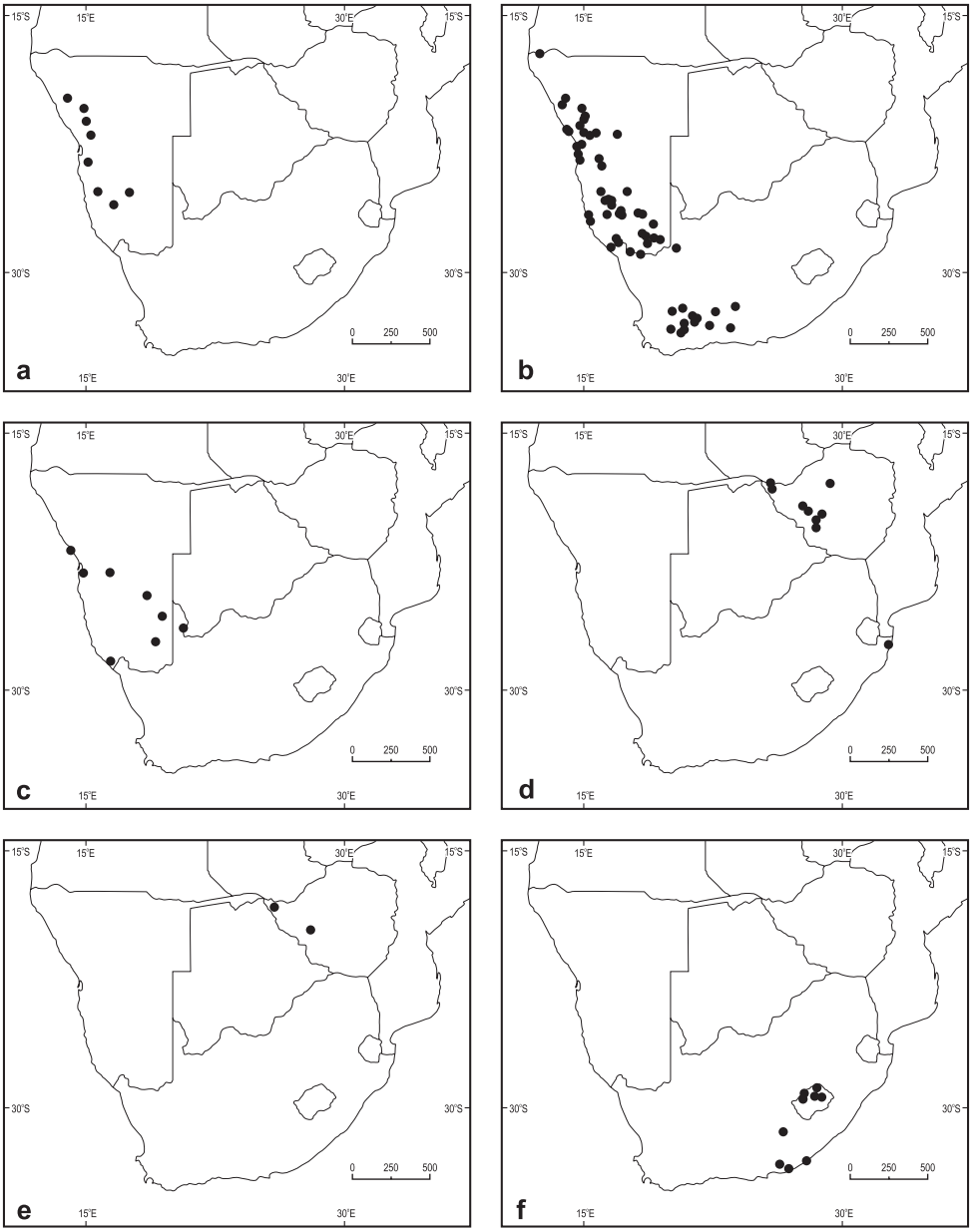

Figure 14. Distributions of collection records of *Bembix* spp.: **a** *namibensis* **b** *ochracea* **c** *olivata* **d** *regnata* **e** *scaura* **f** *sibilans*.

2 ♂♂ (visiting yellow flowers of *Zygophyllum simplex* L., Zygophyllaceae) [AMGS]; Solitaire (23.52S, 16.00E), 30.iv.2002 (F.W. and S.K. Gess), 2 ♀♀ [AMGS]; W [of] Solitaire (23.53S, 16.00E), 6.iv.2002 (F.W. and S.K. Gess), 1 ♀ [AMGS]; Gorrasis 99, Lüderitz (SE 2515 Bd) [25.18S, 15.56E], 12–15.ii.1973 (collector ?), 1 ♀ [NMNW]; SW of

Gibeon, 41 km on [road] 1089 (25.20S, 17.29E), 10.iii.1999 (F.W. and S.K. Gess), 1 ♀ [AMGS]; Sinclair Mine 2, Lüderitz (SE 2516 Cb) [25.43S, 16.23E], 7.x.1972 (collector ?), 1 ♀, 3 ♂♂ [NMNW]; Kanaän 104, Lüderitz (SE 2516 Cc) [25.51S, 16.10E], 6–7.x.1972 (collector ?), 1 ♀, 1 ♂ [NMNW]; Barby 26, Bethanie (SE 2516 Dc) [25.51S, 16.33E], 2–7.x.1972 (collector ?), 10 ♀♀, 1 ♂ [NMNW]; 34 km on [road] C13 from Helmeringhausen (26.05S, 16.38E), 9.iii.1999 (F.W. and S.K. Gess), 2 ♀♀, 1 ♂ (visiting yellow flowers of *Deverra denudata* (Viv.) Pfisterer & Podl., Apiaceae) [AMGS]; 32 km SW of Helmeringhausen (26.06S, 16.36E), 16.iii.1997 (F.W. and S.K. Gess), 3 ♀♀ (1 ♀ visiting yellow flowers of *Deverra denudata* (Viv.) Pfisterer & Podl., Apiaceae) [AMGS]; 12 km E [of] Springbokwater (20.15S, 13.44E), 11.iv.2002 (F.W. and S.K. Gess), 1 ♀ (visiting *Zygophyllum simplex* L., Zygophyllaceae) [AMGS]; Konkiep R[iver] at Bethanie (SE 2717Bd) [26.29S, 17.08E], 23.x.1971 (collector ?), 6 ♂♂ [NMNW]; Keetmanshoop [26.35S, 18.08E], 15.xii.1974 (Empey), 13 ♀♀, 6 ♂♂ [AMGS]; same locality and collector, 29.xii.1977, 7 ♀♀, 9 ♂♂, 19.xi.1984 (F.J. Herbst), 1 ♀ [AMGS]; 17 km E of Keetmanshoop [circa 26.36S, 18.19E], 25.v.1973 (M.F. Johannsmeier), 1 ♀ [AMGS]; near Aus on road to Helmeringhausen (26.37S, 16.20E), 15.iii.1997 (F.W. and S.K. Gess), 3 ♀♀, 3 ♂♂(visiting white flowers of *Psilocaulon glareosum* (Berger) Dinter & Schwantes, Aizoaceae: Mesembryanthema) [AMGS]; Riverside 135, Bethanie (SE 2616 Ca) [26.37S, 17.00E], 23–16 (*sic*). x.1971 (collector ?), 1 ♀ [NMNW]; Klein-Aus Vista (26.39S, 16.15E), 2.iii.2000 (F.W. and S.K. Gess), 5 ♀♀, 1 ♂ [AMGS]; Aus [26.40S, 16.15E], . xii.1929 (R.E. Turner), 2 ♀♀ [SAMC ex NMBZ]; Aus (26.40S, 16.15E), 2.iii.2000, 1 ♂; same locality, 3.iii.2000 (F.W. and S.K. Gess), 2 ♂♂ (visiting yellow flowers of *Acacia* sp., Mimosaceae) [AMGS]; Keetmanshoop/Aus, 96 km E of Aus (26.42S, 17.11E), 28.iii.2000 (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers of *Tribulus* sp., Zygophyllaceae) [AMGS]; Sperrgebiet, Dreizakberg (27.01S, 15.23E), 8.ix.2005 (F.W. and S.K. Gess),1 ♀ (hunting at bushes) [AMGS]; Noachabeb 97, Keetmanshoop (SE 2718 Ad), 7–12.i.1972 (collector ?), 1 ♀ [NMNW]; Karas Mountains, 14 km south on [road] 201 from [road] 26 (27.12S, 18.59E), 7.iii.1999 (F.W. and S. K. Gess), 1 ♂ (visiting yellow flowers of *Geigeria pectidea* (DC.) Harv., Asteraceae) [AMGS]; G[rea]t Karas Mountains, xi.1936 (Mus. Staff), 13 ♀♀, 7 ♂♂ [SAMC]; Grünau [27.44S, 18.23E], 19.xi.1984 (F.J. Herbst), 2 ♀♀, 2 ♂♂ [AMGS]; W of Karasburg on road to Grünau (27.54S, 18.41E), 13.iii.1997 (F.W. and S.K. Gess), 3 ♀♀, 2 ♂♂ (on cream flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae) [AMGS]; Karasburg (28.00S, 18.45E), 13.iii.1997 (F.W. and S.K. Gess), 2 ♂♂ (1 ♂ on cream flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae; 1 ♂ on yellow flowers of *Acacia karroo* Hayne, Mimosaceae) [AMGS]; Karasburg, 14.xii.1974 (Empey), 4 ♀♀ [AMGS]; same locality and collector, 5.i.1975, 4 ♀♀, 9.i.1975, 1 ♀, 10.xii.1983, 2 ♀♀, 2 ♂♂ [AMGS]; 30 km E of Karasburg on road from Ariamsvlei (28.00S, 19.03E), 12.iii.1997 (F.W. and S.K. Gess), 13 ♀♀, 1 ♂♂ (visiting yellow flowers of *Geigeria* sp., Asteraceae) [AMGS]; 10 km NE [of] Rosh Pinah [?], 16.x.1972 (H.D. Brown, E. Koster, A. Prinsloo), 1 ♀ [AMGS]; 16 km S [of] Rosh Pinah (28.04S, 16.51E), 13.x.2000 (F.W. and S.K. Gess), 3 ♀♀, 2 ♂♂ (1 ♀ visiting white flowers of Aizoaceae: Mesembryanthema) [AMGS]; between Karasburg and Ariamsvlei (28.05S, 19.25E), 18.iv.1998 (F.W. and S.K. Gess), 2 ♀♀ (visiting yellow flowers of

Geigeria pectidea (DC.) Harv., Asteraceae) [AMGS]; Ortmansbaum 120, Warmbad (SE 2818 Bd) [28.21S, 18.41E], 18–21.x.1971 (collector ?), 1 ♂ [NMNW]; Gt. Fish R[iver], Aiais [Ais-Ais], S.W.A., xi.1936 (Mus. Staff), 1 ♀.[NMNW]. SOUTH AFRICA: NORTHERN CAPE: Richtersveld (2816BB) [circa 28.16S, 16.55E] at rd. Khubus-Ochta near Vyfsusters Mt., 7.x.1987 (M. Struck), 1 ♀, 1 ♂ [AMGS]; Pachtvlei, E [of] Alexander Bay (28.33S, 16.34E), 10.x.2000 (F.W. and S.K. Gess), 1 ♀ [AMGS]; 23 km N of Kakamas on road to Lutzputz [28.34S, 20.34E], 13.iii.1990 (F.W. and S.K. Gess), 1 ♀ [AMGS]; Augrabies Nat. Reserve [28.35S, 20.20E], 11.xii.1974 (Empey), 1 ♀ [AMGS]; Vioolsdrift, Namaqualand [28.46S, 17.38E], iii.1935 (Museum Staff), 3 ♂♂ [SAMC]; Goodhouse [28.55S, 18.13E], xi.1936 (Mus. Staff), 4 ♀♀, 3 ♂♂ [SAMC]. WESTERN CAPE:Prince Albert Dist., Tierberg (Study Site) (33.10S, 22.16E), 26.xi.-5.xii.1987 (F.W., S.K. and R.W. Gess), 19 ♀♀, 11 ♂♂ (9 ♀♀, 11 ♂♂, on flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae; 2 ♀♀ on flowers of *Carissa haematocarpa* (Eckl.) DC, Apocynaceae); Prince Albert Dist., Tierberg [Study Site] (33.10S, 22.16E), 16.xi.1994 (F.W. and S.K. Gess), 4 ♀♀, 1 ♂ (on cream flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae); Prince Albert Dist., Tierberg (Res[earch Stat[ion]) (33.08S, 22.16E), 26.xi.-5.xii.1987 (F.W., S.K. and R.W. Gess), 7 ♀♀, (2 ♀♀ on flowers of *Acacia karroo* Hayne, Fabaceae, Mimosoideae); Prince Albert Dist., Tierberg Farm (33.10S, 22.15E), 21.i.1996 (F.W. and S.K. Gess), 1 ♂ (visiting cream flowers of *Gomphocarpus filiformis* (E. Mey.) D. Dietr., Asclepiadaceae) [AMGS]; Touwsrivier [33.20S, 20.02E], 9.i.1975 (Empey), 1 ♂ [AMGS]; Bushmans Riv[er], Letjiesbosch, Koup [32.34S, 22.16E], xi1935 (Mus.Staff), 1 ♂ [SAMC]; Letjiesbosch, Koup, iii.1937 (Mus. Staff, 3 ♀♀ [SAMC]; Merweville Dist[rict] [32.40S, 21.31E], ii.1941 (H. Zinn), 2 ♀♀ [SAMC]; Merweville Distr[ict], i-ii.1947 (H. Zinn), 117 ♀♀, 22 ♂♂ [SAMC]; Merweville Distr[ict], 8.ii.1978 (H. Zinn), 2 ♀♀ [SAMC]; Merweville, Laingsburg Distr[ict] [32.40S, 21.31E], i.1959 (H. Zinn), 21 ♀♀, 5 ♂♂ [SAMC]; Dikbome, Merweville, Koup [32.54S, 21.22E], i.1953 (H. Zinn), 41 ♀♀, 77 ♂♂ [SAMC]; Rooinek, Laingsburg Distr[ict] [33.20S, 20.52E], i.1949 (Zinn-Hesse Mus. Exp.), 1 ♂ [SAMC]; Spitzkop, Laingsburg Disr[rict] [33.30S, 20.35E], iii.1938 (Mus. Staff), 1 ♀, 1 ♂ [SAMC]; Thee Kloof [32.05S, 20.41E], Fraserburg Div[ision], xi.1935 (Mus.Staff), 1 ♀, 1 ♂ [SAMC]; Moordenaars Karoo, Laingsburg Div[ision] [circa 32.58S, 20.49E], iii.1937 (Mus. Staff), 1 ♀, 1 ♂ [SAMC]; Moordenaars Karoo, Laingsburg Div[ision], xi.1937 (Mus. Staff), 5 ♀♀, 1 ♂ [SAMC]; Beaufort West Dist[rict] [circa 32.18S, 22.36E], ii.1958 (S.A.M.), 9 ♀♀, 9 ♂♂ [SAMC]; Beaufort West, Oukloof [circa 32.18S, 22.36E], i.1949 (Zinn-Hesse Mus. Exp.), 2 ♀♀, 1 ♂ [SAMC]; Murraysburg Dist[rict][circa 31.58S, 23.47E], iii.1931 (Museum Staff), 3 ♀♀, 6 ♂♂ [SAMC]; Tankwa Karoo, Renoster Riv[er] [circa 32.16S, 20.05E], xi.1952 (Mus.Expd.), 1 ♂ [SAMC]; Gouph, Laingsburg Dist[rict] [circa 33.12S, 20.52E], ix.1937(Museum Staff), 1 ♀, 3 ♂♂ [SAMC]; Vogelfontein, Prince Albert Div[ision], iii-iv.1929 (A. J .Hesse), 4 ♀♀ [3 ♀♀ SAMC; 1 ♀ SAMC ex NMBZ]; Matjiesfontein, 14–27.xi.1928 (R.E. Turner), 1 ♂ [SAMC ex NMBZ]. EASTERN CAPE: Willowmore [33.15S, 23.30E], 5.iii.1902 (Brauns), 1 ♀ [SAMC ex NMBZ]; same locality and collector, 25.xii.1902 (Brauns), 1 ♀ [AMGS], 15.iii.1919 (Brauns), 1 ♂ [SAMC ex NMBZ], 20.i.1922, 1 ♀ [AMGS], no date, 1 ♂ [AMGS].

Geographical distribution. Principally in western semi-arid to arid Namibia extending to the coast and southwards and eastwards through northern Namaqualand across the western and southeastern Nama-Karoo (Fig. 14b).

Floral associations. Recorded from nine plant families: Boraginaceae (*Heliotropium* sp. not *tubulosum*); Acanthaceae (*Monechma genistifolium* (Engl.) C.B. Clarke); Amaranthaceae (*Hermbstaedtia* sp.); Asteraceae (*Geigeria pectidea* (DC.) Harv. and *Geigeria* sp. (Asteraceae)); Aizoaceae (Mesembryanthema, *Brownanthus kuntzei* (Schinz) Ihlenf. & Bittrich, *Psilocaulon salicornioides* (Pax) Schwantes (Aizoaceae: Mesembryanthema) and *Psilocaulon glareosum* (Berger) Dinter & Schwantes; non-Mesembryanthema, *Galenia papulosa* (Eckl. & Zeyh.) Sond.); Zygophyllaceae (*Tribulus* sp. and *Zygophyllum simplex* L.); Apiaceae (*Deverra denudata* (Viv.) Pfisterer & Podl.); Fabaceae (Mimosoideae, *Acacia* sp.); Apocynaceae (*Carissa haematocarpa* (Eckl.) DC; formerly Asclepiadaceae, *Gomphocarpus filiformis* (E. Mey.) D. Dietr.).

Nesting. Unknown.

Prey. Unknown.

***Bembix olivata* Dahlbom**
http://species-id.net/wiki/Bembix_olivata
Fig. 13c

Bembex olivata Dahlbom, 1845: 491, ♀ (Holotype or syntype, ♀, South Africa, Cape of Good Hope, in Lund or Stockholm); Handlirsch 1893: 812, pl. 2, fig. 17, pl. 5, fig. 23, ♂, ♀ (in revision of world Bembicini); Dalla Torre 1897: 510 (in catalogue of world Hymenoptera); Magretti 1899: 51 (Somalia); Bingham 1902: 211 (Malawi); Cameron 1910: 144 (Olifants River [Mpumalanga] South Africa); Schouteden 1930: 96 (Zaire).

Bembix olivata Dahlbom, R. Bohart and Menke 1976: 548 (in checklist of world Sphecidae); Pulawski 2013: 63 (in catalogue of world Sphecidae sensu lato).

Bembex intermedia Dahlbom, 1845: 491, ♀ (Holotype or syntypes, ♀, South Africa, Port Natal (now Durban), in Lund or Stockholm); Handlirsch 1893: 812 (tentatively synonymised with *Bembex olivata*, in revision of world Bembicini); Arnold 1929: 358, figs 23, 23a, 23b, pl. 6, fig. 19, ♂, ♀ (in revision of southern African Sphecidae as valid name for *Bembex olivata*); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Arnold 1935: 503 (Metsimaklaba, Kalahari, 12.iii.1930, Vernay-Lang Expedition, 3 ♂♂, 6 ♀♀).

Bembix intermedia Dahlbom & Arnold, 1951: 138 (Ethiopia, Danakil, Mille River, vii.1946, K.M. Guichard, ♀); Gess and Gess 2003: 124 (flower visiting records).

Material examined. NAMIBIA.Swakopmund (21.51 S14.05E), 12.iv.1998 (F.W. Gess and S.K. Gess) 1 ♀ (visiting yellow flowers of *Senecio* sp. Asteraceae) [AMGS]; Swakopmund, 12.iv.1998 (F.W. Gess and S.K. Gess) 1 ♀ 2 ♂♂ (visiting yellow flowers of *Zygophyllum simplex* L., Zygophyllaceae) [AMGS]; Rooibank, Kuiseb R. (23.11S,

14.49E), 10.iv.1998, (F.W. Gess and S.K. Gess) 3 ♂♂ (visiting yellow flowers of *Geigeria pectidea* (DC.) Harv.), Asteraceae) [AMGS]; Rooibank, Kuiseb R., 10.iv.1998, (F.W. Gess and S.K. Gess) 3 ♂♂ (visiting yellow flowers of *Zygophyllum simplex* L., Zygophyllaceae) [AMGS]; Hakos/Weissenfels (28.18S, 16.23E), 21.iii.2000 (F.W. Gess and S.K. Gess) 1 ♀, 1 ♂ (visiting white flowers of *Selago dinteri* Rolfe, Scrophulariaceae) [AMGS]; Rehoboth (23.10S, 16.42E), 11.iii.1999, (F.W. Gess and S.K. Gess) 4 ♂♂ (visiting pink flowers of *Hermbstaedtia odorata* (Burch.) T. Cooke, Amaranthaceae) [AMGS]; Aranos/Stampriet (24.30S, 18.32E), 27.iii.2000 (F.W. Gess and S.K. Gess) 9 ♂♂ (visiting pink flowers of *Hermbstaedtia odorata* (Burch.) T. Cooke, Amaranthaceae) [AMGS]; Koes/Gochas (25.40S, 19.24E), 7.iii.2000 (F.W. Gess and S.K. Gess) 1 ♀ (visiting yellow flowers of Tribulus sp., Zygophyllaceae) [AMGS]; Gross Nabas (24.30S, 18.32E), 30.iii.2000 (F.W. and S. K. Gess) 1 ♀ (visiting white flowers of *Limeum argute-carinatum* Wawra & Peyr., Molluginaceae) [AMGS]; Karasberge (27.09S, 19.01E) 5.iii.2000 (F.W. and S.K. Gess), 1 ♀ (visiting white flowers of *Limeum argute-carinatum* Wawra & Peyr., Molluginaceae) [AMGS]. NORTHERN CAPE: Twee Rivieren (26.24S, 20.40E), 8–11.iii.1990 (F.W. Gess and S.K. Gess) 27 ♀♀, 27 ♂♂ (visiting yellow flowers of *Deverra denudata* (Viv.) Pfisterer & Podl., Apiaceae) [AMGS].

Additional records extracted from database of specimens in collection of SAMC were determined by G. Arnold and H. Brauns, from Namibia and from KwaZulu-Natal, Mfongosi [28.43S, 30.48E].

Geographical distribution. In southern Africa recorded from the northwestern Namibian coast at Swakopmund south eastwards through Namibia to the southern Kalahari and also from KwaZulu-Natal (Fig. 14c). Also recorded from Ethiopia and Somalia in the northeast and Zaire in the northwest. The overall distribution is therefore unclear and further records are required to establish a distribution pattern.

Floral associations. Recorded from six plant families: Molluginaceae (*Limeum argute-carinatum* Wawra & Peyr); Amaranthaceae (*Hermbstaedtia odorata* (Burch.) T. Cooke); Apiaceae (*Deverra denudata* (Viv.) Pfisterer & Podl .); Asteraceae (*Geigeria pectidea* (DC.) Harv.) and *Senecio* sp.); Scrophulariaceae (*Selago dinteri* Rolfe); Zygophyllaceae (*Tribulus* sp. and *Zygophyllum simplex* L.).

Nesting. Unknown.

Prey. Unknown.

Bembix regnata J. Parker

http://species-id.net/wiki/Bembix_regnata
Fig. 13d

Bembix regnata Parker, 1929 (June): 111, pl. 13, figs 179–183, ♂, ♀ (Holotype, ♂, Tanganyika [Tanzania] in ZMNH); Arnold 1931: 209, 216; Benson 1934 (prey Lepidoptera); Gess 1986: 158 (prey listed); R. Bohart and Menke 1976: 548 (in checklist of world Sphecidae); Evans 2002a: 5 (known to prey on Lepidoptera) Pulawski 2013: 70 (in catalogue of world Sphecidae sensu lato).

Bembix speciosa Arnold, 1929 (December): 337, figs 8, 8a-e, ♂, ♀ (Syntypes, ♂, Southern Rhodesia [Zimbabwe], Gwaai, in SAMC ex NMBZ) (in revision of southern African Sphecidae); Arnold 1931: 209, 216 (synonymised with *regnata*); R. Bohart and Menke 1976: 548 (in checklist of world Sphecidae).

Note. *Bembix regnata* was described by Parker from two localities in Tanganyika (Usaramo and Rufiaji Klurtusteppe) and Nyasa [Malawi] (Lake Nyasa). Arnold described his *speciosa* from Southern Rhodesia [Zimbabwe] (Gwaai, Victoria Falls, Matopos, Sanyati Valley and Bulawayo).

Material examined. ZIMBABWE: Gwaai [= Gwai] [19.17S, 27.43E], 16.i.1927 (G. Arnold), 1 ♀, 1 ♂ Types of *B. speciosa* Arnold [SAMC ex NMBZ]; Matopos [20.35S, 28.30E], 18.xi.1923 (Rhodesia Museum), 1 ♂ [SAMC ex NMBZ]; Sanyati Valley [17.58S, 29.17E], ix-x.1925 (R.H. R. Stevenson), 1 ♂ [SAMC ex NMBZ]; Turk Mine [19.44S, 28.48E], 16.xii.1957 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Sawmills [19.35S, 28.02E], 4.ii.1926 (R.H.R. Stevenson), 1 ♂ [SAMC ex NMBZ]; Wangezi Riv. [?], i.1928 (R.H.R. Stevenson), 1 ♂ [SAMC ex NMBZ]; W. Matetsi [18.15S, 25.55E], iv.1934 (R.H.R. Stevenson), 3 ♀♀, 1 ♂ [SAMC ex NMBZ]; Bulawayo [20.07S, 28.32E], 24.xii.1924 (R.H.R. Stevenson), 1 ♀ SAMC ex NMBZ]; Bulawayo [20.07S, 28.32E], 16.i.1938 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]; Victoria. Falls [17.55S, 25.50E], 1934 (Nat. Museum S. Rhodesia), 1 ♀ [SAMC ex NMBZ]; Westwood, Vic. Falls, [circa 17.56S, 25.50E] 26. iii.1934 (R.H.R.S.), 1 ♀ [SAMC ex NMBZ]; Westwood nr Matetsi [18.17S, 25.5E], 30.iii.1934 30.iii.1934 (R.H.R. Stevenson), [SAMC ex NMBZ]; SOUTH AFRICA: KWAZULU-NATAL: Lake Sibaya [27.23S, 32.41E], 13–25.iii.1968 (D.J. Brothers), 1 ♂ [AMGS].

Additional records extracted from database of specimens in collection of SAMC are six specimens from Zimbabwe and one specimen from Nyaka (no country given), no sexes or determiners given.

Geographical distribution. From north to south Zimbawe, in South Africa known from one specimen from northern coastal KwaZulu-Natal (Fig. 14d). Further records are required to establish a distribution pattern.

Floral associations. Unknown.

Nesting. Unknown.

Prey. Recorded taking three families of Lepidoptera: Pieridae, Hesperidae, and Nymphalidae (Benson 1934).

***Bembix scaura* Arnold**

http://species-id.net/wiki/Bembix_scaura
Fig. 13e

Bembex scaura Arnold, 1929: 340, figs 10. 10a-e, pl. 6, fig. 51, ♂, ♀ (Syntypes, ♂, S. Rhodesia [Zimbabwe], Sawmills and ♀, Sawmills, S. Rhod. [Zimbabwe], in SAMC ex NMBZ) (in revision of southern African Sphecidae).

Bembix scaura Arnold, R. Bohart and Menke 1976: 548 (listed in checklist of world Sphecidae); Pulawski 2013: 79 (in catalogue of world Sphecidae sensu lato).

Material examined. ZIMBABWE: Sawmills [19.35S, 28.02E], S. Rhodesia, 1.iv.1923 (G. Arnold), Holotype ♂; Sawmills, S. Rhod, 1st April, 1923 (Roy Stevenson), Allotype ♀; W. Matetsi, iv. 1934 (R.H.R. Stevenson) 1 ♀; Westwood, nr. Matetsi [18.15S, 25.55E], 30.iii.1930 (R.H.R. Stevenson) 1 ♂ [all SAMC ex NMBZ].

Geographical distribution. Known only from Zimbabwe (Fig. 14e).

Floral associations. Unknown.

Nesting. Unknown.

Prey. Unknown.

***Bembix sibilans* Handlirsch**

http://species-id.net/wiki/Bembix_sibilans

Fig. 13f

Bembex sibilans Handlirsch, 1893: 852, pl. 3, fig. 3. Pl. 7, fig. 30, ♂, ♀ (Syntypes, South Africa, Cape Province, no locality, in NMW, ZMHB, TMB, RMCA); Dalla Torre 1897: 514 (in catalogue of world Hymenoptera); Bingham 1902: 211 (South Africa, Malawi); Arnold 1929: 374, figs 37, 37a, 37b, pl. 6, fig. 31, ♂, ♀ (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix sibilans Handlirsch & Lohrmann, 1948: 448 (member of *fuscipennis* species group); de Beaumont 1967: 506 (South Africa, Cape Province); R. Bohart and Menke 1976: 548 (in checklist of world Sphecidae); Gess 1981: 21 (habitat); Gess 1986: 154–155, 158 (plants visited, nesting, prey); S. Gess 1996: 275, 291, 304 (flower visiting records); Gess and Gess 2003: 125 (flower visiting records); Evans and O'Neil 2007: 185 (summary of information on nesting habits); Pulawski 2013: 80 (in catalogue of world Sphecidae sensu lato).

Material examined. LESOTHO: Bokong P.O. [29.17S, 28.23E], 26.xii.1946 (L. Bevis), 1 ♂ [AMGS]; Leribe [28.52S, 28.3E], 22.xii.1933 (C. Guillarmod), 1 ♀ [AMGS]; Malinguaneng [29.19S, 28.47E], 15.i.1955 (A. Jacot-Guillarmod), 1 ♀ [AMGS]; Mamathes [29.08S, 27.51E], ii.1940 (C. Jacot-Guillarmod), 1 ♂, iv.1940 (C. Jacot-Guillarmod), 1 ♀, xi.1940 (C. and A. Jacot-Guillarmod), 2 ♂♂, xii.1940 (C. and A. Jacot-Guillarmod), 2 ♂♂, xii.1941 (C. and A. Jacot-Guillarmod), 1 ♀, 13.i.1945 (A. Jacot-Guillarmod), 1 ♀, 5.i.1946 (C. Jacot-Guillarmod), 1 ♀, 15.xii.1946 (C. Jacot-Guillarmod), 1 ♂, 14.xi1948 (C. Jacot-Guillarmod), 1 ♀, 8.xi.1949 (C. Jacot-Guillarmod), 4 ♂♂, 13.xi.1949 (C. Jacot-Guillarmod), 3 ♂♂, 17.xi.1949 (C. Jacot-Guillarmod), 2 ♂♂, 18.xi.1949 (C. Jacot-Guillarmod), 1 ♂, 1.xi.1951 (C. Jacot-Guillarmod), 1 ♂, 2.xi.1951 (C. Jacot-Guillarmod), 1 ♂, 4.xi.1951

(C. Jacot-Guillarmod), 1 ♀, 7.xi.1951 (A. Jacot-Guillarmod), 1 ♂, 18.xi.1951 (C. Jacot-Guillarmod), 2 ♂♂, 23.xi.1952 (C. Jacot-Guillarmod), 1 ♀, 22.xi.1952 (C. Jacot Guillarmod), 1 ♀, 2.i.1953 (C. Jacot-Guillarmod), 1 ♀, 14.xi.1954 (C. Jacot-Guillarmod), 1 ♀, 22.i.1956 (C. Jacot-Guillarmod), 1 ♀, 1.xii.1957 (C. Jacot-Guillarmod), 1 ♀ [all AMGS]; Roma [29.28S, 27.44E], 17.xii.1964 (C. Jacot-Guillarmod), 3 ♂♂ [AMGS]; Roma, 17.xii.1964 (D.J. Brothers), 1 ♀, 1 ♂ [AMGS]. SOUTH AFRICA: EASTERN CAPE: Bathurst [33.29S, 26.50E], 14.i.1959 (C. Jacot-Guillarmod), 1♂ [AMGS], Belmont Valley [33.19S, 26.35E], Grahamstown, 24.i.1970 (C. Jacot-Guillarmod), 1 ♀ (on flowering *Foeniculum vulgare* Mill., Apiaceae) [AMGS]; East London [33.03S, 27.55E], no date given (G. Rattray), 1 ♂ [AMGS]; Gxulu River [33.07S, 22.44E], 15.xii.1970 (F.W. Gess), 1 ♀ [AMGS]; Hilton farm [33.15S, 26.20E], Grahamstown, 1–4.xii.1970 (F.W. Gess), 1 ♂ (Malaise trap). WESTERN CAPE: Grootbos Nature Reserve (34.31S, 19.26E), 20.xi.2012 (S.K. Gess), 1 ♂ (on sandy road, female sighted taking prey into nest) [AMGS].

Additional records extracted from database of specimens in collection of SAMC are eight specimens from Lesotho, Mamathes, two determined by G. Arnold, and a nineth specimen from Port Elizabeth determined by H. Brauns, no sexes given.

Geographical distribution. Known only from Lesotho and the Eastern Cape (Fig. 14f).

Floral associations. Recorded from four plant families: Apiaceae (one female on flowering *Foeniculum vulgare* Mill.); Asteraceae (*Berkheya heterophylla* (Thunb.) O. Hoffm. and *Chrysocoma ciliate* L.); Boraginaceae (*Anchusa capensis* Thunb.); Scrophulariaceae (*Phyllopodium cuneifolium* (L. *f.*) Benth.).

Nesting. Two nests were investigated, one at Hilton and the other at Slaaikraal, both Eastern Cape. Both were single-celled sloping burrows excavated in friable soil. Unlike the nests of other species of southern African species, in neither nest did the main shaft end in a spur.

Prey. Recorded taking six families of Diptera: Tabanidae, Nemestrinidae, Bombyliidae, Calliphoridae, Sarcophagidae, and Tachinidae.

***Bembix triangulifera* Arnold**

http://species-id.net/wiki/Bembix_triangulifera
Fig. 15a

Bembix stevensoni (non Parker) Arnold, 1929: 331, figs 3, 3a, 3b; Plate VI, fig.48, ♂, (Holotype, ♂, Southern Rhodesia [Zimbabwe], Bulawayo, in SAMC ex NMBZ) (in revision of southern African Sphecidae).

Bembix triangulifera Arnold, 1944: 23, ♀ (substitute name for *stevensoni*); R. Bohart and Menke 1976: 549 (in checklist of world Sphecidae); Pulawski 2013: 88 (in catalogue of world Sphecidae sensu lato).

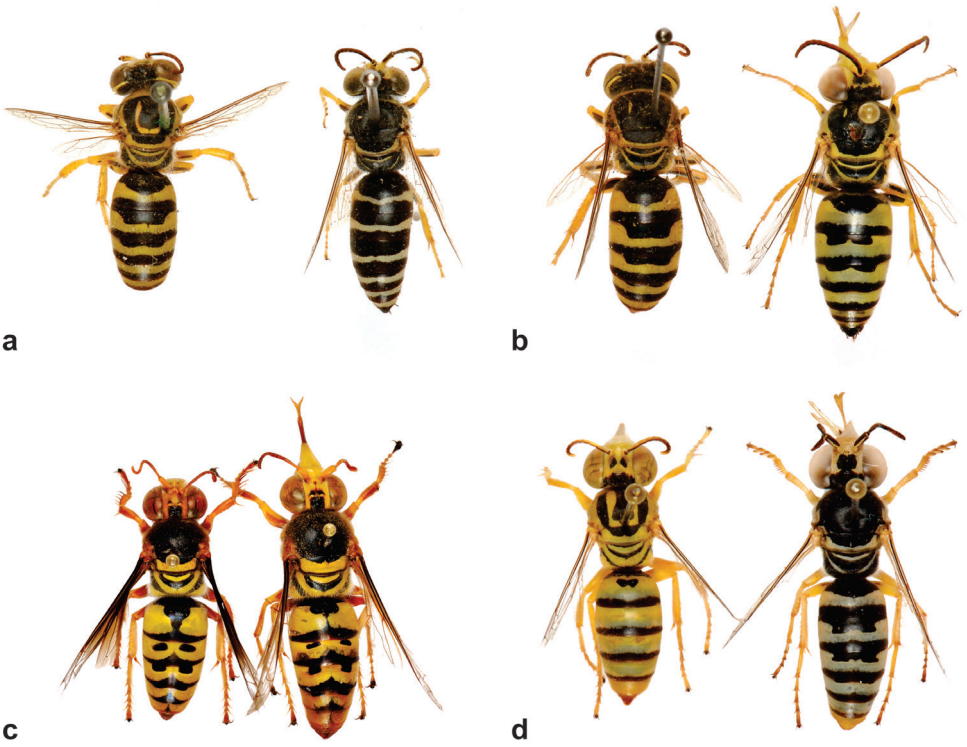

Figure 15. *Bembix* spp.: **a** *triangulifera*, female, male **b** *ulula*, female, male **c** *venusta*, female, male **d** *zinni*, female, male. (approximate lengths of females: **a** 14.5 mm; **b** 15.5 mm; **c** 22 mm; **d** 14 mm).

Note. The specific name, *stevensoni*, proposed by Arnold (December, 1929) is pre-occupied by *stevensoni* Parker (June, 1929) and in consequence Arnold (1944) proposed the substitute name *triangulifera*, at the same time describing the hitherto unknown female. However, both the holotype male and the allotype female are labelled in Arnold's handwriting as *angulifera*, not *triangulifera*.

Material examined. ZIMBABWE: W. Matetsi [18.15S, 25.55E], iv.1934 (R.H.R. Stevenson), 1 ♀; Sawmills [19.35S, 28.02E], 11.iii.1924 (R.H.R. Stevenson), 1 ♂; same locality and collector, 12.iii.1924, 1 ♂; Igusi [19.40S, 28.05E], 9.iii.1941 (Nat. Museum S. Rhodesia), 2 ♂♂; Umgusa Valley [20.02S, 28.34E], 16.ii.1941 (Nat. Museum S. Rhodesia), allotype ♀, 1 ♂; Bulawayo [20.07S, 28.32E], 7.i.1923 (Rhodesia Museum), holotype ♂ [all SAMC ex NMBZ]. SOUTH AFRICA: MPUMALANGA: Newington, Komatipoort [25.25S, 31.55E], 9.i.1912 (J.P. Fenouhlet), 1 ♀; NORTH WEST PROVINCE: Rustenburg [25.41S, 27.14E], 1.viii.1967 (H.N. Empey), 1 ♂. NORTHERN CAPE: Campbell [28.48S, 23.44E], 7.i.1916 (collector ?), 1 ♀ [all AMGS].

Geographical distribution. Known only from Zimbabwe and northern South Africa (Fig. 16a).

Floral associations. Unkown.
Nesting. Unknown.
Prey. Unknown

***Bembix ululula* Arnold**
http://species-id.net/wiki/Bembix_ululula
Fig. 15b

Bembex ululula Arnold, 1929: 330, figs 2, 2a, 2b, Pl.VI, figs 3, 43, ♂, ♀ (flower visiting), (Syntypes, Southern Rhodesia [Zimbabwe], Gwaai, in SAMC ex NMBZ and Zimbabwe, in SAMC) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae); Arnold 1935: 503 (Botswana);
Bembix ululula Arnold, Bohart and Menke 1976: 549 (in checklist of world Sphecidae); Gess 1986 (justification of synonymy with *Bembix junodi*): 147; Pulawski 2013: 90 (in catalogue of world Sphecidae sensu lato).
Bembix Junodi Arnold, 1929: 379, figs 42, 42a, 42b, 42c, Pl. VI, fig 45, ♂ (Holotype, ♂, Mozambique, Lourenço Marques (now Maputo), in TMSA) (in revision of southern African Sphecidae); Gess 1986: 147 (synonymized with *B. ululula*).

Material examined. ZIMBABWE: W. Matetsi [18.15S, 25.55E], iv.1934 (R.H.R. Stevenson), 2 ♀♀ [SAMC ex NMBZ]; Lupane [18.55S, 27.45E], xii.1938 (National Museum S. Rhodesia), 1 ♀ [AMGS], 1 ♂ [SAMC ex NMBZ]; Gwaai [19.17S, 27.43E], 16.i.1927 (G. Arnold), 1 ♂ (holotype), 1 ♀ (allotype), 1 ♀ [SAMC ex NMBZ]; Insuza River [19.25S, 18.05E], 24.xii.1939 (Nat. Museum S. Rhodesia), 1 ♂ [SAMC ex NMBZ]; Sawmills [19.35S, 28,02E], 22–27.xii.1923 (R.H.R. Stevenson), 1 ♀ [AMGS]; same locality, 22.ii.1925 (Rhod. Museum), 1 ♀ [SAMC ex NMBZ]; same locality, 4.ii.1926 (R.H.R. Stevenson, 1 ♀ [SAMC ex NMBZ]. NAMIBIA: circa 17km W [of] Khorixas (20.28S, 14.51E), 16.iii.2004 (F.W. and S. K. Gess), 1 ♂ (visiting pink flowers of *Hermbstaedtia* sp., Amaranthaceae) [AMGS]. SOUTH AFRICA: KWAZULU-NATAL: Manguzi River near Maputa, Z[ululand] [circa 26.59S, 32.45E], xi-xii.1945 (H. Bell-Marley), 1 ♂ [AMGS]. NORTHERN CAPE: ??, 24–27.iv.1973 (M.W. Mansell), 1 ♀ (Malaise trap) [AMGS].

Additional records given by Arnold 1929 and 1935: ZIMBABWE: Victoria Falls [17.55S, 25.50E], Springvale [18.22S, 30.22E]. BOTSWANA: Kuke Pan, Kalahari [23.23S, 24.27E].

Geographical distribution. Known from Zimbabwe, Namibia, Botswana, northern KwaZulu-Natal and the Northern Cape (Fig. 16b).

Floral associations. Recorded from two plant families: Amaranthaceae (one record only, a female visiting flowers of *Hermbstaedtia* sp.) (Gess and Gess); Fabaceae, Papilionoideae, "small leguminous, clover-like plant (Arnold).

Nesting. Unknown.

Prey. Unkown.

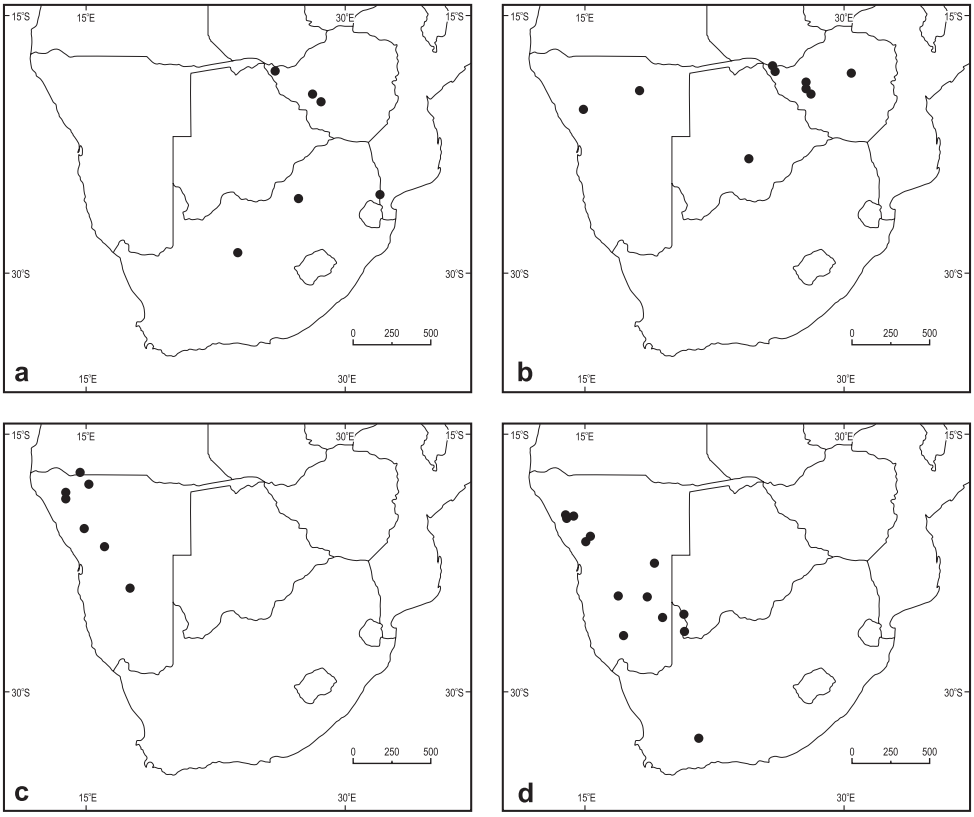

Figure 16. Distributions of collection records of *Bembix* spp.: **a** *triangulifera* **b** *ulula* **c** *venusta* **d** *zinni*.

***Bembix venusta* Arnold**
http://species-id.net/wiki/Bembix_venusta
Fig. 15c

Bembex venusta Arnold, 1929: 347, figs 15, 15a-d, plate VI, figs 35, 47, ♂, ♀ (Syntypes, Namibia, Kamanyab (sic) [Kamanjab] and Namibia, various localities, in SAMC) (in revision of southern African Sphecidae); Arnold 1930: 21 (in checklist of Afrotropical Sphecidae).

Bembix venusta Arnold & Lohrmann, 1948: 447 (member of *diversipennis* species group); R. Bohart and Menke 1976: 549 (in checklist of world Sphecidae); Gess and Gess 2003: 125 (flower visiting records); Pulawski 2013: 91 (in catalogue of world Sphecidae sensu lato).

Material examined. ANGOLA: Eriksons' Drift, Kunene River [circa 17.15S, 14.36E], iii.1923 (S.W. Africa Mus. Exped.) [A.J. Hesse et al.], paratype ♀, paratype ♂ [SAMC ex NMBZ]. NAMIBIA: Ongandjera [17.55S, 15.05E], iii.1923 (S.W. Africa Mus. Exped.) [A.J. Hesse et al.], 1 ♀ [SAMC ex NMBZ]; [on road] 3704 to Sesfontein

57 km from Opuwa (18.29S, 13.48E), 20.iii.1999, 1 ♀; on [road] 3704 to Opuwa 53 km from Sesfontein (18.49S13.46E), 19.iii.1999, 1 ♀; 23 km by r[oa]d to Uis on [road] C35 from [road] C39 (20.31S, 14.5E), 1.iv.1997, 1 ♂ (visiting white flowers of *Leucas pechuelii* (Kuntze) Guerke, Lamiaceae); between Omaruru and Wilhemstal (21.31S, 16.03E), 3.iv.1998, 7 ♀♀, 4 ♂♂ (4 ♀♀, 4 ♂♂ visiting deep pink flowers of *Hermbstaedtia odorata* (Burch.) T. Cooke, Amaranthaceae; 1 ♀ with prey: Bombyliidae); c[irca] 9 km S [of] Omaruru on r[oa]d to Karibib (21.32S, 15.58E), 24. iii. 1997, 1 ♂; 22 km N [of] Kalkrand (23.55S, 17.28E), 3.iv.2004, 1 ♂ (visiting yellow flowers of *Gazania pectidea* (DC.) Harv., Asteraceae) – (all F.W. and S.K. Gess) [all AMGS].

Additional localities recorded by Arnold (1929) but specimens not seen by the present authors: NAMIBIA: Ombombo [18.40S, 13.56E]; Kamanjab [19.38S, 14.49E]; Otjimbumbe [locality not traced].

Geographical distribution. Northern Namibia and across the Kunene in southern Angola (Fig. 16c).

Floral associations. Recorded from three plant families: Amaranthaceae (*Hermbstaedtia odorata* (Burch.) T. Cooke); Asteraceae (*Gazania pectidea* (DC.) Harv.); Lamiaceae (*Leucas pechuelii* (Kuntze) Guerke).

Nesting. Unknown.

Prey. Recorded taking one family of Diptera: Bombyliidae (one female captured with bombyliid prey).

***Bembix zinni* Gess**
http://species-id.net/wiki/Bembix_zinni
Fig. 15d

Bembix zinni Gess, 1986: 140, figs 9–19, ♂, ♀ (Holotype, ♂, South Africa, Laingsburg District, Merweville, in SAMC); S. Gess 1996: 266, 284 (flower visiting records); Gess and Gess 2003: 126 (flower visiting records); Pulawski 2013: 93 (in catalogue of Sphecidae sensu lato).

Material examined. NAMIBIA: 24 km N [of] Palm Wag (19.43S, 13.51E), 18.iii.1999 (F.W. and S.K. Gess), 2 ♀♀ [AMGS]; Western end of Grootberg Pass (19.47S, 14.17E), 19.iii.2004 (F.W. and S.K. Gess), 1 ♀ (visiting white flowers of *Heliotropium tubulosum* E. Mey. ex .DC., Boraginaceae) [AMGS]; Two Palms, Uniab River (19.53S, 13.54E), 27.iii.2004 (F.W. and S.K. Gess), 1 ♀ (at water) [AMGS]; same locality, 28.iii.2004 (F.W. and S.K. Gess), 4 ♀♀ (visiting white flowers [of] *Heliotropium tubulosum*) [AMGS]; road D344 WNW [of] Omatjete (20.57S, 15.14E), 15.iii.2004 (F.W. and S.K. Gess), 2 ♀♀ [AMGS]; Uis to Omaruru (21.14S, 15.00E), 21.iii.2004, (F.W. and S.K. Gess), 1 ♀ (visiting yellow flowers [of] *Cleome* sp., Capparaceae) [AMGS]; Gobabis [22.30S, 18.58E], 12.xii.1983 (Empey), 2 ♀♀, 3 ♂♂ [AMGS]; Nomtsas (24.25S, 16.51E), 18.iii.1997, 3 ♀♀ (1 ♀ visiting deep pink flowers of *Sesuvium sesuvioides* (Fenzl) Verdc., Aizoaceae: non-Mesembryanthema; 2 ♀♀ visiting white

flowers of *Limeum argute-carinatum* Wawra & Peyr., Molluginaceae); 18 km SE [of] Stampriet on [road] C15 to Gochas (24.28S, 18.30E), 29.iii.2000, 1 ♀ (visiting white flowers of *Limeum argute-carinatum*); Gross Nabas, 24 km SE [of] Stampriet (24.30S, 18.32E), 30.iii.2000, 7 ♀♀, 1 ♂ (1 ♀ visiting orange/pink flowers of *Indigofera* sp., Papilionaceae; 6 ♀♀, 1 ♂ visiting white flowers of *Limeum argute-carinatum*); S [of] Maltahöhe, on [road] D811 (25.15S, 17.01E), 23.iii.1999, 1 ♀; 8, 10 & 24.iii.1999, 8 ♀♀, 3 ♂♂ (1 ♀ visiting white flowers of *Limeum* sp.); 2 km from [road] C17 on [road] R511 to Mata Mata (25.37S, 19.25E), 8.iii.2000, 1 ♀ 1 ♂ (♂ visiting white flowers of *Limeum argute-carinatum*); Köes to Gochas (25.39S, 19.24E), 8.iii.2000, 1 ♀, 1 ♂ (♀ with prey: Bombyliidae); Keetmanshoop/Aus, 96 km E of Aus (26.42S, 17.11E), 28.ii.2000, 1 ♀ - (all F.W. and S.K. Gess) [all AMGS]; Karasburg [28.00S, 18.43E], 14.xii.1974 (Empey), 8 ♀♀; same locality, 5.i.1975 (Empey), 4 ♀♀, 2 ♂♂ [AMGS]. SOUTH AFRICA: NORTHERN CAPE: Kalahari Gemsbok National Park, Nossob River bed, circa 20 km S of Nossob Rest Camp [circa 25.30S, 20.38E], 8.iii.1990 (F.W. and S.K. Gess), 1 ♀ (on yellow flowers *Tribulus cristatus* Presl., Zygophyllaceae); Kalahari Gemsbok National Park, Nossob River bed, 11 km NNE of Twee Rivieren [26.24S, 20.41E], 8–11.iii.1990 (F.W. and S.K. Gess), 3 ♀♀, 3 ♂♂ (1 ♀ on yellow flowers of *Pentzia incana* (Thunb.) Kuntze, Asteraceae; 2 ♀♀, 3 ♂♂ (on white flowers of *Limeum aethiopicum* Burm.) – (all F.W. and S.K. Gess) [all AMGS]; WESTERN CAPE: Merweville, Laingsburg Dist. [32.40S, 21.31E], i–ii.1947 and i.1959 (H. Zinn), holotype ♂, paratype ♂, 4 paratype ♀♀ [SAMC], paratype ♂, 3 paratype ♀♀ [AMGS].

Geographical distribution. Previously known only from the type locality. The here listed data indicate an extensive and continuous distribution ranging in the north from Palm Wag in Namibia to, in the south, the Kalahari Gemsbok National Park in South Africa. At present the type locality, Merweville in the Western Cape, appears separated from the above, most probably due to a hiatus of collecting (Fig. 16d). It is probably at the southern limit of the species' distribution.

Floral associations. Recorded from seven plant families: Apiaceae (*Deverra denudata* (Viv.) Pfisterer & Podl.); Molluginaceae (*Limeum aethiopicum* Burm. and *Limeum argute-carinatum* Wawra & Peyr.); (Aizoaceae (non-Mesembryanthema, *Sesuvium sesuvioides* (Fenzl) Verdc.); Asteraceae (*Pentzia incana* (Thunb.) Kuntze); Boraginaceae (*Heliotropium tubulosum* E. Mey. ex .DC.); Capparaceae (*Cleome* sp.); Fabaceae (Papilionoideae, *Indigofera* sp.; Zygophyllaceae (*Tribulus cristatus* Presl.).

Nesting. Unknown.

Prey. Unknown.

Discussion of geographical distributions, flower associations and prey

The distribution records here assembled make possible the recognition of geographical distribution patterns for many of the species occurring in southern Africa, however,

for others the number of records remains too few, drawing attention to species which require purposeful collecting.

The most widespread with respect to both latitude and longitude are *B. capensis* (Fig. 6c) and *B. fuscipennis*(Fig. 9d). Neither is restricted to southern Africa, the distributions of both extend northwards, the former to Egypt and the latter to Ethiopia in the northeast and Zaire in the northwest.

Widespread throughout South Africa and Lesotho and with a single record from Zimbabwe is *B. albofasciata* (Fig. 2c).

Species with an apparently relatively widespread eastern distribution are: *B. diversipennis* (Fig. 9a), from northeastern South Africa, Zimbabwe and Mozambique to Ethiopia; *B. flavicincta* (Fig. 9b) from Limpopo, South Africa through Zimabwe to Malawi; *B. melanopa* (Fig. 12d) principally from eastern South Africa and Zimbabwe to Kenya.

A species with an apparently relatively widespread principally western distribution within southern Africa and not extending northwards is *B. ochracea* (Fig. 14b), which appears to be a species of both the Succulent Karoo and Nama-Karoo.

Another species of the Succulent and Nama-Karoo is *B. bubalus* which has been recorded principally from the south of the Nama-Karoo in South Africa (Fig. 7a).

Bembix cameronis and *B. liturata* have been widely and repeatedly recorded from the extreme south and south west of South Africa – the former also from Lesotho and central Namibia (Fig. 7b), suggesting that it is more widespread, and the latter surprisingly has alledgedly been recorded from the Victoria Falls area in Zimbabwe (Fig. 12b), requiring further investigation.

With strongly western distributions within southern Africa and associated with semi-arid to arid areas are: *B. karroensis* (Fig. 12a) apparently restricted to the Nama-Karoo; *B. namibensis* (Fig. 14a) apparently restricted to the arid areas of Namibia; *B. olivata* (Fig. 14c) apparently principally restricted to the arid areas of Namibia but also recorded from the southern Kalahari; *B. venusta* (Fig. 16c) apparently the Nama-Karoo of Namibia and Angola; *B. zinni* (Fig. 16d) principally Nama-Karoo and southern Kalahari.

Species with strictly coastal distributions (Fig. 17) are: *B. albata* along the coast of the Namib Desert to its southern extension in Namaqualand; *B. arnoldi* and *B. harenarum* along the south and south east coasts of South Africa; *B. fraudulenta* along the east coast of South Africa from the south into Mozambique.

Widespread species in northern southern Africa are: *B. ulula* (Fig. 16b) and *B. cultrifera* (Fig. 7e), not known from further north; and *B. moebii* (Fig. 12e), known to extend northwards to Tanzania and recorded from Ethiopia in northeast Africa but not from northwest Africa.

Another apparently northern species but less widespread with repect to longitude is *B. regnata* (Fig. 14d).

Two species apparently restricted to South Africa but not found in the karroid areas are *B. capicola* (Fig. 6d) and *B. sibilans* (Fig. 14f).

Comments on the distributions of the other species would be premature.

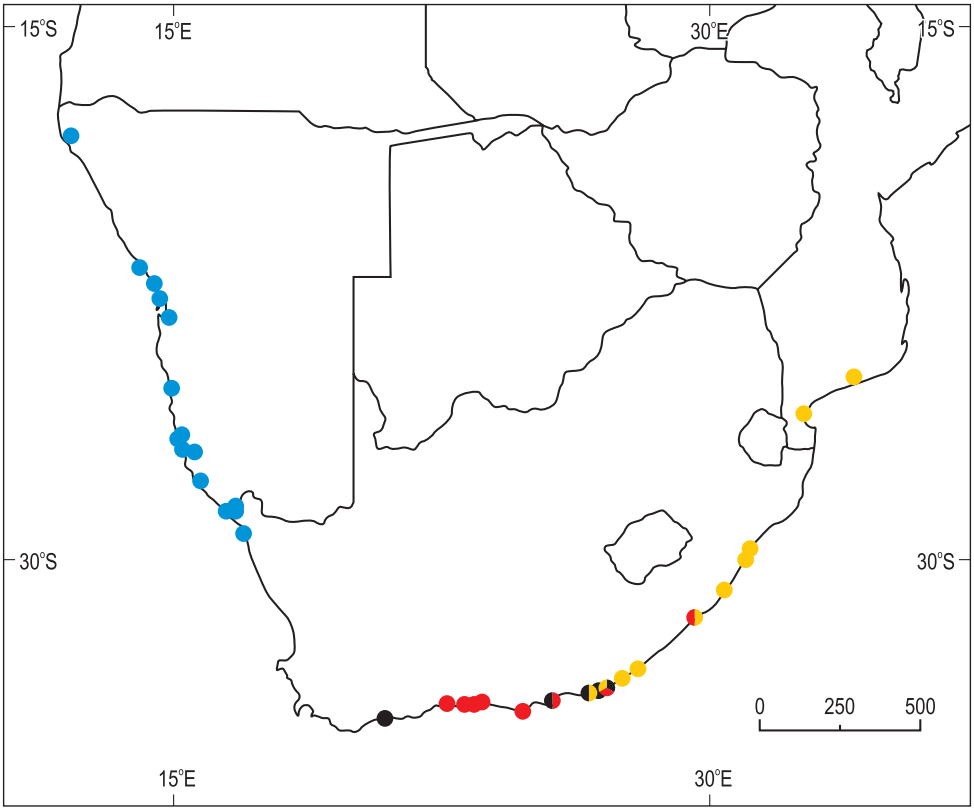

Figure 17. Combined distributions of collection records of the coastal species: *albata* (blue); *arnoldi* (black); *harenarum* (red); *fraudulenta* (yellow).

Bembix visit flowers not only to obtain nectar for adult nourishment but also when hunting. Recorded flower associations cannot therefore be assumed to be for imbibing nectar. As nectar seekers they are polyphagous.

Bembix typically prey on flies (Diptera) of various families. Unusual for the Afrotropical Region is *Bembix regnata* Parker which was found by Benson (1934) provisioning with butterflies (Lepidoptera) of three families in East Africa. In this regard it is of note that Evans and Matthews (1973, 1975) recorded considerable radiation with respect to prey taken by Australian *Bembix*. Of the 22 species studied 14 took only flies, however, one took damselflies (Odonata) in addition to flies, one bees and wasps in addition to flies, three only bees, primarily stingless bees of the genus *Trigona* (Apidae), one only tiphiid wasps, one only damselflies and yet another only antlions (Neuroptera). Species hunting flies seem to show little selection with respect to fly family, the qualifying criterion being apparently one of size and habitat.

Bembix hunt their prey on the wing. They tend to find a good source of flies, often decaying organic matter such as faeces and corpses, in the case of *B. arnoldi* ocean

wrack, but also flowers. Having found a good source of flies they return to it repeatedly. Fly prey has been recorded for 19 species of Afrotropical *Bembix*, *B. albofasciata* Smith, *B. arnoldi* Arnold, *B. bequaerti dira* Arnold, *B. braunsii* Handlirsch, *B. bubalus* Handlirsch, *B. cameronis* Handlirsch, *B. capensis* Lepeletier, *B. capicola* Handlirsch, *B. flavocincta* Turner, *B. forcipata* Handlirsch, *B. fraudulenta* Arnold, *B. fuscipennis* Lepeletier, *B. massaica* Cameron, *B. moebii* Handlirsch, *B. olivata* Dahlbom, *B. sibilans* Handlirsch, *B. ugandensis* Turner and *B. zinni* Gess (Gess 1986, Gess and Gess 1989 and Gess and Gess fieldnotes and voucher specimens 2000). Thirteen fly families, Stratiomyidae, Tabanidae, Mydidae, Asilidae, Bombyliidae, Syrphidae, Conopidae, Muscidae, Calliphoridae, Sarcophagidae, Tachinidae, Glossinidae and Nemestrinidae, have been recorded for *Bembix* in southern Africa. The number of families represented in the prey of a single species ranging up to 11!

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Synonymy of the potter wasp genus *Philippodynerus* Gusenleitner (Hymenoptera, Vespidae, Eumeninae) with *Apodynerus* Giordani Soika, with taxonomic notes on *Apodynerus* species

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Abstract

Philippodynerus omicroniformis Gusenleitner, 1996, the type species of the monotypic potter wasp genus *Philippodynerus* Gusenleitner, 1996, is a synonym of *Apodynerus gregarioides* (Giordani Soika, 1986), and consequently *Philippodynerus* Gusenleitner, 1996 is synonymized under *Apodynerus* Giordani Soika, 1993. Taxonomic notes on *Apodynerus* species are given, including two new synonymies for *Apodynerus troglodytes troglodytes* (de Saussure, 1856): *A. t. karimonensis* (van der Vecht, 1937), **syn. n.** and *A. t. baliensis* (Giordani Soika, 1987), **syn. n.** A synoptic key to species and a revised species checklist are provided.

Keywords

Potter wasps, Vespidae, Eumeninae, *Apodynerus*, *Philippodynerus*, new synonymy

Introduction

The potter wasp genus *Apodynerus* was proposed for *Odynerus troglodytes* de Saussure, 1856 (Giordani Soika 1993a). Giordani Soika (1994) redescribed *Apodynerus* treating it as a new genus, and included in it six species that had been until then placed in *Pachymenes* de Saussure, 1852 and also one newly described species. The genus *Philippodynerus* was proposed by Gusenleitner (1996) together with a description of the only included species, *Philippodynerus omicroniformis*.

We examined the holotypes of *Philippodynerus omicroniformis* Gusenleitner, 1996 and *Apodynerus gregarioides* (Giordani Soika, 1986) [= *Pachymenes gregarioides* Giordani Soika, 1986], and came to the conclusion that they are synonymous. Consequently *Philippodynerus* Gusenleitner, 1996 is synonymized under *Apodynerus* Giordani Soika, 1993. The present paper also provides taxonomic notes on some other species of *Apodynerus* including new synonymies, a synoptic key to all the species of *Apodynerus*, and a revised species checklist.

Materials and methods

The materials examined are deposited in the Natural History Collection at Ibaraki University, Mito, Japan (IUNH), Systematic Entomology Institute, Hokkaido University Museum, Sapporo, Japan (SEIHU), Museum Zoologicum Bogoriense, Cibinong, Indonesia (MZB), and Forestry and Forest Products Research Institute, Tsukuba, Japan (FFPRI).

The acronyms for other type repositories are as follows: BMNH – The Natural History Museum, London; ETHZ – Entomologisches Institut, Technische Hochschule, Zürich; LACM – Natural History Museum of Los Angeles County, Los Angeles, California; MRSN – Museo Regionale di Scienze Naturali, Torino; MVEN – Museo Civico di Storia Naturale, Venice; OLM – Oberösterreichischen Landesmuseum, Linz; OUM – Hope Entomological Collection, Oxford University Museum, Oxford, UK; RMNH – Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden.

Morphological characters and color patterns were examined on pinned-and-dried specimens under a stereoscopic dissecting microscope. Drawings were made using the drawing tube attached to the microscope. Terminology mainly follows Carpenter and Cumming (1985) and Yamane (1990).

Synonymy of *Philippodynerus* under *Apodynerus*

The holotypes of *Philippodynerus omicroniformis* Gusenleitner and *Apodynerus gregarioides* (Giordani Soika) are both males and collected in the same locality, Palo on Leyte

Island, the Philippines. We examined these holotypes and they are only slightly different from each other, allowing us to conclude that they are the same species, and thus we synonymize *Philippodynerus omicroniformis* under *Apodynerus gregarioides*. The holotype of *P. omicroniformis* differs from that of *Apodynerus gregarioides* (character states for the latter are given in square brackets) as follows: clypeus proportionally slightly wider, 1.17 [1.13] × as wide as high in frontal view; metasomal tergum I slightly stouter (Fig. 7), 1.4 [1.45 (Fig. 6)] × as long as its apical width; mesoscutum posteriorly with paired small ferruginous spots [absent]; metasomal sternum II with no basal markings (Fig. 5) [with paired lateral yellow spots basally (Fig. 4)].

We did not find any characters that would allow us to differenciate *A. gregarioides* [=*Philippodynerus omicroniformis*, the type species of *Philippodynerus*] from the other species of *Apodynerus* at the generic level. Consequently *Philippodynerus* Gusenleitner, 1996 is synonymized under *Apodynerus* Giordani Soika, 1993.

Taxonomy

***Apodynerus* Giordani Soika, 1993**
http://species-id.net/wiki/Apodynerus

Apodynerus Giordani Soika, 1993a: 155, genus; reference to *Apodynerus* Gusenleitner, 1988. Type species: *Odynerus troglodytes* de Saussure, 1856, by original designation and monotypy.

Apodynerus Gusenleitner, 1988: 180, used as generic name in the combination "*Apodynerus* (VDV.i.sch.) *t. troglodytes* (SAUSSURE 1856)". Unavailable under Article 13.1.1 of the Code (ICZN 1999).

Apodynerus Giordani Soika, 1993b: 22. *Nomen nudum*.

Apodynerus Giordani Soika, 1993c: 27. *Nomen nudum*.

Philippodynerus Gusenleitner, 1996: 39, genus. Type species: *Philippodynerus omicroniformis* Gusenleitner, 1996, by original designation and monotypy. **Syn. n.**

Note. The characters given in the key for *A. amandus* Gusenleitner, 2002, *A. diffinis* Giordani Soika, 1996, *A. rufipes* Giordani Soika, 1994 and *A. nitidiclypeus* Gusenleitner, 2013, were taken from the original descriptions (Giordani Soika 1994, 1996, Gusenleitner 2002, 2013), and for *A. formosensis* (von Schulthesses, 1934), from Giordani Soika (1994). The characters in the key are applicable to both sexes unless the sex is mentioned.

Key to species of *Apodynerus*

1 Anterior face of pronotum densely punctured, with median pit. Female clypeus truncated apically; in frontal view nearly entirely flattened, with distinctly carinate border; in lateral view flattened.....***A. nitidiclypeus* Gusenleitner**

– Anterior face of pronotum glossy and slightly punctured laterally, without median pit and with series of median striae. Female clypeus in frontal view more or less convex, without carina; in lateral view more or less convex.....**2**

2 Female clypeus truncated apically. Punctures on frons moderately dense in lower half, sparser and superficial in upper half; posterior part of vertex and gena with large, sparse punctures. Propodeum with lateral face distinctly separated from dorsal face.....***A. rufipes* Giordani Soika**

– Female clypeus at least slightly emarginate apically (Figs 2, 11–14, 41). Punctures on frons and vertex more or less dense, slightly smaller and sparser in posterior part of vertex. Border between lateral face and dorsal face of propodeum ill-defined **3**

3 Submarginal carina of propodeum long, narrow, curved upwards and sharply pointed. Mesepisternum smooth and glossy, with superficial punctures. Metanotum obtusely dentiform. Male terminal flagellomere slender, curved backwards, apically nearly reaching the base of flagellomere IX.....
.....***A. flavospinosus* (Giordani Soika)**

– Submarginal carina of propodeum short and wide. Mesepisternum usually with dense punctures. Metanotum dentiform or not. Shape of male terminal flagellomere variable **4**

4 Tergum II in lateral view only slightly convex dorsally (Fig. 24); basomedian furrow of metasomal sternum II distinct.....**5**

– Tergum II in lateral view convex dorsally (Figs 4, 25–27); basomedian furrow of metasomal sternum II absent or inconspicuous.....**6**

5 Clypeus with sparse and superficial punctures. Mesepisternum with dense punctures; interspaces between punctures cariniform. Body entirely covered with long and dense setae.....***A. icarioides* (Bingham)**

– Clypeus with dense and deep punctures. Mesepisternum with dense punctures; interspaces non-cariniform. Body with short setae.....
.....***A. formosensis* (von Schulthess)**

6 Metanotum sharply dentiform. Metasomal segment I proportionally long, 0.6 × as long as mesosoma (Figs 4, 5); in dorsal view more or less smoothly widened posteriorly (Figs 6, 7). Male terminal flagellomere flattened dorsoventrally, long and curved backwards, apically reaching the base of flagellomere IX (Figs 8, 9).....***A. gregarioides* (Giordani Soika)**

– Metanotum obtuse or non-dentiform. Metasomal segment I proportionally short, about or less than 0.4 × as long as mesosoma; in dorsal view abruptly widened at the base (Fig. 30). Male terminal flagellomere short in most specimens (Figs 28, 29) **7**

7 Female clypeus about as wide as high. Metanotum non-dentiform. Metasomal sternum II without basomedian furrow.....***A. amandus* Gusenleitner**

– Female clypeus wider than high (Figs 11, 12, 41–47). Metanotum hardly to obtusely dentiform. Metasomal sternum II with inconspicuous basomedian furrow.....**8**

8 Metasomal tergum II with dense punctures in anterior half, interspace between punctures smaller than puncture, punctures becoming smaller but denser towards apex. Tergum I in lateral view abruptly swollen dorsally .... ***A. diffinis* Giordani Soika**

– Metasomal tergum II more or less uniformly punctured. Tergum I in lateral view gradually swollen dorsally (Figs 25–27)..... **9**

9 Ventral margin of clypeus proportionally wider, about 0.3 × maximum width of clypeus (Figs 41–47). Metasomal tergum II in lateral view more or less evenly and slightly convex dorsally (Fig. 25) ..... ***A. troglodytes* (de Saussure)**

– Ventral margin of clypeus proportionally narrower, about 0.2 × the maximum width of clypeus (Figs 11, 12, 15, 16) **10**

10 Female clypeus about 1.2 × as wide as high (Fig. 11). Gena wider ventrally (Fig. 21). Anterior face of pronotum with distinct striae. Mesosoma proportionally long and slender, 1.4 × as long as high ..... ***A. yayeyamensis* (Matsumura)**

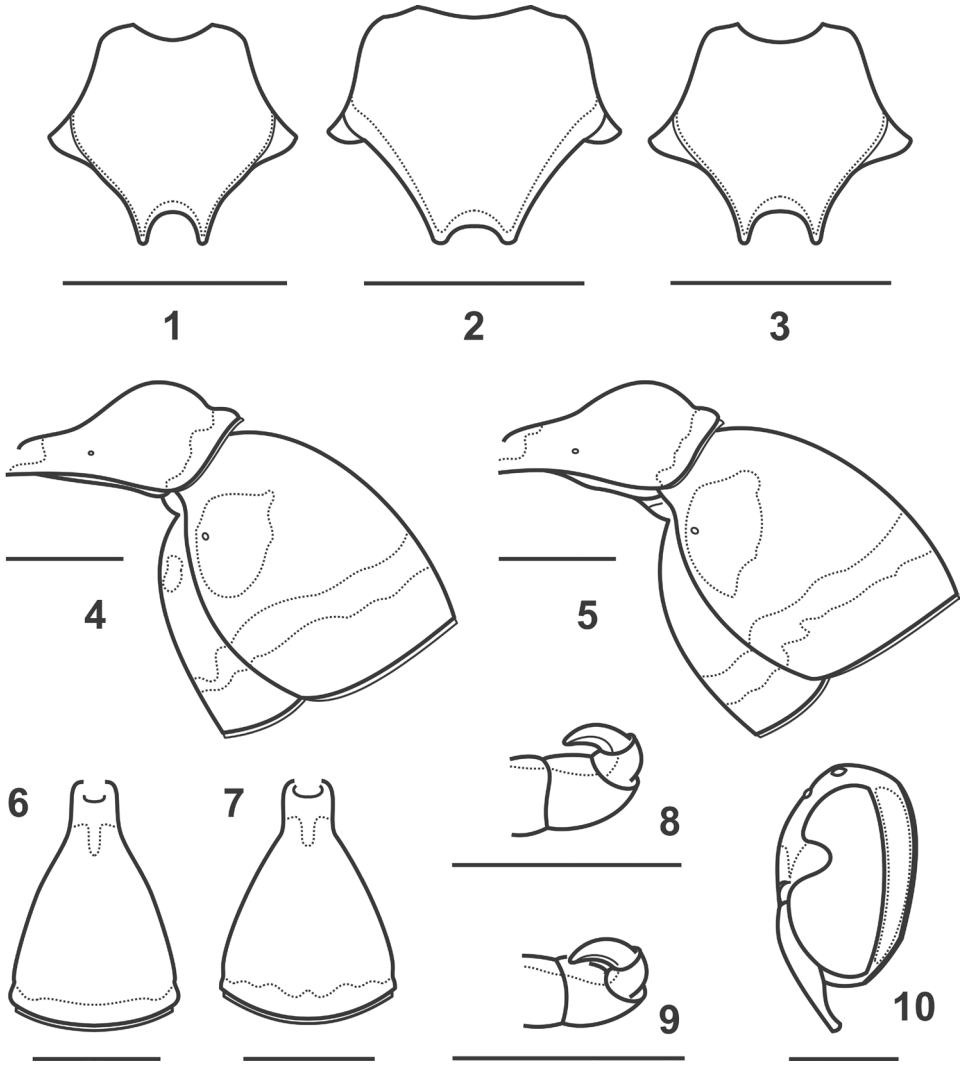
– Female clypeus about 1.1 × as wide as high (Fig. 12). Gena wider dorsally (Fig. 22). Anterior face of pronotum without distinct striae. Mesosoma proportionally short and stout, 1.2 × as long as high .... ***A. quadricolor* Giordani Soika, stat. n.**

***Apodynerus gregarioides* (Giordani Soika)**
http://species-id.net/wiki/Apodynerus_gregarioides
Figs 1, 2, 4, 6, 8, 10

Pachymenes gregarioides Giordani Soika, 1986: 79, ♂♀, "Leyte: Palo", holotype ♂ (IUNH).

Philippodynerus omicroniformis Gusenleitner, 1996: 39, 40, ♂, "Philippines, Palo, Leyte, Naga-Naga", holotype (SEIHU). **Syn. n.**

Diagnosis. MALE: Head in frontal view about as wide as high; clypeus as wide as high (Figs 1, 3), in lateral view with anterior margin slightly convex dorsally and nearly straight ventrally (Fig. 10); labrum broadly rounded apically; apicalmost tooth of mandible long and sharp; gena narrow (Fig. 10); antennal flagellomeres IX and X flattened ventrally, flagellomere X smaller than preceding flagellomeres; mesosoma slender, 1.4 × as long as high and 1.3 × as long as wide; pronotum with distinct and well-developed striae on vertical anterior face; propodeum with shallow and narrow (less than half as wide as width of propodeum) concavity on posterior face; propodeal valvula subrectangular, not fused to submarginal carina; propodeal orifice oval; second submarginal cell of fore wing petiolate basally; metasomal segment I proportionally longer than that of any other species, 0.6 × as long as mesosoma; sternum VII with longitudinal carina at least in anterior half, latero-basally with brush-like setae. FEMALE: Head in frontal view about as wide as high; clypeus proportionally wider than that of male, 1.2 × as wide as high (Fig. 2); mesosoma 1.5 × as long as wide.



Figures 1–10. *Apodynerus gregarioides*. **1, 4, 6, 8, 10** holotype ♂ **2** paratype – allotype ♀. *Philippodynerus omicroniformis* **3, 5, 7, 9** holotype ♂ **1–3** clypeus **4, 5** Metasomal segments I–II, lateral view **6, 7** Metasomal tergum I, dorsal view **8, 9** Apical part of antenna **10** Head, lateral view. Scale 1 mm.

Material examined. PHILIPPINES: LEYTE I.: 1 ♂ (IUNH; holotype of *Pachymenes gregarioides*), labeled "Palo, Leyte, Philippines, 1978.3.20, J. Kojima" and "Holotypus *Apodynerus gregarioides* Giordani Soika"; 1 ♂ (SEIHU; holotype of *Philippodynerus omicroniformis*), labeled "Naga-Naga, Palo, Leyte, Philippines, 1978.3.25, J. Kojima" and "*Philippodynerus omicroniformis* nov. Spec. ♂, J. Gusenleitner, det. 1996, Holotypus"; LUZON I.: 1 ♀, C.L.S.U. [Central Luzon State University], Munoz, Nueva Ecija, 18 Apr.1980, J. Kojima (IUNH; paratype of *Pachymenes gregarioides*).

Remarks. This species is only known from the areas given in the original description (Luzon and Leyte, the Philippines). Giordani Soika (1994) recorded this species from Lokojengo on Sumba Island, Lesser Sunda Islands. The occurrence of this species on Sumba, however, needs confirmation, considering the unusual disjunct distribution and possibility of misidentification with the other species known from the Lesser Sunda Islands, such as *A. rufipes* Giordani Soika and *A. quadricolor* Giordani Soika.

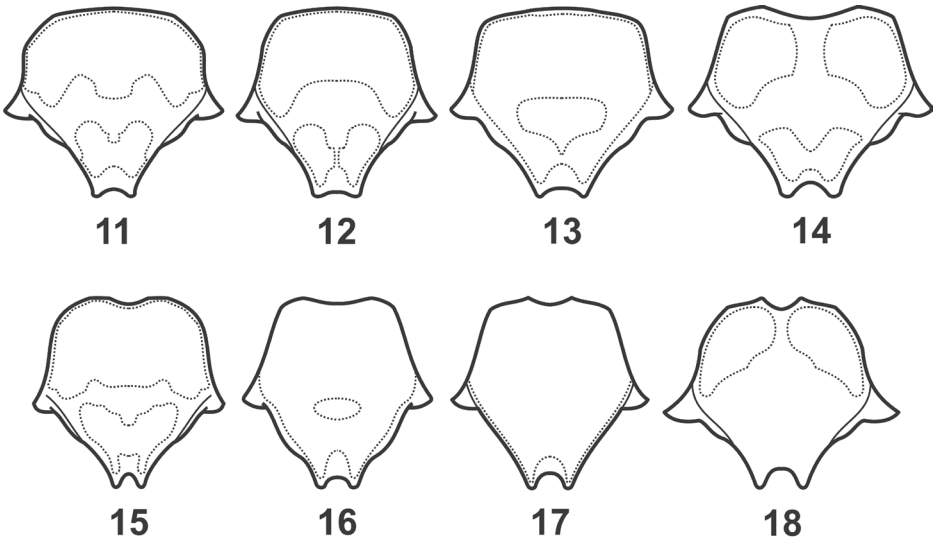
***Apodynerus flavospinosus* (Giordani Soika)**
http://species-id.net/wiki/Apodynerus_flavospinosus
Figs 13, 17, 20, 23

Pachymenes flavospinosus Giordani Soika, 1986: 80, ♀♂, "Naga Naga, Leyte, Palo", holotype ♀ (IUNH).

Diagnosis. The species can be easily distinguished from other *Apodynerus* by the peculiar shape of the submarginal carina, which is long, narrow, sharply pointed and curved upwards. The following combination of characters also helps distinguish this species from its congeners: female clypeus in frontal view wider than high, 1.2 × as wide as high (Fig. 13); male clypeus in frontal view proportionally narrower than in female, as wide as high (Fig. 17); metanotum obtusely dentiform; metasomal tergum I in lateral view moderately convex dorsally, then slightly concave preapically (Fig. 23).

Material examined. PHILIPPINES: LEYTE I.: 1 ♀ (IUNH; holotype of *Pachymenes flavospinosus*), labeled "Naga-Naga, Palo, Leyte, Philippines, 1978.3.26, J. Kojima" and "Holotypus *Apodynerus flavispinosus*"; 1 ♀, 1 ♂ (IUNH; paratypes of *Pachymenes flavospinosus*), Naga-naga, Palo, 25 Mar.1978, J. Kojima; 11 ♀, 11 ♂ (IUNH; paratypes of *Pachymenes flavospinosus*), Palo, [1 ♀, 1 Mar.1978; 1 ♀, 1 ♂, 9 Mar.1978; 1 ♀, 1 ♂, 20 Mar.1978; 2 ♀, 2 ♂, 24 Mar.1978; 1 ♀, 1 ♂, 25 Mar.1978; 1 ♂, 26 Mar.1978; 1 ♀, 27 Mar.1978; 1 ♂, 30 Mar.1978; 3 ♀, 1 ♂, 31 Mar.1978; 1 ♂, 3 Apr.1978; 1 ♀, 2 ♂, 20 Jun.1980], J. Kojima; 1 ♀ (IUNH; paratype of *Pachymenes flavospinosus*), Burauen, 5. Mar.1978, J. Kojima; PALAWAN I.: 2 ♂ (IUNH; paratypes of *Pachymenes flavospinosus*), St. Pedro, Puerto Princesa, 29. Apr.1980, J. Kojima; 4 ♀, 7 ♂ (IUNH; paratypes of *Pachymenes flavospinosus*), Puerto Princesa, [1 ♀, 2 ♂, 23 Apr.1980; 1 ♂, 26 Apr.1980; 3 ♀, 3 ♂, 27 Apr.1980; 1 ♂, 29 Apr.1980], J. Kojima; LUZON I.: 8 ♀, 17 ♂ (IUNH; paratypes of *Pachymenes flavospinosus*), Univ. Phil. Los Banos, Laguna, [1 ♀, 18 Mar.1980; 1 ♀, 1 ♂, 26 Mar.1980; 4 ♂, 4 May.1980; 1 ♂, 6 May.1980; 1 ♀, 9 May.1980; 1 ♀, 1 ♂, 10 May.1980; 2 ♀, 1 ♂, 11 May.1980; 3 ♂, 12 May.1980; 1 ♂, 13 May.1980; 1 ♂, 20 May.1980; 1 ♂, 21 May.1980; 2 ♀ 3 ♂, 27 Jun.1980], J. Kojima; MINDANAO I.: 1 ♂ (IUNH; paratype of *Pachymenes flavospinosus*), C.M.U. Musuan, Bukidnon, 28. May.1980, J. Kojima; 1 ♂ (SEIHU), Zamboanga, 13 Jun.1933, K. Kuwasima.

Remarks. This species is only known from the Philippines.



Figures 11–18. *Apodynerus* species. **11–14** ♀ **15–18** ♂. **11, 15** *A. yayeyamensis* **12, 16** *A. quadricolor* **13, 17** *A. flavospinosus*, holotype and paratype – allotype, respectively **14, 18** *A. icarioides* **11–18** Clypeus, frontal view.

***Apodynerus icarioides* (Bingham)**
http://species-id.net/wiki/Apodynerus_icarioides
Figs 14, 18, 19, 24, 29

Odynerus icarioides Bingham, 1897: 363 (in key to aculeates of British India), 372, ♀, "Tenasserim", type (BMNH).

Diagnosis. This species can be distinguished from other species of *Apodynerus* by the combination of the following characters: head in frontal view subcircular, slightly wider than high, 1.1 × as wide as high; female clypeus in frontal view wider than high, 1.3 × as wide as high, with dorsal and ventral margins distinctly emarginate medially (Fig. 14); male clypeus in frontal view proportionally narrower than that of female, 1.15 × as wide as high (Fig. 18); gena wide (Fig. 19); metanotum obtusely dentiform; metasomal tergum I stout, in lateral view swollen dorsally from base to mid-length, then moderately concave preapically (Fig. 24); metasomal tergum II in lateral view slightly convex dorsally (Fig. 24).

Material examined. INDONESIA: Kalimantan: 2 ♀, Bukit Soeharto, East Kalimantan, 3, 23 Feb.1998, H. Makihara (FFPRI); 1 ♀, Mentawir River, about 50 m, Balikpapan, East Kalimantan, Oct.1950, A.M.R. Wegner (MZB); 1 ♂, Kayan Mentarang Nature Reserve, Pujungan, East Kalimantan, Apr.1993, D.C. Darling & R. Ubaidillah (MZB).

Remarks. This species shows a disjunct distribution pattern, occurring in India and Myanmar, and on Borneo. Van der Vecht (1937) examined the type and provided a diagnosis for this species.

***Apodynerus yayeyamensis* (Matsumura)**
http://species-id.net/wiki/Apodynerus_yayeyamensis
Figs 11, 15, 21, 26

Odynerus yayeyamensis Matsumura, 1926, *in* Matsumura and Uchida 1926: 36, ♂, "Okinawa (Okinawa-honto)" [possibly erroneously listed locality], lectotype from Yaeyama Islands (SEIHU).

Odynerus hokotoensis Sonan 1929: 534, ♀♂, [Taiwan:] "Hôkotô ... Takao". Holotype ♀ originally in "Entomological Laboratory, Taihoku Imperial University", but current depository unknown.

Description of female and lectotype male. FEMALE. Head in frontal view about as wide as high. Clypeus in frontal view wider than high, 1.2 × as wide as high (Fig. 11). Vertical anterior face of pronotum with series of conspicuously produced striae. Metanotum compressed, obtusely dentiform; posterior margin oblique in lateral view. Metasomal tergum II in lateral view distinctly swollen anterodorsally and barely convex in posterior two-thirds (Fig. 26).

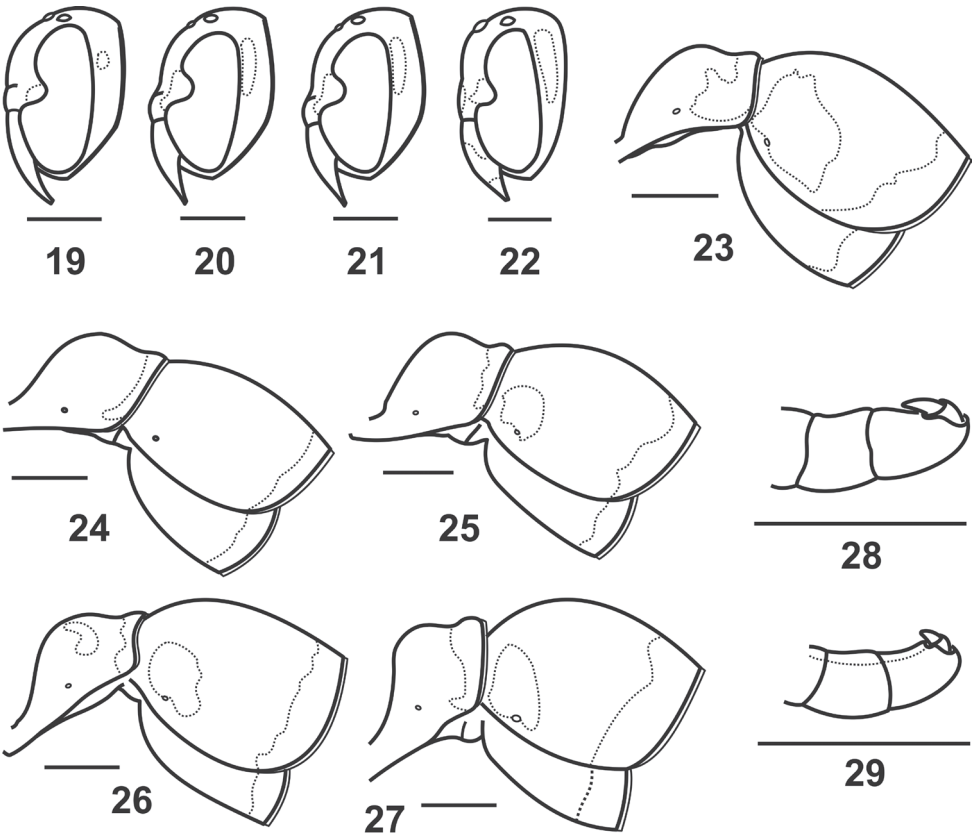
Head and mesosoma black, with following yellow markings: interantennal spot, ocular sinus, scape ventrally, mandible basally, band on gena, large dorsal spot and ventral scrobal spot on clypeus; anterior half of dorsal face of pronotum interrupted medially; spot on upper part of mesepisternum, tegula except median ferruginous spot, parategula, scutellum nearly entirely, large spots on dorsal face of propodeum; antenna dark brown. Legs black, but apical part of fore and mid femora and outer face of tibiae yellow. Metasoma black, with following yellow markings: tergum I: paired sublateral bands running obliquely towards posterolateral corner of tergum and apical band; segment II: basal lateral spots on tergum, and apical band.

Lectotype male. Clypeus in frontal view about as wide as high; ventral margin proportionally narrow (Fig. 15), about 0.2 × the maximum width of clypeus. Scape 3.3 × as long as its maximum width; flagellomere X small; flagellomere XI minute, curved backward, with apex reaching about half length of flagellomere IX. Mandible with five teeth; apicalmost tooth long and sharp.

Mesosoma in lateral view about 1.4 × as long as high; in dorsal view about 1.3 × as long as wide. Metanotum dorsally with closely pair of obtuse teeth. Propodeum with somewhat deep median concavity on posterior face, in lateral view strongly convex.

Lateral face of propodeum with dense, strong punctures, in most specimens forming ridges between punctures. Metasomal segment I with dense, conspicuous deep punctures; segments II–VII with dense, deep punctures.

Black, with following yellow markings: interantennal spot, spot filling ocular sinus extending ventrally to antennal socket, band on gena, clypeus except apical ferruginous band and black transverse band at level of lateral lobes, scape except black dorsal face, mandible except ferruginous tip and narrow black band along outer margin; anterodorsal part of pronotum, scrobal spot on mesepisternum, tegula except ferruginous mid spot and outer margin, parategula, scutellum nearly entirely, spot on metanotal



Figures 19–29. *Apodynerus* species. **19–27** ♀ **28–29** ♂ **19, 24, 29** *A. icarioides* **20, 23** *A. flavospinosus*, holotype **25** *A. troglodytes* **21, 26** *A. yayeyamensis* **22, 27, 28** *A. quadricolor* **19–22** Head, lateral view **23–27** Metasomal segments I–II, lateral view **28, 29** Apical part of antenna. Scale 1 mm.

teeth, paired large dorsal spots on propodeum; markings on metasoma as in female, but terga IV–V with posteromedian yellow spot.

Color variation in males from Taiwan. Sublateral yellow bands on tergum I in some specimens reduced to small spots or lacking, terga IV–V and occasionally also VI with posteromedian yellow spot, and sternum III sometimes with apical yellow band.

Material examined. JAPAN: 1 ♂ (SEIHU; lectotype of *Apodynerus yayeyamensis*), labeled "SK, Japan Matsumra, Yaeyama, VIII 07", "*Odynerus* n. sp. *yayeyamensis*, det. Matsumura", "Type Matsumura", and "*Pachymenes fragilis* (Smith) det. K. Yasumatsu, 1938"; 1 ♀, Motobu, Sesoko I., 9 Sep.1982, J. Kojima (IUNH). TAIWAN: 2 ♂, Tojuko, Prov. Taichu [=Taichung], 1–8 Aug.1931, N. Owaki (SEIHU).

Remarks. Matsumura and Uchida (1926) mentioned the two males collected on "Okinawa-honto" [=Okinawa Island] by S. Kiyamu and S. Sakaguchi in the description of *Odynerus yayeyamensis* [= *Apodynerus yayeyamensis*]. Although, as Yamane (1990) pointed out, the locality "Yaeyama" written on the label was not mentioned in

the original description, the two male specimens referred to by Yamane (1990: 137) as "The type specimen" and that "believed to be the one in the type-series" are certainly the syntypes. Yamane (1990: 137) inadvertently designated the lectotype by specifically referring to one of the two syntypes as "The type specimen" (Article 74.6.1 in the Code, ICZN 1999). The lectotype we located in the SEIHU bears the following labels: (1) on upper side "SK" [=?S. Kiyamu] in handwriting and "Japan Matsumra" in print; on underside, "Yaeyama" [Chinese characters] and "VIII 07" [=August 1907; Yamane (1990) read "vii[?] 0'7"], both in handwriting, (2) "*Odynerus* n.sp. *yayeyamensis*" in handwriting, and "det. Matsumura" in print, (3) red label "Type Matsumura" in print, (4) *Pachymenes fragilis* (Smith) det. K. Yasumatsu, 1938" in handwriting. We have added a label "LECTOTYPE [in red]/*Odynerus yayeyamensis*/Matsumura, 1926/by designation of/Yamane (1990)" [a slash denotes the start of a new line]. We searched in vain in the SEIHU for the other specimen, the paralectotype, that according to Yamane (1990) is labeled (1) "56" in handwriting and (2) "Okinawa S. Sakaguchi" in print.

***Apodynerus quadricolor* Giordani Soika, stat. n.**
Figs 12, 16, 22, 27, 28

Apodynerus yayeyamensis tricolor Giordani Soika 1994: 209 (key), [incorrect spelling].
Apodynerus yayeyamensis quadricolor Giordani Soika 1994: 215, ♂♀, "C. Sumba: Lokojengo", holotype ♂ (RMNH).

Diagnosis. *Apodynerus quadricolor* is distinguished from *A. yayeyamensis* in the following characters [states for the latter are given in the brackets]: clypeus in frontal view proportionally narrower, about 1.1 × as wide [1.2 × as wide] as high in female (Fig. 12) and slightly narrower [wider] than high in male (Fig.16); gena narrow (Fig. 22) [wider (Fig. 21)]; vertical anterior face of pronotum with series of striae faintly produced [distinct and conspicuously produced]; mesosoma more or less stout [slenderer], in lateral view about 1.2 [1.4] × as long as high, in dorsal view about 1.2 [1.4] × as long as wide; metanotum with posterodorsal margin rather sharply dentiform [obtusely dentiform]; metasomal tergum I in lateral view with dorsal margin arising after short distance from [at] basal slit; metasomal tergum II with dorsal margin basally strongly convex (Fig. 27) [less convex (Fig. 26)].

Description. *Color.* MALE. Black, with following bright-colored markings: yellowish-orange: band on gena, interantennal spot, ocular sinus, anterior half of dorsal face of pronotum, large scrobal spot on mesepisternum, tegula except semitransparent ferruginous median spot, parategula, scutellum nearly entirely, paired small lateral spots on metanotum, dorsal face of propodeum, paired large anterolateral spots on metasomal tergum II; yellow: clypeus except dark-brown median spot and ferruginous semitransparent ventral part, mandible basally, posteromedian spot on metasomal terga V and VI; apical bands on metasomal tergum I and segment II pale yellow. Antenna pale ferruginous,

darker dorsally. Pronotal lobe dark ferruginous. Coxae black; trochanters, femora, tibiae, and tarsi ferruginous. Fore wings ferruginous, slightly darker along anterior margin.

Female. Markings as those on male, but clypeus black with yellow dorsal spot and ventral scrobal spot, only metasomal tergum V apically with median yellow oval spot.

Material examined. INDONESIA: Sumba I.: 1 ♂, 9°40'S, 119°51'E, Sumba Timur, 30 Jan.2003, J. Kojima (IUNH); 2 ♂, 10°02.247'S, 120°03.332'E, alt. about 350 m, Laiwangi, 17 Jun.2010, A. Perrard (MZB); 1 ♀, 9°45'S, 120°35'E, Sumba Timur, 29 Jan.2003, J. Kojima & R. Ubaidillah (MZB).

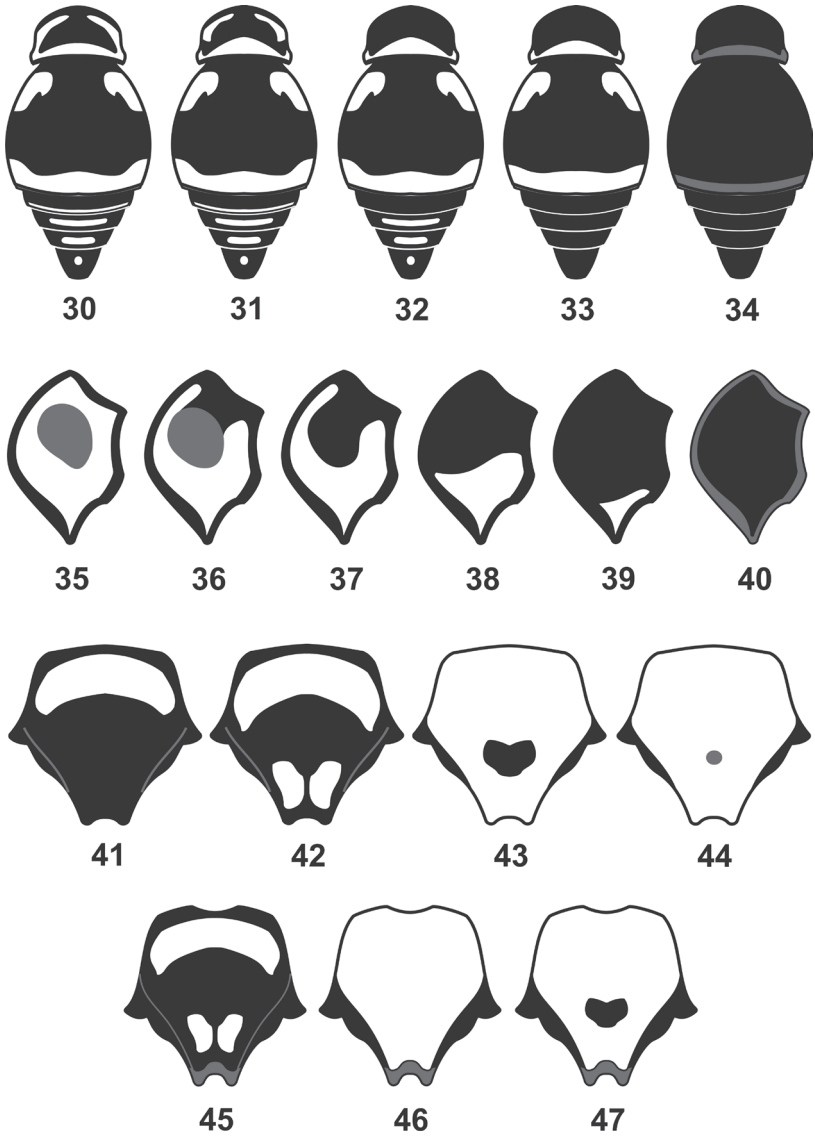
Remarks. Giordani Soika (1994) described *A. yayeyamensis quadricolor* based on two males and one female collected in Central Sumba. Our specimens from Sumba more or less agree with his original description of *quadricolor*, while as mentioned above they are different from the specimens of *A. yayeyamensis* (including the lectotype) enough to allow us to conclude that *quadricolor* is a distinct species.

***Apodynerus troglodytes troglodytes* (de Saussure)**
http://species-id.net/wiki/Apodynerus_troglodytes_troglodytes
Figs 25, 30–47

Odynerus troglodytes de Saussure, 1856: 249, ♂, "le Sénégal" [type locality doubtful: Yamane (1990) mentioned "Vecht (pers. comm., 1981) ... doubts Saussure's statement about the type locality."], type (MRSN).
Odynerus fragilis Smith, 1857: 61, ♂, "Borneo", type (BMNH).
Odynerus petulans Smith, 1861: 89, ♀, "Makassar", type (OUM).
Odynerus lybas Cameron, 1902: 114, ♀, "Sarawak", type (BMNH).
Odynerus drescheri Cameron, 1905: 77, ♀, "Tjandi near Semarang", type (BMNH).
Odynerus brooksii Cameron, 1908: 561, ♂, "Kuching, Sarawak, Borneo", type depository unknown.
Pachymenes fragilis var. *karimonensis* van der Vecht, 1937: 278, ♀♂, "Karmon Djawa Islands", holotype ♀(MZB). **Syn. n.**
Pachymenes troglodytes baliensis Giordani Soika, 1987: 145, ♀♂, "Bali: Samur", holotype ♀ (MVEN). **Syn. n.**

Diagnosis. *Apodynerus troglodytes* is similar to *A. yayeyamensis*, but can be distinguished from the latter by the following characters: Ventral margin of clypeus proportionally wide (Figs 41–47), about 0.3 × the maximum width of clypeus; female clypeus slightly wider than high, 1.1 × as wide as high (Fig. 41); male clypeus proportionally narrower than that of female, about as wide as high (Fig. 45); metasomal tergum I in lateral view with dorsal margin arising in slightly convex line from the basal slit, then broadly curved down to slight preapical convexity (Fig. 25); tergum II in lateral view more or less evenly and weakly convex dorsally.

Material examined. HONG KONG: 1 ♀, Pak Sha O, 70 m, 24 Apr.–14 May.2009, C. Barthelemy (IUNH). VIETNAM: 1 ♂, TT Mai, Chau, Hoa Binh, 3 Jun.2012, P.H.



Figures 30–47. Marking patterns of *Apodynerus troglodytes*. For the variations in Indian specimens, after Kumar et al. (2013). **30** Java, Kangean Is., Bali **31** Kangean Is., Java, Bali, Kepulauan Seribu, Krakatau, Lesser Sunda, Moluccas **32** India, Hongkong, Vietnam, Malay peninsular, Sumatra, Java, Bali, Krakatau, Kangean Is., Borneo, Lesser Sunda **33** Sumatra, Krakatau, Java, Borneo, Lesser Sunda, Sulawesi, Moluccas **34** Karimunjawa Is. **35** Kangean Is., Krakatau, Bali **36** India, Sumatra, Krakatau, Java, Bali, Kangean Is., Borneo, Sulawesi **37** India, Hongkong, Sulawesi, Java, Bali **38** India, Vietnam, Malay peninsular, Sumatra, Krakatau, Java, Borneo, Lesser Sunda, Sulawesi **39** Sumatra, Krakatau, Lesser Sunda, Borneo, Moluccas **40** Karimunjawa Is., Sulawesi **41** Karimunjawa Is. **42** India, Hongkong, Sumatra, Java, Krakatau, Borneo, Lesser Sunda, Sulawesi **43** Sumatra, Kepulauan Seribu, Krakatau, Java, Kangean Is., Bali, Sulawesi, Lesser Sunda, Moluccas **44** Kangean, Bali **45** India, Sumatra, Karimunjawa Is., Borneo, Sulawesi **46** Krakatau, Kangean Is., Java, Bali, Lesser Sunda **47** Vietnam, Malay peninsular, Sumatra, Krakatau, Java, Kangean Is., Borneo, Sulawesi, Lesser Sunda, Moluccas **30–34** metasoma **35–40** tegula **41–44** female clypeus **45–47** male clypeus.

Phong (IUNH). MALAYSIA: Peninsular Malaysia: 1 ♂, Bukit Fraiser, 20 Jan.1991, T. Matsumura (IUNH); 1 ♂, Kuala Tahan, 31 Aug.1970, R. Jander (SEIHU). INDONESIA: Sumatra I.: 1 ♀, 4 ♂, Sekincau, S. Sumatra [= Lampung], 23 Jul.1982, Sk. Yamane (MZB); 1 ♂, Labuan Batu, Kec. Jabung, Lampung Tengah, 5 Nov.1975, S. Achmad (MZB); 1 ♂, West Sumatra, Kec. Limau Manis, Andalas University, 0°54.683'S, 100°28.35'E, 23. Sep.2010, H. Nugroho & J. Kojima (MZB); Sunda Strait I.: 2 ♀, P. Sebuku, S. Sumatra, 15 Jun.1955, AMR Wegner (MZB); 1 ♀, 1 ♂, P. Legundi, S. Sumatra, ♀ 19, Jun, ♂ 21 Jun.1955, AMR Wegner (MZB); 4 ♂, P. Rakata Kecil, Krakatau, 27 Jul.1982, Sk. Yamane (MZB); 1 ♂, P. Anak Krakatau, 10 Jul.1982, Sk. Yamane (MZB); Kepulauan Seribu: 6 ♀, 19 ♂, [1 ♀, Pulau Opak Besar, 05°40.23'S, 106°34.92'E, 9 Mar.2005; 1 ♀, 1 ♂, Pulau Kotok Besar, 05°41.976'S, 106°32.254'E, 10 Mar.2005; 1 ♂, Pulau Samak Daun, 05°43.778'S, 106°34.313'E, 11 Mar.2005; 1 ♀, 1 ♂, Pulau Pamagaran, 05°38.093'S, 106°34.74'E, 24 Mar.2005; 1 ♀, Pulau Dua Timur, 05°25.1'S, 106°29.4'E, 9 Apr.2005; 2 ♂, Pulau Bira Kecil, 05°37.6'S, 106°34.53'E, 12 Apr.2005; 1 ♀, 1 ♂, Pulau Bundar, 05°31.260'S, 106°31.563'E, 28 Apr.2005; 1 ♀, 1 ♂, Pulau Paniki, 05°41.726'S, 106°42.675'E, 30 Apr.2005; 4 ♂, Pulau Bokor, 05°56.744'S, 106°37.917'E, 5 May.2005; 2 ♂, Pulau Lancang Besar, 05°55.867'S, 106°35.230'E, 7 May.2005; 3 ♂, Pulau Rambut, 05°58.680'S, 106°41.569'E, 9 May.2005; 3 ♂, Pulau Untung Jawa, 05°58.611'S, 106°42.181'E, 11 May.2005], A. Spengler (MZB); Java I.: 1 ♀, 2 ♂, Carita, West Java, [1 ♀, 1 ♂, 21 Jul; 1 ♂, 13 Jul.1982], Sk. Yamane (MZB); 1 ♂, Geduwang, Baturetno, Wonogiri, Central Java, 24 Jul.2008, H. Nugroho & Giyanto (MZB); 1 ♂, 7°41.73'S, 110°28.99'E, alt. about 280 m, Manisrenggo, Klaten, Central Java, 30 Jun.2009, H. Nugroho (MZB); Kangean Is.: 4 ♀, 5 ♂, Bujutan, [3♀, 23 Aug; 1 ♀, 21 Aug; 5 ♂, 23 Aug.1954], A. Hoogerwerf (MZB); Karimunjawa Is.: 1 ♀ (MZB; holotype of *Pachymenes fragilis* var. *karimonensis*), 1 ♂ (MZB; paratype – allotype of *Pachymenes fragilis* var. *karimonensis*), "Karimon Djawa", 22–20 Nov.1930, M.A. Lieftinck; Kalimantan I.: 1 ♀, 1 ♂, Central Kalimantan, Hutan Gambut Kalampangan, Palangkaraya, Pemantang Kanal, 02°17.956'S, 114°01.625'E, alt. about 15 m, 31. May.2003, S Kahono (MZB); 2 ♀, 1 ♂, E. Borneo, Samarinda, Muara Kaman, alt. about 50 m, Nov.1950, AMR Wegner (MZB); 3 ♀, 4 ♂, E. Borneo, Balikpapan [2 ♀, Wain River, alt. about 50 m, Nov.1950; 1 ♀, 4 ♂, Mentawir River, alt. about 50 m, Oct.1950], AMR Wegner (MZB); Bali I.: 1 ♀, 8°08'S, 115°04'E, Singaraja, 9 Sep.2005, J. Kojima & R. Ubaidillah (IUNH); 1 ♂, Tanah Lot, 10 Sep.2005, J. Kojima & R. Ubaidillah (IUNH); Lombok I.: 1 ♂, Mataram, 4 Nov.2000, J. Kojima (IUNH); 2 ♀, 4 ♂, 8°31.903'S, 116°14.288'E, alt. about 270 m, Aiq Nyet, Lingsar, Lombok Barat, 28 Mar.2010, H. Nugroho (MZB); 1 ♀, 8°34.010'S, 116°14.009'E, alt. about 255 m, TWA Suranadi, Narmada, 27 Mar.2010, H. Nugroho (MZB); 1 ♀, 8°33.065'S, 116°25.245" E, alt. about 590 m, Tetebatu, Sikur, Lombok Timur, 3 Apr.2010, H. Nugroho (MZB); Sumbawa I.: 1 ♂, Batudulang, Batulanteh, Sumbawa Besar, 10 Nov.2000, J. Kojima (IUNH); 1 ♀, 1 ♂, 8°37.555'S, 117°10.71'E, alt. about 920 m, Tepal, Batu Lanteh, [♀, 14 Apr.; ♂, 16 Apr.2010], H. Nugroho & Y.R. Suhardjono (MZB); Sulawesi I.: 2 ♀, [Remboken, Tondano; Rurukan, Tomohon], Minahasa Peninsula, 27 Nov.1999, J. Kojima (IUNH); 1 ♀, 2 ♂, Tompasu, Remboken, Minahasa peninsula, 29 Nov.1999, J. Kojima (IUNH).

Remarks. This species, widely distributed in southern Asia from India in the west to Moluccas and Lesser Sunda Islands (Lombok and Sumbawa, new records) in the east, is represented by four color forms formally recognized as subspecies, of which two are so far known respectively only from Bali (*baliensis*) and Karimunjawa Islands (*karimonensis*). As mentioned below, after examination of specimens from various localities mainly in the Indonesian Archipelago, we have reached the conclusion that *A. t. baliensis* and *A. t. karimonensis* are synonyms of *A. troglodytes*. We tentatively treat *shanensis* Giordani Soika, 1994 as a subspecies of *A. troglodytes* (see the checklist) until we have a chance to examine specimens of *A. troglodytes* from Myanmar including the type of *A. t. shanensis*.

Giordani Soika (1987) described *Pachymenes troglodytes baliensis* based on the female holotype and two males (paratypes) from Bali, and according to him this subspecies is characterized by more extensive yellow markings than typical *troglodytes* as follows: tegula and parategula entirely, paired sublateral bands and apical band on metasomal tergum I (Figs 30, 31), paired basal spots and apical bands both on tergum and sternum II, traces of apical band on tergum III, narrow apical band on sternum III, and narrow posteriomedian bands on terga IV–V. Our examination of the large number of specimens listed above, mainly from Java and Kangean Islands, shows that extensive variation in markings even occurs within local populations, thus *baliensis* would not be treated as a subspecies even if the subspecies had a position in the phylogenetic system. Van der Vecht (1937) treated the Karimunjawa Islands population of *P. troglodytes* as a distinct color variety and named it *Pachymenes fragilis* var. *karimonensis*. This local population is characterized by markings much reduced (Figs 34, 40, 41, 45). The Karimunjawa Islands population does not have any morphological characters justifying treating it as a valid species, and thus *A. t. karimonensis* (van der Vecht, 1937) is synonymized under *A. troglodytes* (de Saussure, 1856).

Revised species checklist of the genus *Apodynerus*

Kumar et al. (2013) provided a checklist of the world species of *Apodynerus*, which included 15 species-group taxa (nine species and six subspecies). Below a revised species checklist is provided with detailed nomenclatural information.

Apodynerus sparsipunctatus Gusenleitner, 2008 described from New Caledonia was synonymized under *Parodynerus quodi* (Vachal, 1907) by Gusenleitner and Madl (2011) and is not included here.

Apodynerus amandus Gusenleitner, 2002

Apodynerus amandus Gusenleitner, 2002: 1091, 1093, ♂, ♀, "Thailand, Chiang Mai: Maerim", holotype ♂ (LACM).

Distribution. Thailand: North Thailand.

Apodynerus diffinis Giordani Soika, 1996

Apodynerus diffinis Giordani Soika, 1996: 36, ♂, "Sulawesi: Patunuang", holotype (MVEN).

Distribution. Indonesia: Sulawesi.

Apodynerus flavospinosus (Giordani Soika, 1986)

Pachymenes flavospinosus Giordani Soika, 1986: 80, ♀, ♂, "Naga Naga, Leyte, Palo", holotype ♀ (IUNH).
Apodynerus flavospinosus; Giordani Soika 1994: 207 (key), 216.

Distribution. Philippines: Luzon, Leyte, Mindanao, Palawan.

Apodynerus formosensis formosensis (von Schulthess, 1934)

Odynerus formosensis von Schulthess, 1934: 101, ♂, ♀, "Formosa" [=Taiwan], syntypes (ETHZ).
Apodynerus formosensis formosensis; Giordani Soika 1994: 208 (key), 217.

Distribution. Taiwan.

Apodynerus formosensis continentalis Giordani Soika, 1994

Apodynerus formosensis continentalis Giordani Soika, 1994: 208 (key), 217, ♀, ♂, "Cina*:* Kukien, Kuatun", holotype ♀ (MVEN).

Distribution. China; Laos; Vietnam.

Apodynerus formosensis indicus Giordani Soika, 1994

Apodynerus formosensis indicus Giordani Soika, 1994: 208 (key), 218, ♀, "Nepal: Taplejung Distr., Snagu, 6500 ft", holotype (BMNH).

Distribution. Nepal.

***Apodynerus gregarioides* (Giordani Soika, 1986)**

Pachymenes gregarioides Giordani Soika, 1986: 79, ♂, ♀, "Leyte*:* Palo", holotype ♂ (IUNH).
Apodynerus gregarioides; Giordani Soika 1994: 208 (key), 219.
Philippodynerus omicroniformis Gusenleitner, 1996: 39, 40, ♂, "Philippines, Palo, Leyte, Naga-Naga", holotype (SEIHU). **Syn. n.**

Distribution. Philippines: Luzon, Leyte; ?Indonesia: Sumba.

***Apodynerus icarioides* (Bingham, 1897)**

Odynerus icarioides Bingham, 1897: 363 (key), 372, ♀, "Tenasserim", type (BMNH).
Pachymenes icarioides; van der Vecht 1937: 278.
Apodynerus icarioides; Giordani Soika 1994: 208 (key), 219.

Distribution. India: Assam, Sikkim; Myanmar; Malaysia: Sarawak, Sabah; Indonesia: Kalimantan.

***Apodynerus nitidiclypeus* Gusenleitner, 2013**

Apodynerus nitidiclypeus Gusenleitner, 2013: 121, 125, figs 11–15, ♀, ♂, "Vietnam, Dak Lak Prov., Easo, 12°55'N 108°38'E, holotype ♀ (OLM).

Distribution. Vietnam.

***Apodynerus quadricolor* Giordani Soika, 1994**

Apodynerus yayeyamensis tricolor Giordani Soika 1994: 209 (key), [incorrect spelling].
Apodynerus yayeyamensis quadricolor Giordani Soika 1994: 215, ♂, ♀, "C. Sumba: Lokojengo", holotype ♂ (RMNH).

Distribution. Indonesia: Sumba.

***Apodynerus rufipes* Giordani Soika, 1994**

Apodynerus rufipes Giordani Soika, 1994: 207 (key), 214, ♀, "*Flores:* Ruteng", holotype (RMNH).

Distribution. Indonesia: Flores.

Apodynerus troglodytes troglodytes (de Saussure, 1856)

Odynerus troglodytes de Saussure, 1856: 249, ♂, "le Sénégal " [type locality doubtful], type (MRSN).
Odynerus fragilis Smith, 1857: 61, ♂, "Borneo", type (BMNH). Synonymized by Yamane (1990).
Odynerus petulans Smith, 1861: 89, ♀, "Makassar", type (OUM). Synonymized by van der Vecht (1937).
Odynerus lybas Cameron, 1902: 114, ♀, "Sarawak", type (BMNH). Synonymized by van der Vecht (1937).
Odynerus drescheri Cameron, 1905: 77, ♀, "Tjandi near Semarang", type (BMNH). Synonymized by van der Vecht (1937).
Odynerus brooksii Cameron, 1908: 561, ♂, "Kuching, Sarawak, Borneo", type depository unknown. Synonymized by van der Vecht (1937).
Pachymenes fragilis; van der Vecht, 1937: 277.
Pachymenes fragilis var. *karimonensis* van der Vecht, 1937: 278, ♀♂, "Karmon Djawa Islands", holotype ♀ (MZB). **Syn. n.**
Antepipona fragilis; Lee 1982: 218, 220.
Pachymenes troglodytes baliensis Giordani Soika, 1987: 145, ♀♂, "*Bali*: Samur", holotype ♀ (MVEN). **Syn. n.**
Apodynerus troglodytes troglodytes; Gusenleitner 1988: 180.
Apodynerus "(VAN DER VECHT i. l.)" *troglodytes*; Gusenleitner 1991: 258.
Pachymenes troglodytes; Giordani Soika 1991: 164.
Apodynerus troglodytes; Giordani Soika 1993a: 156, fig.
Apodynerus troglodytes baliensis; Giordani Soika 1994: 209 (key), 212.
Apodynerus troglodytes karimonensis; Giordani Soika 1994: 209 (key), 213.

Distribution. India; Andaman and Nicobar Islands; China; Hong Kong; Myanmar; Thailand; Laos; Malaysia: Peninsular Malaysia, Sarawak, Sabah; Singapore; Indonesia: Sumatra, Krakatau Islands, Kepulauan Seribu (new record), Java, Kangean Islands, Bali, Karimunjawa Islands, Sulawesi, Moluccas, Lombok (new record), Sumbawa (new record).

Apodynerus troglodytes shanensis Giordani Soika, 1994

Apodynerus troglodytes shanensis Giordani Soika 1994: 209 (key), 213, ♂, ♀, "Burma: Shan State, estremità S del lago Inle, Taugdo, 900 m", holotype ♂ (RMNH).

Distribution. Myanmar.

***Apodynerus yayeyamensis* (Matsumura, 1926)**

Odynerus yayeyamensis Matsumura 1926, *in* Matsumura and Uchida, 1926: 36, ♂, "Okinawa (Okinawa-honto)" [possibly erroneously listed locality], lectotype from Yaeyama Islands (SEIHU).

Odynerus hokotoensis Sonan 1929: 534, ♀♂, [Taiwan:] "Hôkotô ... Takao". Holotype ♀ originally in "Entomological Laboratory, Taihoku Imperial University", but current depository unknown. Synonymized by Yamane (1990).

Pachymenes yayeyamensis; Giordani Soika, 1986: 65, figs 5–9.

Apodynerus yayeyamensis yayeyamensis; Giordani Soika 1994: 209 (key), 215.

Distribution. Taiwan; Japan: Ryukyu Islands

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