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A Revision of the Ant Genus *Stenamma* in the Palaearctic and Oriental Regions

by
Mark B. Dubois

CONTENTS

Associate Editors:

Murray S. Blum, Dept. of Entomology, University of Georgia, Athens, GA 30601, U.S.A.

Ralph W. Howard, USDA-ARS, U.S. Grain Marketing Research Laboratory, 1550 College Av., Manhattan, KS 66502, U.S.A.

ABOUT THE COVER

The cover of this issue heralds the appearance of a book by the life long collaborator, Associate Editor of Sociobiology, and wife of the editor, Alzada Carlisle Kistner. This book traces the human side of our five African Expeditions to Subsaharan Africa. For more information see pages 404-406 of this issue of Sociobiology.

A Revision of the Ant Genus *Stenamma* in the Palaearctic and Oriental Regions (Hymenoptera: Formicidae: Myrmicinae)

by

Mark B. DuBois[1,2,3]

ABSTRACT

Palaearctic and Oriental species of the myrmicine ant genus *Stenamma* Westwood are reviewed and keys are presented for their identification. Twenty four species are recognized from these regions. Three species are described as new (*S. orientale* from Sarawak, *S. gurkhalis* from Nepal, and *S. jeriorum* from Pakistan); the synonymy of four species is confirmed (*S. tscherssicum* = *S. striatulum*, *S. westwoodii polonicum* = *S. debile*, *S. myops* = *S. punctiventre*, and *S. caucasicum* = *S. hirtulum* = *S. lippulum*). Additional synonymies are presented (*S. africanum submuticum* = *S. africanum* = *S. msilanum*, *S. golosojevi* = *S. ucrainicum* = *S. debile*). Specimens representing types of two species have been lost (previous descriptions prove inadequate for identification) and the names associated should be considered *Incertae Sedis* until such specimens are located (*S. westwoodii asiatica*, and *S. berendti*).

INTRODUCTION

Ants (in their currently recognized habitus) have survived for at least 65 million years (Brown, Wilson, and Carpenter, 1969). Although a number of species have passed into extinction, many have prospered to propel this group into one of the dominant life forms on earth (Hölldobler and Wilson, 1990). Some species are extremely abundant and frequently encountered. Others are secretive and discovered only through patient extraction from sod, leaf litter, or rotten wood.

The ant genus *Stenamma* belongs to this latter category. Although a number of species are known, most are represented from a few isolated localities; many species are known from workers only. There are many qualified ant collectors scattered throughout the world, yet some species remain quite rare. Examples include *S. sogdianum*, *S. picetojuglandeti*, *S. ussuriense*, and *S. hissarianum* (all known from a handful of specimens each). It is possible that additional specimens of

[1]116 Burton St., Washington, IL 61571-2509 U.S.A.
[2]Research Affiliate, Center for Biodiversity, Illinois Natural History Survey, 607 East Peabody Drive, Champaign, Illinois 61820
[3]Send reprint requests to the Washington, Illinois address.

these rare species will be discovered. For example, the North American *Stenamma foveolocephalum* was recently encountered for the second time (after a lapse of over 60 years) (DuBois and Davis, 1998).

Within the last two decades, three new species have been described from Asia (*S. bhutanense* Urbani, *S. kashmirense* Urbani, and *S. gurkhalis* new species). One new species has been described from Corsica (*S. orousseti*) (Casevitz-Weulersse, 1990). A rather unusual species is known only from soil core samples and leaf litter in remote areas on the island of Borneo (*S. orientale* new species).

Since most species of *Stenamma* only live in moist, cool areas of forests and large tracts of forests have been cleared (and are being cleared today), many of these species are probably on the verge of extinction (or have recently become extinct). It has been estimated that large tracts of forest are being cleared at the rate of one acre per second (Raven, 1990). This phenomonen is not limited to the tropics — the type locality of *Stenamma meridionale* (mesic deciduous forest, Droste Woods, St. Charles Co., Missouri, U.S.A.) is now a suburban lawn (late M. Talbot, pers. comm.).

Extinction is an integral part of life and is offset by biological evolution. Plant and animal extinctions have occurred throughout geologic history. It is probable that many more species are extinct than are alive today. However, the rate of extinction is now alarmingly fast and probably exceeds previous catastrophies. Entire books have been devoted to this calamity and some indicate that it may take tens of millions of years for levels of diversity to return to those of a few centuries ago (for example, Wilson, 1988 and Wilson, 1992).

In order to better understand these vanishing creatures, one must first answer the question: what kind of animal is it? This revision is an attempt to summarize existing knowledge concerning one genus of ants in the Palaearctic and Oriental regions. Due to observed variability within species coupled with paucity of specimens from large tracts of Asia, a rigorous classification is not attempted herein. Rather, this work represents my attempt to summarize existing knowledge of this group of insects.

Stenamma is found worldwide, ranging from 1 to 50 degrees north latitude (except for sub-Saharan Africa); most species are found from 25 to 45 degrees north latitude. One exception is the extensive fauna of Central America which is currently being revised by Snelling (pers. comm.). Since *Stenamma* was first established as a genus, most species have been described as isolated taxa or as part of a limited regional revision.

Stenamma was described as a separate genus in 1840, based upon

one species, *Stenamma westwoodii*. No additional species were added for approximately 40 years. Early author's isolated descriptions with no attempt at synthesis, a poor understanding of the modern species concept, and a fascination with trivial characters and subspecies compounded the complexity of this genus. This has lead, in some instances, to species living in the same area being named as new without having been compared with earlier named species from the same area. For example, *S. hirtulum* was described from the Caucasus Mountains in the late 1800s. *S. lippulum* was described from the same area nearly 50 years earlier. *S. caucasicum* was described from the same area in 1975. In my opinion, all names represent the same species (DuBois, 1993).

Since Westwood's original description of the genus, no systematist has ever analyzed all European species as a group. The most recent and comprehensive revision is Arnol'di (1975) which includes species found within the borders of the former U.S.S.R. Although this revision is in Russian, it is an excellent starting point. Arnol'di described six new species. However, some European species (such as *S. petiolatum* and *S. sardoum*) do not occur in the regions of the former U.S.S.R. while some species from the central and eastern asian portions of the former U.S.S.R. are included (*S. ussuriense*, *S. kurilense*, *S. picetojuglandeti*, *S. sogdianum*, and *S. hissarianum*).

Collingwood (1979) discussed the single species which occurs in much of northern and central Europe (*S. debile*, which he called *S. westwoodi*). Kutter (1971) examined those species found in Switzerland (*S. petiolatum*, *S. striatulum*, and *S. debile*, which he called *S. westwoodi*). Arnol'di (1928) examined European species of *Stenamma* and described two new species. He later synonymized *S. tscherssicum* with *S. striatulum*. His publication represents the most detailed description and greatest quantity of measurements of any analysis of this genus in this region to date. Several analyses of regional ant faunas have included keys to the *Stenamma* species encountered (for example Agosti and Collingwood, 1988 provide excellent keys to ants of the Balkan region).

The bulk of European studies are best represented by examples such as Karaviev's (1926) description of an isolated species (*S. golosojevi*) or Begdon's (1931) description of an isolated subspecies (*S. westwoodii polonicum*).

African species received the same cursory treatment in the early years of the twentieth century by Forel (1901), Emery (1908), and Santschi (1921, 1940). No additional work has been done until recently (Espadaler, pers. comm.). Forel (1901) described an isolated queen (*S. msilanum*). Emery (1908) described another queen (*S. punctiventre*).

Later, Santschi (1921) described the worker for this species and placed it in a new genus (*Theryella myops*). Finally, Santschi (1940) described both worker and queen for another species (*S. africanum*) and workers of a subspecies (*S. africanum submuticum*). This subspecies is synonymized with *S. africanum*. Furthermore, *S. africanum* is synonymized with *S. msilanum*.

It is probable north African *Stenamma* species represent successful invasions from Europe (perhaps as recently as the Pleistocene). Further spread of these species towards the south is doubtful given the current environment (mostly desert) and the abundance of *Tetramorium* and related ants which probably compete for similar resources (B. Bolton, pers. comm.).

Oriental species have also been described in isolation. Baroni Urbani (1977) described two species from northern India (Kashmir) and Bhutan. These were compared with European and Japanese species. No comparisons were made with species which occur on the other side of the Himalayas and were described by Arnol'di (1975) (*S. picetojuglandeti*, *S. sogdianum*, and *S. hissarianum*). The enigmatic *S. westwoodii asiatica* (Ruzsky, 1905) from Turkestan (Aluieata) with its peculiar coloration has never been collected again. The type for this species is apparently lost (G. Dlussky and A. Antropov, pers. comm.).

Arnol'di (1975) described two species from far eastern Russia (*S. ussuriense*, from the mainland, and *S. kurilense* from the Kuril Islands). Both appear to be valid species even though the Kuril Islands are adjacent to Japan with its own two species. Yasumatsu and Murakami (1960) described *S. nipponense*. The remaining Japanese species, *S. owstoni* was described by Wheeler (1906). Although various authors have made comparisons between selected Asian species, no previous attempt has been made to compare all these species.

Stenamma has also been studied in North and Central America. DuBois and Davis (1998) presented an analysis of selected *Stenamma* of the southeastern U. S. (and synonymized one species). Snelling (1973) revised the genus in western North America with emphasis on California. He described six new species. Smith (1957) reviewed *Stenamma* in America north of Mexico and described three new species. Creighton (1950) conducted the first modern review of the genus in North America. Previously, Wheeler (1904) reviewed the North American taxa and assigned most to subspecies of *S. brevicorne*. Earlier analyses (such as Emery, 1895 and Forel, 1901) were based on very limited material and compared only selected forms. On this continent as well, there have been isolated descriptions of *Stenamma* species (for example, Mayr, 1886 — *S. neoarcticum* and *S. brevicorne*; Smith, 1930

— *S. foveolocephalum*; Gregg, 1972 — *S. knowltoni*).

Overlap between the *Stenamma* fauna of various regions is difficult to determine due to the paucity of collections from key regions. In those areas where numerous collections have been made (for example, Europe and Japan), several species may be found in close proximity (a few meters to a few kilometers). Compare, for example, the known ranges of *S. debile* and *S. westwoodii* in England. Unfortunately, most *Stenamma* species are known from one or two localities making it futile to attempt to draw conclusions about their distribution.

It is possible that some Palaearctic and Oriental species may be conspecific with North American *Stenamma*. For example, the Russian *S. ussuriense* is superficially similar to the North American *S. snellingi*. Yet, too few samples of the former species are known to ascertain the range of variation in many of its features. Until collections are made in the intervening areas (Russia, Alaska, and north western Canada), I believe these should be treated as distinct species.

Many species examined were represented by such small samples that it is unlikely their complete range of variation was observed. This makes it difficult to develop a solid classification scheme. To depict the lack of sufficient sample size, the following information is presented. For each species examined, the table lists the examined sample size and needed sample size. This latter number assumes a desire for a 99% confidence interval that the observed mean is within 0.1 mm of the population mean.

The formula used to calculate minimum sample size:

$$n = (z_c \sigma / E)^2$$

where:

n represents the minimum sample size,

z_c represents the critical z value (for 99% this equals 2.58),

σ represents the sample standard deviation,

and E represents the allowable error (0.1 mm in this case).

The single measurement of total length (TL) is used as an illustration. Of the 21 species listed below, only 7 species examined represent sufficient sample sizes to meet the above criteria. The remaining 14 species are marked with an asterisk to reflect insufficient sample size. However, in the majority of cases, the sample sizes examined constitute the known number of specimens (within one or two specimens). Thus, significant additional collecting is needed for some species to properly understand variation within the population.

In addition to the small known sample sizes for many species, the most notable observation is the paucity of knowledge concerning the habits of these animals. Since *Stenamma* workers are characterized by

Species	Sample size examined	Minimum sample size 99% c.i. of 0.1 mm TL
S. westwoodii *	11	35
S. debile	346	35
S. sardoum *	3	37
S. orousseti *	11	65
S. kashmirense	46	6
S. jeriorum	31	8
S. petiolatum *	20	159
S. msilanum *	7	17
S. striatulum *	28	35
S. lippulum	85	20
S. georgii *	17	18
S. hissarianum	18	14
S. picetojuglandeti *	3	7
S. sogdianum	21	5
S. owstoni *	10	127
S. nipponense *	20	64
S. kurilense *	2	9
S. ussuriense *	16	24
S. bhutanense	9	5
S. gurkhalis *	4	113
S. orientale *	7	50

slow movement, it is probable that most colonies are overlooked by the casual collector. Most distributions are poorly known (numerous species are known from one or two localities; others from widely scattered localities). Except for anecdotes, no detailed study of the biology and behavior of these organisms exists. Donisthorpe (1936) reported the life span of a *Stenamma debile* queen to be at least 18 years. He received a queen and approximately 50 workers on September 20, 1921 [ENGLAND: Mount Garret Wood, near New Ross, Wexford Co.]. The queen subsequently died in captivity on October 2, 1935. Donisthorpe estimated the colony would have not reached the level of 50 workers until roughly the third year. He concluded the minimum age of the queen would be 16 years with a probable age of 18 years. No other species have been studied for longevity. For the bulk of species, even their preferred food is unknown. Most attempts to raise colonies in the laboratory have failed (including my personal attempts).

This revision was restricted in scope to Palaearctic and Oriental regions so as to not conflict with work being done on the Central American fauna by Snelling (pers. comm.). It is hoped this analysis will better position future systematists to review the genus on a world-wide basis. Since significant gaps have been identified in our understanding of the Palaearctic and Oriental *Stenamma*, it is hoped this revision will encourage others to fill the gaps in our understanding of the distribu-

tion and biology of these animals.

FOSSIL HISTORY

Stenamma is poorly represented in the fossil record. Two males are known from Baltic amber. One was described as *Aphaenogaster berendti* (Mayr, 1868: 82) from the Berendt collection. Wheeler (1914: 53) discovered an additional male in the Geological Institute of Königsberg collection. He placed this species within genus *Stenamma* based upon wing venation. I have been unable to locate either specimen and suspect they may have been lost (I understand many amber specimens were lost during WW II). The following comparative notes are based upon both Mayr's and Wheeler's descriptions and upon Mayr's illustrations.

I agree with Wheeler's placement within *Stenamma*. Wing venation is quite similar to extant species with a single discoidal cell and a single submarginal cell. Wheeler believed that this species was more similar to North American species (such as *S. brevicorne*) since veins R_s and M separate well before cross vein 2r. He noted that in many European species, this separation occurs just beneath cross vein 2r or beyond. However, some specimens show anomalies with this vein branching similar to that found in *S. berendti*. Additionally, *S. nipponense* (from Japan) consistently shows the same vein placement as *S. berendti*. Given the antiquity of the latter species, this tends to confirm Bolton's (1972) hypothesis regarding evolution of the "standard Pheidoline reduction" within veins of the forewing, including loss of r-m cross vein.

I believe this fossil species represents a separate group within *Stenamma* based upon their antiquity, small size, and differences in wing venation. There do not appear to be any close modern relatives. However, two lost isolated males do not provide much information regarding variation within a species. Although ants have been found in a number of Tertiary deposits (ranging from amber to shale), no additional fossils have been identified as *Stenamma*.

Recently, subfossils of *Stenamma* were discovered in Great Britain (Collingwood and Hughes: 1987: 100 - 101). These are represented as head capsules of ants which perished during the Bronze Age. Collingwood and Hughes (1987) indicate these specimens were found at Thorne Moor which is about 100 miles north of the nearest collection of *Stenamma* in recent history. These specimens are clearly *S. debile* given their head sculpture and width of the glassy smooth frontal area between antennal insertions (DuBois, 1993).

It seems probable that *Stenamma* (*sensu lato*) has existed since the Oligocene. During the Miocene, forests began their retreat and grasses filled the void forming prairies and savannahs (Lewin, 1982: 191).

Stenamma appears to prefer forested areas. It seems likely that the range of *Stenamma* has been shrinking since the Miocene.

With a scarce fossil record, the history of *Stenamma* must be gleaned from an analysis of their modern distributions and relationships. This can only represent a small part of the total picture since a number of species have undoubtedly become extinct during the 40+ million year history of this genus. Given their restricted habitat, it is probable additional species will become extinct soon.

DEFINITIONS

Most terms used can be found in standard entomological glossaries (for example, Torre-Bueno, 1989). Many myrmecological terms are defined in Bolton (1994). Some terms are defined below to avoid confusion regarding their use within the context of this revision.

Full face view -- with head aligned so clypeal margin, occipital vertex, and side margins are all in focus simultaneously (see Fig. 4).

Occipital vertex -- more commonly called the occiput. However, occiput is correctly applied to that area directly above the point of attachment of the head to the thorax. In ants, this is on the posterior of the head.

Palpal formula -- expressed as two integers representing the number of segments of maxillary palp, followed by number of segments of labial palp (for example, 4,3). In all specimens of *Stenamma* examined to date, their palpal formula is 4,3 (this applies to workers, queens, and males). The male of *S. orousseti* was described as having a palpal formula of 5,3 (Casevitz-Weulersse, 1990: 146). However, the single male I examined exhibited the typical formula of 4,3.

SCULPTURE

Harris (1979) presented terminology for standard descriptions of surface sculpturing. He discussed the issue of relative size of sculpture in some detail and is quoted as this work attempts to follow his philosophy with all descriptions of *Stenamma*.

> "Absolute vs. Relative Size of Sculptures. The question of magnification and absolute versus relative size of specific sculpturing presents a few problems. Many descriptive terms exist with diminutive or superlative forms. If we consider specific sculpturing to have an absolute value, then the magnification at which we view the specimen and the actual size of the specimen will be irrelevant to the type of sculpturing present. This may seem desirable at first, but consider that a chalcid with a dozen deep punctures on its scutum

would be described the same as a large vespid with several hundred of the same size punctures. This does not seem suitable. Terminology would be more consistent if specimens that have the same number and arrangement of impressions or excrescenses per unit of body area are described the same, regardless of specimen and sculpture size. In other words, the specimen should be described only in its own context; particular structures should be viewed only in relation to the whole specimen, not individually. Comparative size should be considered independently. If two specimens are identical, except for size, then their sculpturing, though differing in absolute size, is described as identical because the relationship of the structure to the body region remains constant." (Harris, 1979: 3).

In following Harris' philosophy (with structures viewed as they relate to the whole specimen), variation is limited in terms to large, medium, and small. These sizes are relative to the average size of that specimen's compound eye ommatidia. Sculpture terms representing varying sizes include cross reference to terms indicating smaller (sm.) or larger (lg.) similar sculpturing. Thus, wrinkles when very large (in relation to size of the specimen under examination and much larger than the average ommatidium size) are scabrous. Moderate wrinkles are rugose; small wrinkles are rugulose. The sculpture terminology discussed below follows Harris (1979).

Carinate — area with several longitudinal narrow raised ridges (keels) set closely together (lg. = costate, sm. = carinulate). Carinate areas occur typically between the antennal insertions in many *Stenamma* species. Examples include, *S. striatulum* (Fig. 59). This species also exhibits such sculpture on the thoracic dorsum (Fig. 64). Similar patterns are also seen on the thoracic dorsum of *S. georgii* (Fig. 62) and *S. orousseti*. Sides of alitrunk and propodeum may also exhibit this sculpture. Examples include *S. georgii* (Fig. 77), *S. picetojuglandeti* (Fig. 79) and *S. jeriorum* (propodeum only, Fig. 73).

Carinulate — area with several small longitudinal narrow raised ridges (keels) set very closely together (lg. = carinate). Distance between keels is considerably less than distance between keels in areas with carinate sculpture. Areas with carinulate sculpture are found less frequently in *Stenamma*. Examples include the frontal area and cheeks of *S. owstoni* (Fig. 49) and *S. nipponense* (Fig. 52).

Costate — area with several coarse longitudinal narrow raised ridges set together (sm. = carinate). These ridges are much coarser than carinae. Costate sculpture is typically visible on the thoracic dorsum of

Stenamma species such as *S. nipponense* and *S. bhutanense*.

Foveate — area with numerous, regular, large pits. (sm. = foveolate). Foveate areas of sculpture are only found in *S. orientale* (Fig. 42, postpetiolar node dorsum).

Foveolate — area with small, deep pits. (lg. = foveate). Foveolate areas of sculpture are limited to *S. orientale* (Fig. 42, alitrunk dorsum). However, the petiolar node dorsum of *S. hissarianum* has sculpture which approaches this texture.

Glassy-smooth — highly polished surface which strongly reflects light (very shiny or glossy). Within *Stenamma*, most species have a glassy-smooth gaster. Examples can be observed in *S. orientale* (Fig. 43), *S. owstoni* (Fig. 84), and *S. picetojuglandeti* (Fig. 91).

Interstice — area (space) between adjacent lines (carinae or rugae).

Punctate — Area with fine punctures which appear as pin pricks (sm. = punctulate). Although punctate sculpture is most often restricted to venter of petiole and postpetiole in *Stenamma*, it is also found on the thoracic pleura of *S. gurkhalis* (Fig. 74).

Punctulate — area with minute, closely spaced punctures (lg. = punctate). This has also been termed finely punctate. Punctulate sculpture is typically found along the petiolar or postpetiolar ventral regions in *Stenamma* (for example, *S. ussuriense*, Fig. 95).

Rugose — irregular, nonparallel wrinkles (lg. = scabrous, sm. = rugulose). Perhaps the most common type of sculpture in examined *Stenamma* is rugose. Nearly every species examined has some rugae on the head, thoracic dorsum, and/or thoracic pleura. An example is found in *S. nipponense* (Fig. 70). In many instances, these rugae are anastomosing (resembling a web).

Rugulose — irregular, nonparallel wrinkles set closely together (lg. = rugose). This has also been termed minutely rugose. Rugulose sculpture is typically found on the anterior neck of the pronotum in most *Stenamma* species examined. It is also found on the venter of petiole and postpetiole in many species. An example is found in *S. sogdianum* (Fig. 92).

Scabrous — rough, irregular, nonparallel wrinkles (sm. = rugose). This has also been termed roughly rugose. Scabrous sculpture is typically found on the thoracic dorsum and thoracic pleura. An example is found in *S. owstoni* (Fig. 71).

Scrobiculate — area uniformly covered with short, oblong or trench-like hollows. Most *Stenamma* examined have a scrobiculate metanotal impression and a scrobiculate area near the median portion of the mesopleuron. An example is found in *S. jeriorum* (Fig. 73).

Variolate — area pitted with irregular indentations (pock like marks).

Variolate sculpture is only found in *S. orientale* on the petiolar venter near the anterior subpetiolar process (Fig. 43).

MEASUREMENTS AND INDICES

All measurements are expressed in millimeters. All indices are rounded to the nearest integer.

Alitrunk Index (AI) — pronotal width divided by alitrunk length, result then multiplied by 100 (PRW/AL x 100).

Alitrunk Length (AL) — diagonal length of alitrunk in lateral view measured from the anterior pronotal apex to the posterior base of the metapleural lobes (Fig. 5).

Cephalic Index (CI) — head width divided by head length, result then multiplied by 100 (HW / HL x 100).

Eye Length (EL) — maximum length of the compound eye, measured while head is in lateral view. In many species, this line of maximum length is at an angle to the head length.

Head Length (HL) — length of the head, excluding mandibles, measured from anterior-most point of the median clypeal margin (excluding clypeal "teeth") to the midpoint of the occipital vertex in full face view (Fig. 4).

Head Width (HW) — maximum width of the head, measured just behind the compound eyes, in full face view. Some authors measure head width in male ants to include the compound eyes. Such a practice was not followed in this work (Fig. 4).

Ocular Index (OI) — compound eye length divided by head length, result then multiplied by 100 (EL / HL x 100).

Petiole Height (PH) — maximum height of the petiole, measured perpendicularly from apex of petiolar node to venter of petiole (directly beneath node) (Fig. 6).

Petiole Length (PL) — maximum length of petiole, measured from ventral juncture with propodeum to juncture with postpetiole (Fig. 6).

Petiole Width (PW) — maximum width of petiole, measured across node in dorsal view.

Postpetiole Height (PPH) — maximum height of the postpetiole, measured perpendicularly from apex of postpetiolar node to venter of postpetiole (directly beneath node) (Fig. 7).

Postpetiole Length (PL) — maximum length of postpetiole, measured from juncture with petiole to juncture with gaster (Fig. 7).

Postpetiole Width (PW) — maximum width of postpetiole, measured across node in dorsal view.

Pronotal Width (PRW) — maximum width of pronotum in dorsal view.

Scape Index (SI) -- scape length divided by head width, then

multiplied by 100 (SL / HW x 100).

Scape Length (SL) — straight line length of the antennal scape excluding the basal condylar bulb and adjacent constriction or neck (Fig. 8).

Total Length (TL) — total outstretched length of the individual from clypeal margin to gastral apex. Although this is usually measured from mandibular apex, many specimens had their mandibles buried in glue or arranged in such a position so that measurement from this point was not practical. Given the size of mandibles in this genus, such a difference is not appreciable. Typically, the combination (addition) of HL, AL, PL, PPL, and GL (gaster length, Fig. 9) equals total length.

PILOSITY

Appressed — setae nearly parallel to the surface.

Decumbent — setae standing between 10 and 40 degrees from the surface.

Erect — setae nearly vertical (perpendicular) to the surface.

Subdecumbent — setae slanted about 45 degrees from the surface.

Suberect — setae bent about 10 to 20 degrees from the vertical.

COLOR

Ferrugineous — rusty, reddish brown.

Infuscate — smoky gray brown with a black tinge.

Piceous — pitch black or black with a slight reddish tinge.

Testaceous — brownish yellow.

REFERENCE COLLECTIONS

Specimens examined during this revision were provided by the following individuals and institutions (abbreviations are used throughout rest of the text). I am extremely grateful to all who cooperated by sending specimens. Where possible, codens (coded abbreviations referenced in species descriptions) follow those used by Arnett and Samuelson (1986). Codens not used in the above reference are preceded by an asterisk.

ANIC, Canberra, Australian National Insect Collection, Canberra, A. C. T. (Robert W. Taylor, and Steve Shattuck)

*ASPC, Dormagen, Andreas Schulz Personal Collection, Dormagen, Germany

*ATPC, Granada, Alberto Tinaut Personal Collection, Granada, Spain

BMNH, London, British Museum (Natural History), London, U. K. (Barry Bolton)

*CCPC, Leeds, Cedric Collingwood Personal Collection, Leeds, U. K.

*FRPC, Milan, Fabrizio Rigato Personal Collection, Milan, Italy

ISNB, Brussels, Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium (Paul Dessart)

*KOPC, Obihiro, Keiichi Onoyama Personal Collection, Obihiro, Japan

KEUC, Fukuoka, Entomological Laboratory, Kyushu University, Fukuoka, Japan (Kazuo Ogata)

MCSN, Genoa, Museo Civico di Storia Naturale "Giacomo Doria," Genoa, Italy (V. Raineri)

MCZC, Cambridge, Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A. (Stefan Cover and Edward Wilson)

*MDPC, Washington, Mark DuBois Personal Collection, Washington, Illinois, U.S.A.

MHNG, Geneva, Museum d'Histoire Naturelle, Geneva, Switzerland (Claude Besuchet)

MNHN, Paris, Museum National d'Histoire naturelle, Paris, France (Janine Casevitz - Weulersse)

*MTPC, Tokyo, Mamoru Terayama Personal Collection, Tokyo, Japan

NHMB, Basel, Naturhistorisches Museum, Basel, Switzerland (M. Brancucci)

OXUM, Oxford, Hope Entomological Museum, Oxford, U.K. (Christopher O'Toole)

*PWPC, Prague, Petr Werner Personal Collection, Prague, Czech Republic

TTCC, Lubbock, The Museum, Texas Tech University, Lubbock, Texas (J. C. Cokendolpher)

*UCM, Madrid, Universidad Complutense de Madrid, Madrid, Spain (M. D. Martinez Ibanez)

*WMPC, El Paso, William MacKay Personal Collection, El Paso, Texas, U. S. A.

*XEPC, Barcelona, Xavier Espadaler Personal Collection, Bellaterra, Barcelona, Spain

ZMHB, Berlin, Museum fur Naturkunde der Humboldt Universitat zu Berlin, Germany (F. Koch)

ZMPA, Warsaw, Museum of the Institute of Zoology, Polish Academy of Science, Warsaw, Poland (late B. Pisarski)

ZMUM, Moscow, Biological Department, Zoological Museum, Moscow State University, Moscow, Russia (A. Antropov and G. Dlussky)

GENUS *STENAMMA* WESTWOOD

Stenamma Westwood, 1840: 83.

Type species: *Stenamma westwoodii* Westwood, by monotypy.

Asemorhoptrum Mayr, 1861: 76.

Type species: *Myrmica lippula* Nylander, by original designation and monotypy. Synonymy by André, 1883: 310]. Confirmed by this revision.

Theryella Santschi, 1921: 68.

Type species: *Theryella myops* Santschi (=*S. punctiventre*), by monotypy. [Provisional synonymy by Santschi, 1923: 136]. Confirmed by this revision.

WORKER DIAGNOSIS. Myrmicine ants of the tribe Stenammini which have the following combination of characters. Worker monomorphic; palpal formula 4,3; antennae 12 segmented with indistinct 3-4 segmented club. Grooves lacking on each side of occipital foramen. Propodeum armed with a pair of spines (which may be reduced to small points). Inferior propodeal plates prominent. Petiole pedunculate with low, convex to flat node. Gaster mostly glassy-smooth with small carinae near base of first segment (usually both on sternite and tergite).

WORKER. Myrmicine ants of the tribe Stenammini which have the following combination of characters.

> "Monomorphic. Mandibles subtriangular to elongate triangular, with 6 - 12 teeth which decrease in size irregularly from apex to base [teeth on basal half frequently reduced, sometimes only vaguely defined]; apical tooth largest, followed by 1 - 2 that are subequal or slightly decrease in size basally. Extra teeth are added as intercalated denticles between the basal teeth. Basal angle square to oblique. Palp formula 4,3. Anterior clypeal margin lacking strong isolated median seta; median portion of clypeus often longitudinally bicarinate; median portion of clypeus narrow posteriorly where it passes between frontal lobes [clypeus here only as wide as, or narrower than, either of the frontal lobes and often impressed]. Frontal lobes small and closely approximated, not entirely covering antennal insertions. Antennal scrobes absent. Compound eyes small to moderate in size [2 - 12 ommatidia in longest diameter], slightly to distinctly in front of midlength of side of head (excluding mandibles). Antenna 12 segmented; club somewhat indistinct from 3 - 4 segments. Scape neither elbowed nor ridged at the base, nor with a distinct apron around the peduncle. Sides of head almost flat to evenly convex, widest just behind eyes, forming rounded corners with the occipital vertex which is weakly concave in full face view. [Posteroventral corners of head lacking grooves (such as those found in *Rogeria*, C. Kugler, pers. comm.)]

"Promesonotum convex in profile, often low domed-convex and very prominent. [Faint groove marking track of former promesonotal suture sometimes present dorsally]. Anterior face of pronotum rising nearly vertically from cervix and usually forming a distinct rounded angle with the dorsal surface. Metanotal groove usually present [only rarely otherwise]. Anterior edge of propodeum often delimited by transverse carinae. Propodeal spiracle circular, at or slightly behind midlength of propodeum, not strongly shifted posteriorly or ventrally on side of propodeum. Propodeum armed with a pair of teeth or short spines. Inferior propodeal plates present and prominent, rounded to bluntly triangular to quadrate [some species with a pair of ridges connecting these lobes to propodeal plates above]. Metapleural gland openings moderately developed [not reaching level of spiracle]. Metasternal process small to absent [when present it consists of a small lobe or tooth on each side of midline], process not followed by a pair of post-processional carinae. Ventral surface of alitrunk lacking long, deep emargination between hind coxae. Articulation with petiole U-shaped and near level of posterior coxal hind margin. Middle and hind tibiae lacking spurs. Tarsal claws simple.

"Petiole with long, anterior peduncle and (usually) a small anteroventral process (and associated keel). Petiolar spiracle situated on peduncle, in front of peduncular midlength and usually close to its articulation with the alitrunk. Petiolar node rounded in profile; most often conical to subconical.

"Postpetiole with very short peduncles and low node slightly longer than broad. Postpetiolar node always wider than petiolar node. Postpetiolar sternum flat to concave in profile, sometimes with anterior and posterior processes. Postpetiolar-gastral articulation very narrow. In profile, postpetiole attached high on anterior face of gaster. Majority of gaster occupied by first segment. Sides evenly rounded. First gastral tergite often with short basigastral carinae.

"Fine simple pilosity present on all dorsal surfaces of head and body. Body cuticle usually thick and hard; usually sculptured. Head and alitrunk with greatest macrosculpture, usually rugose or scabrous, sometimes foveate to punctulate. Interstices usually punctulate, sometimes glassy-smooth. Mesopleural median suture and metanotal suture usually scrobiculate. Mandibles weakly striate or punctate, never

smooth. Dorsum of propodeum (between spines) usually with several transverse carinae. Sculpture of nodes varies from scabrous to glassy-smooth. Antennae, legs, and gaster glassy-smooth except for piligerous punctures (coxae occasionally with reduced carinulae).

"Color mostly brown to dark brown [testaceous to piceous] with appendages lighter in color. Most setae yellow to white." (B. Bolton, pers. comm.).

STING APPARATUS. Only two species have been studied to date (*S. diecki* and *S.* near *manni*). Both species discussed are New World representatives of the genus. Palaearctic and Oriental species are presumed to have a similar sting apparatus.

"Spiracular Plate. In *S.* near *manni*, body of plate ovoid, only slightly longer than broad. Anteroventral corner not prolonged. Dorsal end of plate reduced ... Quadrate Plate. In *S.* near *manni*, ... anterodorsal corner drawn out into a long pollicate process ... No lateral or medial lobes present. *S. diecki* similar, but body not abruptly reduced. Lateral lobe present on apodeme. Oblong Plate. Dorsal ridge wide, posterior apodeme short, acute. Body of posterior arm narrow (especially in *S. diecki*), truncate. Anterior apodeme long, slender. Ventral arm of *S. diecki* tapered ... end ... rounded. In *S.* near *manni*, ventral arm club-shaped, widest distad. [Fulcral arm] of both species narrowly fusiform and curved along edge of arm, not articulating with posterior arm. ... Gonostylus. ... In some individuals of *S. diecki*, a single seta fills gap in setal pattern. Triangular Plate. Body of [triangular plate] long, moderately wide, sides slightly curved, nearly parallel. Apical processes short. ... Lancet. Weak, narrow, ribbon-like; apex tapered, narrowly rounded (end more blunt in *S. diecki*). Groove and ventral ridge closely parallel, both end subterminad. ... Sting. [Sting shaft] weak, long, slender, blunt. [Sting bulb] long, convex. [Sting base] inclined caudad in *S.* near *manni*, but in *S. diecki*, more vertical ... and with more prominent anterolateral processes. ... Basal ridge very wide in both *Stenamma* species... [Sting bulb] quite wide in ventral view... Furcula. Broadly U-shaped, with uniform diameter and sclerotization." (Kugler, 1978: 462 - 463).

CHROMOSOMES. Although the vast majority of *Stenamma* species have not been karyotyped, two species are discussed in literature. Hauschteck (1962), Imai (1966), and Crozier (1970, 1975) report *Stenamma brevicorne* with a haploid number of 4. Crozier (1975)

reported a haploid number of 20 for *S. westwoodii* [most likely *S. debile* based on this revision].

MALPIGHIAN TUBULES. Brown (1988) counted tubules in 7 workers representing 3 species (*Stenamma brevicorne* — Tompkins County, New York, U.S.A.; *S. huachucanum* — E. Turkey Creek, Chiricahua Mountains, Arizona, U.S.A.; and *S. diecki* — W. North Carolina and Tompkins County, New York, U.S.A.). All specimens had a Malpighian Tubule count of 4; the specimens of *S. diecki* were cryptonephritic. It is probable that most species studied in this revision have a similar number of Malpighian Tubules.

Brown indicated a number of genera which contained 4 tubules (*Stenamma*, *Oxyepoecus*, *Wasmannia*, *Monomorium* (*minimum* group), *Solenopsis*, and all other genera of Dacetini examined, except *Daceton*). "It is interesting to note that reduction in body size in evolution usually is accompanied by a variable or constant reduction in the number of tubules, but that a count of 4 seems to represent a numerical lower limit below which further reduction is rare and perhaps difficult." (Brown, 1988: 27).

GYNE DESCRIPTION. Characters as for worker, but with usual female modifications such as larger eyes, ocelli, full complement of flight sclerites, wings, and so forth. (B. Bolton, pers. comm.).

MALE DESCRIPTION. Characters for worker, but with many modifications. Features detailed below.

> "Mandible triangular, meeting or overlapping along midline, with 3 - 7 teeth. Palp formula 4,3. Clypeus not bicarinate; median portion narrow posteriorly between closely approximated antennal insertions. Frontal lobes absent; scrobes absent. Compound eyes large, distinctly in front of midline of sides. Ocelli conspicuous, not borne on a turret and not breaking outline of posterior margin of head (in full face view). Antenna 13 segmented; segments thickening from base towards apex but apex usually not distinctly clavate. Notauli faint to absent [when present, the stem of the Y-shape is usually absent]. Parapsidial grooves present. Maximum width of mesothorax exceeds head width. Axillae feebly delimited on dorsum. Propodeal spiracle more anteriorly situated than in worker [propodeum sometimes deformed]. Metapleural gland openings appear to be absent. Propodeal armament and metapleural lobes reduced from that seen in worker. Metasternal process as in worker but less strongly developed [when present]. Wing venation as in gyne. Sculpture reduced from that seen in conspecific worker. Genitalia

small and apparently fully retractile." (B. Bolton, pers. comm.).

Terminal abdominal segments and genitalia were not examined in detail during this revision, nor were comparisons made between species. In males examined, genitalia were fully retractile. Since many species are known by only one or two males, I hesitated to dissect their genitalia. Additionally, males of many species are unknown so such a comparison would be of limited value. Terminal abdominal segments are photographed in Figs. 27 - 31. Although these represent a North American species, they are similar to the European specimens I examined. Their general appearance and placement of setae is consistent across species examined. The entire genital capsule of *S. diecki* (a North American species) is photographed in Figs. 29 - 31. There are probably useful characters among male genitalia. However, much additional material needs to be collected before such a study would be justified.

WING VENATION. Discussion follows the terminology of Brown and Nutting (1950). Most species exhibit the standard "pheidoline" reduction of Bolton (1982: 362) including loss of r-m cross vein. However, males of *S. striatulum* from former Yugoslavia and some males of *S. nipponense* from Japan display the r-m cross vein (creating a second submarginal cell). Remaining specimens of *Stenamma* examined lacked this cross vein. Typical cells of the forewing consist of: costal, median, submedian, 1st discoidal, and 1st submarginal. Variation between species is usually found in length of Rs, M, and Cu veins. Separation of Rs and M veins in relation to cross vein 2r may be a useful separatory character. In most species from North America and *S. nipponense*, this separation is located in front of 2r while with most European and Asian species, it is located just underneath or behind. Typical venation and cells are depicted in Figs. 1 - 3.

Some specimens exhibit adventitious vein stubs (for example, *S. nipponense* with the beginnings of a second discoidal cell, Fig. 206). One male of *S. westwoodii* even lacked a complete discoidal cell, Fig. 335).

Hind wing venation is somewhat variable, but usually reduced from that found in *S. debile* (Fig. 109). Most reductions are a shortening of the anal vein, loss of cu-a cross vein, loss of r-m cross vein, shortening of the cubital vein and/or median vein. A small section of hindwing is photographed in Fig. 26 to depict the abundant microtrichia which cover both wings. Shape and arrangement of hamuli are also shown. There are usually between 4 and 7 hamuli on each hindwing and most have a square tip and are bent as in the photograph.

MATURE WORKER LARVA. Most species examined were represented as pinned material only (with no associated larvae). The following

information is based principally upon North American forms. Until additional larval material is known for most Palaearctic and Oriental species, further analyses of larval characters is not possible.

> "Moderately stout; constricted slightly at the first abdominal somite; thorax turgid; abdomen swollen; no neck. Submature larvae shaped somewhat like a crook-neck squash; thorax and first abdominal somite forming a short stout neck, which is curved ventrally; remainder of abdomen subellipsoid. Body hairs moderately numerous, rather long, 2-4 branched, usually bifid, rarely denticulate. Posterior surface of labrum spinulose, the spinules minute and mostly in short arcuate rows which form a reticulate pattern, a few isolated near the lateral borders. Mandibles with the apex forming a moderately long slender tooth which is curved medially; two rather stout medial teeth; medial surface of basal half with several short coarse spinules. Maxillae with the apex spinulose; palp a short stout peg with two large contiguous apical sensilla, two small discoidal apical sensilla (each bearing a short spinule) and one lateral sensillum (bearing a very long spinule). Dorsal portion of hypophyranx with sublongitudinal ridges; ventral spinulose, the spinules minute and arranged in rows which form a reticulate pattern." (Wheeler and Wheeler, 1953: 50).
>
> "Profile aphaenogastroid ... Head hairs mostly bifid. Labrum short, bilobed, spinules on posterior surface usually minute and in rows. Maxillary palp shorter than galea. Mandibles pogonomyrmecoid ..." (Wheeler and Wheeler, 1976: 53).

It is apparent that specific differences exist between mature worker larvae. Wheeler and Wheeler (1953: 50 - 51) provided a detailed description of *S. diecki* based upon material collected in Michigan and North Dakota and compared this species to an undescribed species from Cloudcroft, New Mexico. They also reprinted Donisthorpe's (1922 and 1927) descriptions of *S. westwoodii* [presumably *S. debile*] larvae. Later, Wheeler and Wheeler (1972: 237 - 238) provided comparative notes and described the larvae of *S. manni* from specimens collected in Mexico. To date, these are the only comprehensive descriptions of *Stenamma* larvae.

ADDITIONAL CHARACTERS. Ants of the genus *Stenamma* are fairly uniform in external morphology. Various aspects of their morphology are discussed below as most have not been previously examined within this genus. In some cases, I only state the obvious which has not been

stated before.

All members examined possessed an indistinct 4-segmented antennal club with appressed setae (Fig. 10). Apical club segments grow increasingly larger with the ultimate segment being the largest of all funicular segments. Microsetae near the base of each funicular segment are reduced, presumably to allow movement of these segments against the proximal segment.

The compound eye is quite small and usually composed (in workers) of nearly isolated ommatidia. Average eye length for workers is between 4 and 6 ommatidia in greatest diameter (Fig. 11) when ommatidia are counted in a straight line. Each ommatidium is surrounded by cuticle. Many species have piligerous eyes (ranging from one to many setae) with setae projecting from this cuticle between ommatidia. Vision in this genus must be remarkably poor and approaching that found in ants which forage exclusively underground.

Ants of the genus *Stenamma* also possess a prominent sternal process which is located between meso- and meta-coxal attachments (worker, Fig. 16; male, Figs. 24, 25). Size, pilosity, and shape of this structure could not be compared across species primarily due to limited material available with many specimens buried in unyielding glue. Based upon cursory comparisons and glimpses between coxae and intermixed glue, it appears this character set may be useful in classifying *Stenamma*. The use awaits the availability of sufficient new material.

As best I can determine, no previous researcher has noted the presence of a stridulatory apparatus between the petiole and postpetiole. Although stridulation has not been directly observed in *Stenamma*, there appears to be a strong internal ridge inside the petiole which corresponds to a series of wrinkles on the surface of the postpetiole. Both structures are photographed (petiole interior, Fig. 14; postpetiole surface, Fig. 15).

Another feature not previously reported for *Stenamma* is the presence of two distinct pits on the lower sides of the alitrunk. The first (and most prominent) is located at the base of the procoxae, directly below the suture separating pronotum and anepisternum. This pit is always lined with microsetae (although abundance does vary with species) (Figs. 19, 21). Some specimens have an excessive amount of particles trapped by these microsetae, even though the remainder of the ant is relatively clean. It is not known what function (if any) this pit serves. It is prominent and occurs throughout the *Stenamma* species examined. An additional pit is located on the alitrunk between meso- and meta-coxal attachments. This pit is not lined with microsetae and is usually located

at the base of the sulcus separating katepisternum and propodeum. This pit does not have as much variation across species examined as the prior mentioned pit.

Mouthparts, particularly palpi and mandibular teeth, seem to have limited utility in constructing a classification within the genus. Mandibular and labial palpi are represented by a palpal formula of 4,3. Earlier authors reported widely varying palpal formulas; however, in all specimens examined, palpal formula was unwavering. Palps are depicted in Fig. 13. Lower magnifications show their placement on the underside of the head and higher magnifications show their shape. In most species, the ultimate segment of each palp is a rounded bulb and the basal segment is flattened. Counts of mandibular teeth vary widely. There are usually two prominent apical teeth followed by a number of small teeth (or denticles). Surprisingly, males (although haploid) show little variation within species, but significant variation between species in number of mandibular teeth. This was one of the first clues which lead to the separation of *S. debile* from *S. westwoodii* (see DuBois, 1993 for further discussion). This difference was noted by prior authors as well (see for example, Kutter, 1977: 76).

RELATIONSHIPS

Historically, *Stenamma* has been considered one of the more primitive genera near the base of the Myrmicinae. Emery (1921) placed this genus first (in the subtribe Stenammini) under tribe Pheidolini in his classification of myrmicine ants. He considered the most closely related genus to be *Aphaenogaster*. Emery included *Aphaenogaster*, *Novomessor*, *Messor*, *Goniomma*, *Oxyopomyrmex* and *Macromyrma* within this subtribe. During the latter part of the nineteenth century, *Aphaenogaster* and *Messor* were considered subgenera of *Stenamma* (Emery, 1895). Emery considered Mayr's description of *Aphaenogaster brevinodis* and did not believe these two genera contained characters which would satisfactorily distinguish them. He noted the difference in clypeal shape and wing venation (most of his 1895 discussion centered upon differences in wing venation clustered around a small sample of species). He concluded the common ancestor of *Stenamma westwoodii* and *S. brevicorne* shared wing venation similar to that found in *Aphaenogaster*. Since the older name was *Stenamma*, this had priority. *Goniomma* was originally placed as a subgenus of *Stenamma* (Emery, 1895). Emery's (1921) closest subtribe was Pheidolini.

Although Emery (1921) considered *Rogeria* a member of the Leptothoracini near *Harpagoxenus* and *Formicoxenus*, Brown (1973) placed *Stenamma* and *Rogeria* in close proximity and both were placed

near *Pheidole*. Hölldobler and Wilson (1990: 16) agreed with Brown and placed *Rogeria* and *Stenamma* within tribe Pheidolini. Bolton (1994) retained tribe Stenammini and included the following genera: *Ancyridris*, *Bariamyrma*, *Calyptomyrmex*, *Cyphoidris*, *Dacatria*, *Dacetinops*, *Dicroaspis*, the extinct *Ilemomyrmex*, *Indomyrma*, *Lachnomyrmex*, *Lordomyrma*, *Proatta*, *Rogeria*, *Rostromyrmex*, *Stenamma*, *Thetheamyrma*. Bolton also tentatively included *Mayriella*, *Adelomyrmex*, and *Baracidris*. This revision follows Bolton's placement of *Stenamma* within tribe Stenammini.

Of the genera I have examined, it appears *Stenamma* and *Rogeria* are closely related. However, I do not have ready access to many of the smaller genera also placed in tribe Stenammini. Kugler revised *Rogeria* (Kugler, 1994) and kindly loaned me examples representing ranges of variation found in *Rogeria*. He also indicated *Stenamma* and *Rogeria* are similar in size and appearance. Kugler (pers. comm.) listed the following features as separating *Stenamma* from *Rogeria*:

> "1) [*Stenamma* has] a distinct to indistinct four segmented antennal club which sometimes appears 3 segmented, but then the apical segment was less than the length of the rest of the club.
>
> "2) [*Stenamma* has] no grooves on the posteroventral aspect of the head into which the anterior edges of the pronotum fit ...
>
> "3) [*Stenamma* has] a well rounded anteroventral corner of the pronotum." (Kugler, 1987, pers. comm.)
>
> Kugler (1994: 25) further stated: "*Stenamma* (Pheidolini) workers are similar [to *Rogeria*] in form of clypeus, including marrow posterior portion between frontal lobes, and some have 3-segmented antennal clubs, but in that case the apical segment is shorter than the combined length of the other two segments. Also, *Stenamma* has no nuchal grooves, the anteroventral corner of the pronotum is rounded, and the metanotal groove is generally more distinct than in *Rogeria* species. Larvae of *Stenamma* differ from those of *Rogeria* as follows: form aphaenogastroid; cranium subhexagonal; mandibles pogonomyrmecoid (similar to ectatommoid); body hairs bifid or denticulate, not anchor-tipped..."

Stenamma has a palpal formula of 4,3 while *Rogeria* has a palpal formula of 3,3 or less. Additionally, *Stenamma* has a microsetae lined pit at the base of the procoxae. While some *Rogeria* have this pit, it is not lined with microsetae. The function of this pit is unknown.

Since only *Stenamma* species from Palaearctic and Oriental regions

were examined in detail for this revision, no clearly unique derive features were identified for the genus. The combination of palpa formula, antennal segments (and indistinct club), propodeal spines and the micro-setae lined pit near the base of the procoxae separat examined species from other Myrmicinae. The micro-setae lined pit wa observed in all Nearctic, Palaearctic, and Oriental species examined However, this feature may not be unique to *Stenamma*. It is possibl that *Stenamma* as presently recognized is paraphyletic. For example the enigmatic *S. orientale* is significantly different from nearby species Likewise, the fossil *S. berendti* differs significantly from other know species. Once the *Stenamma* fauna of Central America is bette understood, future systematists should be able to resolve this issue.

Bolton (1994) can be used to separate workers of genus *Stenamm* from other ants. The following keys are provided for identification o worker ants of *Stenamma* found in Palaearctic and Oriental regions.

KEYS TO SPECIES

Workers

The following keys should be used to separate worker *Stenamm* only. Reproductive forms (both gynes and males) are known fro certain species and very few species have reproductive forms know from more than a few specimens. To ease identifications, keys ar divided into geographical areas. A complete key covering all Palaearcti and Oriental species follows. Once a tentative identification is made actual specimens should be compared with appropriate illustration and the description of that species (Fig. numbers are provided with eac species below). Given the paucity of specimens representing som species, it is probable that the entire range of variation is not included Hence, some specimens may not readily key (especially if they represen unknown clinal variation).

ORIENTAL SPECIES (INCLUDING EASTERN RUSSIA)

1a. Mandible with 6 teeth. Gastral tergite one with basal carinae nearl glassy smooth. Alitrunk dorsum foveolate; postpetiolar node dorsu foveate. Total length 2.66 - 3.46 mm. Head length 0.71 - 0.72 mm Head width 0.58 - 0.63 mm. Compound eye length 0.13 - 0.16 mm Known from soil core and leaf litter samples from Borneo (Fig. 213 ..... *S. orientale*
Figs. 41 - 43, 210 - 212

— b. Mandible with more than 6 teeth. Gastral tergite one with basa carinae as long as ¼ length of postpetiole. Alitrunk and postpetiola node dorsum usually rugose or scabrous, never foveolate or foveate

Total length usually more than 3.5 mm. If length less than 3.47 mm, compound eye length less than 0.13 mm, head width greater than 0.63 mm, and head length greater than 0.72 mm. Known from Japan, China, or eastern Russia 2

2 (1) a. Gastral tergite one with basal carinae as long as ¼ length of postpetiole. Compound eye length 0.11 - 0.18 mm. Mandible with 7 - 8 teeth. Known from Japan and China (Fig. 236). ..... *S. owstoni* Figs. 49, 71, 84, 226 - 228.

— b. Gastral tergite one with basal carinae as long as ½ length of postpetiole. Compound eye length always less than 0.12 mm. Mandible with 7 -11 teeth. Known from Japan or eastern Russia 3

3 (2) a. Thoracic dorsum scabrous. Petiole width 0.21 - 0.23 mm. Petiole height 0.24 mm. Known only from type series, Kuril Islands (Fig. 169) ..... *S. kurilense* Figs. 163 - 168.

— b. Thoracic dorsum rugose (Figs. 70, 83). Petiole width 0.20 mm or narrower. Petiole height 0.24 mm or shorter. Known from Japan or eastern Russia 4

4 (3) a. Mandible with 7 - 9 teeth. Metanotal impression shallow, depth approximately ¼ length of propodeal spines. Known from eastern Russia (Fig. 327) ..... *S. ussuriense* Figs. 61, 65, 83, 95, 310 - 314.

— b. Mandible with 11 teeth. Metanotal impression deep, depth approximately ½ length of propodeal spines. Known from Japan (Fig. 209) ..... *S. nipponense* Figs. 52, 70, 86, 200 - 202.

HIMALAYAN SPECIES (AND NEARBY REGIONS)

1a. Gastral tergite one with basal carinae as long as to ½ length of postpetiole or more. Petiole width 0.13 - 0.14 mm. Known from Uzebekistan (Fig. 289) ..... *S. sogdianum* Figs. 58, 68, 80, 92, 284 - 288.

— b. Gastral tergite one with basal carinae as long as ⅓ length of postpetiole or shorter. Petiole width 0.14 mm or wider. Known from various countries, except Uzebekistan 2

2 (1) a. Antennal scape bent at base. Propodeal plates twice as long as propodeal spines. Known from Tajikstan (Fig. 147) ..... *S. hissarianum* Figs. 18, 19, 56, 67, 78, 90, 131 - 135.

— b. Antennal scape straight at base. Propodeal plates slightly longer than propodeal spines or shorter, never twice as long. Known from various countries, except Tajikstan 3

3 (2) a. Propodeal plates not longer than propodeal spines (at most, 0.7 length of spines). Known only from Nepal and Bhutan .....
— b. Propodeal plates equal to or longer than propodeal spines, neve shorter. Known from various countries, except Nepal and Bhutan .....
4 (3) a. Compound eye length 0.06 - 0.10 mm. Scape length 0.60 - 0.7 mm. Postpetiole width 0.18 - 0.24 mm. Gastral tergite one with basa carinae as long as ⅓ length of postpetiole or shorter. Propodeal plate roughly 0.75 as long as propodeal spines. Known only from typ series, Nepal (Fig. 130) ..... *S. gurkhali* Figs. 51, 74, 87, 126 - 129.
— b. Compound eye length 0.11 - 0.13 mm. Scape length 0.50 - 0.5 mm. Postpetiole width 0.24 - 0.29 mm. Gastral tergite one with basa carinae as long as 0.20 to 0.25 length of postpetiole. Propodeal plate roughly ½ as long as propodeal spines. Known only from type series Bhutan (Fig. 99) ..... *S. bhutanens* Figs. 96 - 98.
5 (3) a. Head length 0.84 - 0.85 mm. Scape length 0.61 - 0.63 mm Postpetiole height 0.23 mm. Known from Kazakhstan and Kirghizi (Fig. 268) ..... *S. picetojuglandet* Figs. 20, 21, 57, 63, 79, 91, 251 - 255.
— b. Head length 0.82 mm or less. Scape length 0.60 mm or less Postpetiole height usually less than 0.23 mm. Known from Pakista and India .....
6 (5) a. Petiolar stalk less than ½ length of petiole. Propodeal plate equal to or longer than propodeal spines. Known from Kashmi Province (India) and Pakistan (Fig. 162) ..... *S. kashmirens* Figs. 50, 72, 154 - 161.
— b. Petiolar stalk ½ length of petiole. Propodeal plates equal t propodeal spines or shorter, never longer. Known only from typ series, Pakistan (Fig. 153) ..... *S. jeriorun* Figs. 53, 73, 148 - 152.

SOUTHERN / WESTERN PORTIONS OF FORMER U.S.S.R. SPECIE

1a. Mandible with 9 teeth. Thoracic dorsum rugose or carinate (alway with decided longitudinal orientation), ridges set very close together Known from Spain through Turkey and northward to southern Russia (Fig. 309) ..... *S. striatulun* Figs. 59, 64, 81, 93, 290 - 295.
— b. Mandible with 9 or fewer teeth (usually fewer). Sculpture o thoracic dorsum variable, but never with close set longitudinal ridge .....

2 (1) a. Gastral sternite one with basal carinae as long as 0.20 to 0.25 length of postpetiole. Gastral tergite one with basal carinae as long as ⅓ to ½ length of postpetiole. Known from throughout Europe (Fig. 110) ..... *S. debile*
Figs. 10 - 17, 32 - 34, 36 - 39, 44, 45, 47, 60, 69, 82, 94, 100 - 102.
— b. Gastral sternite one lacking basal carinae and glassy-smooth. Gastral tergite one with basal carinae as long as ⅓ length of postpetiole or slightly less 3
3 (2) a. Head dorsum (above compound eyes) with rugae forming concentric loop like structures. Thoracic dorsum rugose. Known from Azerbaijan, Georgia, and southern Russia (Fig. 183) ..... *S. lippulum*
Figs. 54, 66, 76, 88, 170 - 177, 184 - 186.
— b. Head dorsum (above compound eyes) with anastomosing rugae (not forming loop like structures). Thoracic dorsum carinate. Known from Georgia and southern Russia (Fig. 125) ..... S. georgii
Figs. 4 - 9, 55, 62, 77, 89, 111 - 119.

NORTH AFRICAN SPECIES

1a. Anterior subpetiolar process forming a prominent tubercle. Petiole height to length ratio nearly 0.70. Total length 3.03 mm. Mandible with 6 teeth. Known from Morocco (Fig. 276) ..... *S. punctiventre*
Figs. 269 - 271.
— b. Anterior subpetiolar process reduced. Petiole height to length ratio 0.50 or less. Total length 3.67 - 4.12 mm. Mandible with more than 6 teeth. Known from Algeria, Morocco, and Tunisia (Fig. 199) ..... *S. msilanum*
Figs. 187 - 193.

EUROPEAN SPECIES

(modified from Agosti and Collingwood, 1987)
1a. Scape and tibiae typically with erect, short setae. Larger ants, total length 3.19 - 4.52 mm. Known from southern Europe (mostly France and Italy) (Fig. 250) ..... *S. petiolatum*
Figs. 237 - 242.
— b. Scape and tibiae typically lacking erect, short setae. Smaller ants, total length 2.87 - 4.06 mm 2
2 (1) a. Petiolar dorsum in lateral view a depressed convex dome. Known from southern Europe (including Spain and Sardinia) (Fig. 283) ... *S. sardoum*
Figs. 277 - 282.
— b. Petiolar dorsum in lateral view high with a sharply rounded dome

..... 3

3 (2) a. Head dorsum striate to occiput. Dorsum of alitrunk rugose with longitudinal orientation or longitudinally carinate 4

— b. Head dorsum rugose (if striate or carinate, ridges restricted to area near antennal insertions). Dorsum of alitrunk rugose, rugae anastomosing in some instances, never with a decided longitudinal orientation 5

4 (3) a. Mandible typically with 9 teeth. Propodeal plates ⅓ to ½ as long as propodeal spines. Gastral tergite one with basal carinae as long as ¼ to ⅓ length of postpetiole. Known from Spain through Turkey (Fig. 309) ..... *S. striatulum*
Figs. 59, 64, 81, 93, 290 - 295.

b. Mandible typically with 7 teeth. Propodeal plates nearly as long as propodeal spines. Gastral tergite one with basal carinae typically less than ¼ length of postpetiole. Known mostly from Corsica (also Sardinia and Spain) (Fig. 225) ..... *S. orousseti*
Figs. 214 - 217.

5 (3) a. Frontal region as in Figs. 35, 40. Compound eye relatively small (0.08 - 0.10 mm). Known mostly from England (also Belgium) (Fig. 339) ..... *S. westwoodi*
Figs. 46, 48, 75, 85, 328 - 330.

— b. Frontal region as in Figs. 34, 39. Compound eye small to medium (0.08 - 0.21mm). Known throughout Europe (Fig. 110) .... *S. debile*
Figs. 10 - 17, 32-34, 36 - 39, 44, 45, 47, 60, 69, 82, 94, 100 - 102.

COMPREHENSIVE KEY -- PALAEARCTIC AND ORIENTAL REGIONS

1a. Alitrunk dorsum foveolate; postpetiolar node dorsum foveate. Compound eye relatively large (ocular index 19% or more). Known from soil core and leaf litter samples from Borneo (Fig. 213) .....
..... *S. orientale*
Figs. 41 - 43, 210 - 212.

— b. Alitrunk dorsum never foveolate; postpetiolar node dorsum never foveate. Compound eye smaller (ocular index 17% or less, typically 14% or less) 2

2 (1) a. Anterior subpetiolar process forming a prominent tubercle. Petiole height to length ratio nearly 0.70. Total length 3.03 mm. Known from Morocco (Fig. 276) ..... *S. punctiventre*
Figs. 269 - 271.

— b. Anterior subpetiolar process reduced. Remaining combination of characters not as described above 3

3 (2) a. Thoracic dorsum with transverse carinae or rugae. Petiolar stalk less than ½ length of petiole. Propodeal plates greater than or equal

to length of propodeal spines. Known from Kashmir Province (India) and Pakistan (Fig. 162) ..... *S. kashmirense*
Figs. 50, 72, 154 - 161.

— b. Thoracic dorsum with longitudinal carinae or rugae or with sculpture lacking a distinct orientation. Remaining combination of characters not as described above 4

4 (3) a. Petiole width 0.21 mm or more. Head length 0.81 - 0.82 mm. Scape length 0.60 - 0.61 mm. Scape index 84% or greater. Petiole height 0.24 mm. Thoracic dorsum scabrous. Known only from type series, Kuril Islands (Fig. 169) ..... *S. kurilense*
Figs. 163 - 168.

— b. Petiole width typically 0.20 mm or less. If petiole width greater than 0.20 mm, remaining combination of characters not as described above 5

5 (4) a. Thoracic dorsum carinate or rugose with decided longitudinal orientation (most major ridges running parallel to main axis of body) (for example, Figs. 62, 64) 6

— b. Thoracic dorsum sculpture variable, but always lacking longitudinal orientation (for example, Fig. 65) 16

6 (5) a. Antennal scape bent at base. Propodeal plates twice as long as propodealspines. Known from Tajikstan (Fig. 147) .....
..... *S. hissarianum*
Figs. 18, 19, 56, 67, 78, 90, 131 - 135.

— b. Antennal scape straight at base. Propodeal plates only slightly longer than propodeal spines, in many instances plates may be shorter 7

7 (6) a. Thoracic dorsum sculpture mostly carinate. Species known from southern Europe or southwestern portions of former U.S.S.R. 8

— b. Thoracic dorsum sculpture mostly rugose and longitudinal. Most species from either southern portions of former U.S.S.R. or the vicinity of the Himalaya Mountains 12

8 (7) a. Head with longitudinal carinae close-set and running to occipital vertex. Ridges of thoracic sculpture set close together. Known from Spain through Turkey and northward to southern Russia (Fig. 309)
..... *S. striatulum*
Figs. 59, 64, 81, 93, 290 - 295.

— b. Lacking above close-set longitudinal carinae on head and alitrunk dorsum 9

9 (8) a. Head dorsum (above compound eyes) with rugae forming concentric loop like structures. Known from Azerbaijan, Georgia, and southern Russia (Fig. 183) ..... *S. lippulum*
Figs. 54, 66, 76, 88, 170 - 177, 184 -186.

— b. Head dorsum lacking concentric loop like structures 10

10 (9) a. Gastral tergite one with basal carinae as long as ¼ to ⅓ length of postpetiole. Mandible with 8 - 9 teeth. Petiole length 0.37 - 0.43 mm. Known from Kazakhstan and Kirghizia (Fig. 268) .... *S. picetojuglandeti*
Figs. 20, 21, 57, 63, 79, 91, 251 - 255.

— b. Gastral tergite one with basal carinae as long as ¼ length of postpetiole or shorter. Mandible and petiole length not as above... 11

11 (10) a. Alitrunk dorsum with setae nearly 2 times as long as setae on head dorsum. Mandible with 7 teeth. Known mostly from Corsica (also Sardinia and Spain) (Fig. 225) ..... *S. orousseti*
Figs. 214 - 217.

— b. Alitrunk dorsum with setae approximately same length as setae on head dorsum. Mandible with 7 - 10 teeth. Known from Georgia and southern Russia (Fig. 125) ..... *S. georgii*
Figs. 4 - 9, 55, 62, 77, 89, 111 - 119.

12 (7) a. Ocular index 14.6 - 17%. Scape length 0.50 - 0.53 mm. Scape index typically less than 80%. Petiole height 0.26 - 0.29 mm. Gastral tergite one with basal carinae as long as 0.20 to 0.25 length of postpetiole. Propodeal plates slightly less than ½ length of propodeal spines. Knonw only from type series, Bhutan (Fig. 99) .... *S. bhutanense*
Figs. 96 - 98.

— b. Typically ocular index less than 14.5% and scape length greater than 0.55 mm. Lacking above combination of characters 13

13 (12) a. Petiole width 0.13 - 0.14 mm. Postpetiole width 0.18 - 0.19 mm. Gastral tergite one with basal carinae as long as ½ length of postpetiole or more. Known from Uzbekistan (Fig. 289) .... *S. sogdianum*
Figs. 58, 68, 80, 92, 284 - 288.

— b. Petiole width greater than 0.14 mm. Postpetiole width greater than 0.19 mm. Gastral tergite one with basal carinae as long as or shorter than ½ length of postpetiole 14

14 (13) a. Head dorsum (above compound eyes) with rugae forming concentric loop like structures. Known from Azerbaijan, Georgia, and southern Russia (Fig. 183) ..... *S. lippulum*
Figs. 54, 66, 76, 88, 170 - 177, 184-186.

— b. Head dorsum sculpture lacking concentric loop like structures 15

15 (14) a. Gastral tergite one with basal carinae as long as ¼ to ⅓ length ofpostpetiole. Head length 0.84 - 0.85 mm. Scape length 0.61 - 0.63

mm. Postpetiole height 0.23 mm. Known from Kazakhstan and Kirghizia (Fig. 268) ..... *S. picetojuglandeti*
Figs. 20, 21, 57, 63, 79, 91, 251 - 255.

— b. Gastral tergite one with basal carinae as long as ½ length of postpetiole. Remaining combination of characters not matching those listed above (Fig. 327) ..... *S. ussuriense*
Figs. 61, 65, 83, 95, 310 - 314.

16 (5) a. Mandible with 11 teeth. Compound eye length always less than 0.10 mm. Gastral tergite one with basal carinae as long as ½ length of postpetiole. Metanotal impression deep; depth approximately ½ length of propodeal spines. Known from Japan (Fig. 209) .....
..... *S. nipponense*
Figs. 52, 70, 86, 200 - 202.

— b. Mandible usually with 9 or fewer teeth. Remaining combination of characters not matching those listed above 17

17 (16) a. Mandible with 6 teeth. Propodeal plates shorter than propodeal spines. Gastral tergite one with basal carinae as long as ⅓ length of postpetiole or shorter. Gastral sternite one lacking basal carinae and glassy-smooth. Propodeal plates approximately 0.75 length of propodeal spines. Thoracic dorsum rugose. Known only from type series, Nepal (Fig. 130) ..... *S. gurkhalis*
Figs. 51, 74, 87, 126 - 129.

— b. Mandible with 7 or more teeth. Remaining combination of characters not matching those listed above 18

18 (17) a. Ocular index 14% or greater 19

— b. Ocular index typically less than 12% ..... .21

19 (18) a. Gastral tergite one with basal carinae as long as ⅓ to ½ length of postpetiole. Gastral sternite one with basal carinae as long as 0.20 to 0.25 length of postpetiole (Fig. 110) ..... *S. debile*
Figs. 10 - 17, 32 - 34, 36 - 39, 44, 45, 47, 100 - 102.

— b. Gastral tergite one with basal carinae as long as ¼ to 0.20 length of postpetiole. Gastral sternite one lacking basal carinae and glassy-smooth 20

20 (19) a. Compound eye length 0.11 - 0.18 mm. Postpetiole length 0.24 - 0.40 mm. Postpetiole width 0.21 - 0.29 mm. Known from Japan and China (Fig. 236) ..... *S. owstoni*
Figs. 49, 71, 84, 226 - 228.

— b. Compound eye length 0.08 - 0.11 mm. Postpetiole length 0.21 - 0.26 mm. Postpetiole width 0.19 - 0.23 mm. Known only from type series, Pakistan (Fig. 153) ..... *S. jeriorum*
Figs. 53, 73, 148 - 152.

21 (18) a. Gastral sternite one lacking basal carinae and glassy smooth

(or with very short carinae). Compound eye length 0.06 - 0.10 mm Scape length 0.60 - 0.72 mm. Postpetiole width 0.18 - 0.24 mm. Propodeal plates roughly 0.75 length of propodeal spines. Known only from type series, Nepal (Fig. 130) ..... *S. gurkhalis* Figs. 51, 74, 87, 126 - 129.

— b. Gastral sternite one with basal carinae as long as 0.20 length of postpetiole. Remaining combination of characters not as described above 22

22 (21) a. Scape and tibia typically with erect, short setae. Larger ants, total length 3.19 - 4.52 mm. Mandible with 8 teeth. Gastral tergite one with basal carinae as long as ¼ length of postpetiole. Known from southern Europe (mostly France and Italy) (Fig. 250) .... *S. petiolatum* Figs. 237 - 242.

— b. Scape and tibia typically lacking erect, short setae. Remaining combination of characters not as described above 23

23 (22) a. Gastral sternite one with basal carinae as long as ½ length of postpetiole. Mandible with 7 teeth. Propodeal plates as long as propodeal spines. Gastral tergite one with basal carinae as long as ⅓ to ½ length of postpetiole. Total length 3.67 - 4.12 mm. Known from Algeria, Morocco, and Tunisia (Fig. 199) ..... *S. msilanum* Figs. 187 - 193.

— b. Gastral sternite one with basal carinae less than ¼ length of postpetiole. Remaining combination of characters not as described above 24

24 (23) a. Petiolar dorsum in lateral view a depressed convex dome. Mandible with 9 - 10 teeth. Propodeal plates ⅓ length of propodeal spines. Gastral tergite one with basal carinae as long as ¼ to ⅓ length of postpetiole. Known from southern Europe (including Spain and Sardinia) (Fig. 283) ..... *S. sardoum* Figs. 277 - 282.

— b. Petiolar dorsum in lateral view high with a sharply rounded dome. Number of mandibular teeth variable (usually less than 9). Propodeal plates ½ as long as propodeal spines or longer. Gastral tergite one with basal carinae as long as ⅓ to½ length of postpetiole 25

25 (24) a. Frontal region as in Figs. 35, 40. Compound eye relatively small (0.08 - 0.10 mm). Known mostly from England (also Belgium) (Fig. 339) ..... *S. westwoodii* Figs. 46, 48, 75, 85, 328 - 330.

b. Frontal region as in Figs. 34, 39. Compound eye small to medium in size (0.08 -0.24 mm). Known throughout Europe (Fig. 110) .... *S. debile*

Figs. 10-17, 32-34, 36 - 39, 44, 45, 47, 60, 69, 82, 94, 100 - 102.

LIST OF DESCRIBED STENAMMA SPECIES

Species known from Palaearctic and Oriental regions are preceeded with an asterisk (*). Names of species described from other regions are current as of December, 1993 (except for the synonymy of *foveolocephalum* and *carolinense* by DuBois and Davis, 1998). This cutoff point coincides with the date selected by Bolton (1995). Of the 46 currently recognized taxa, 24 (52%) are known from the area covered by this revision. This list is alphabetized with currently recognized synonyms. Most species are not known from all castes. Workers are described for 45 (98%), gynes are described for 32 (70%), males are described for 17 (37%), and larvae are described for 3 (7%) of the known taxa. Type localities (countries) are listed as originally described.

**berendti* (Mayr) [fossil] (Oligocene)	BALTIC AMBER	Male [type lost?]
**bhutanense* Urbani	BHUTAN	Worker
brevicorne (Mayr)	U.S.A.	Worker, Gyne
= *neoarcticum* Mayr	U.S.A.	
californicum Snelling	U.S.A.	Worker, Gyne
chiricahua Snelling	U.S.A.	Worker, Gyne, Male
**debile* (Foerster)	GERMANY	Worker, Gyne,
= *minkii* (Foerster)	GERMANY	Male, Larva
= *westwoodii polonicum* Begdon	POLAND	
= *golosojevi* Karavaiev syn. n.	UKRAINE	
= *ucrainicum* Arnol'di syn. n.	UKRAINE	
diecki Emery	U.S.A.	Worker, Gyne,
= *diecki impressum* Emery	U.S.A.	Male, Larva
diversum Mann	HONDURAS	Worker
dyscheres Snelling	U.S.A.	Worker, Gyne, Male
exasperatum Snelling	U.S.A.	Worker
expolitum Smith	COSTA RICA	Worker, Gyne
felixi Mann	HONDURAS	Worker
foveolocephalum Smith	U.S.A.	Worker
= *carolinense* Smith	U.S.A.	
**georgii* Arnol'di	RUSSIA	Worker, Gyne
**gurkhalis* sp. n.	NEPAL	Worker
heathi Wheeler	U.S.A.	Worker, Gyne
**hissarianum* Arnol'di	RUSSIA	Worker, Gyne, Male
huachucanum Smith	U.S.A.	Worker
impar Forel	U.S.A.	Worker, Gyne
**jeriorum* sp. n.	PAKISTAN	Worker
**kashmirense* Urbani	INDIA	Worker
**kurilense* Arnol'di	RUSSIA	Worker
**lippulum* (Nylander)	RUSSIA	Worker, Gyne, Male
= *hirtulum* Emery	RUSSIA	
= *caucasicum* Arnol'di	CAUCASUS	

manni Wheeler	MEXICO	Worker, Gyne, Larva
meridionale Smith	U.S.A.	Worker, Gyne
**msilanum* Forel	ALGERIA	Worker, Gyne
= *africanum* Santschi syn. n.	TUNISIA	
= *africanum submuticum* Santschi syn. n.	ALGERIA	
**nipponense* Yasumatsu & Murakami	JAPAN	Worker, Gyne, Male
**orientale* sp. n.	SARAWAK	Worker
**orousseti* Casevitz-Weulersse	CORSICA	Worker, Gyne, Male
**owstoni* Wheeler	JAPAN	Worker, Gyne.
**petiolatum* Emery	ITALY	Worker, Gyne, Male
**picetojuglandeti* Arnol'di	TURKESTAN	Worker, Gyne, Male
punctatoventre Snelling	U.S.A.	Worker, Gyne, Male
**punctiventre* Emery	MOROCCO	Worker, Gyne
= *myops* Santschi	MOROCCO	
**sardoum* Emery	SARDINIA	Worker, Gyne
schmidti Menozzi	COSTA RICA	Worker, Gyne
schmittii Wheeler	U.S.A.	Worker, Gyne, Male
sequoiarum Wheeler	U.S.A.	Worker, Gyne
smithi Cole	U.S.A.	Worker, Gyne
= *knowltoni* Gregg	U.S.A.	
snellingi Bolton [replacement name for *occidentale* Smith; junior primary homonym of *occidentale* Emery)	U.S.A.	Worker, Gyne, Male
**sogdianum* Arnol'di	TURKESTAN	Worker
**striatulum* Emery	ITALY	Worker, Gyne, Male
=*tscherkessicum* Arnol'di	RUSSIA	
**ussuriense* Arnol'di	RUSSIA	Worker, Gyne, Male
**westwoodii* Westwood	GREAT BRITAIN	Worker, Gyne, Male
**westwoodii asiaticum* Ruzsky	RUSSIA	Worker [type lost]
wheelerorum Snelling	U.S.A.	Worker, Gyne

Stenamma westwoodii Species Group

Palaearctic and Oriental ants with predominantly rugose head and occipital margin. Alitrunk predominantly rugose, sometimes carinate. In gynes and males, branch of median vein occurs proximal to stigma. Petiole lacking distinct anterior process; pedunculate with greater than ½ length of petiole devoted to stalk. Gastral tergite one with basal carinae, carinae variable in length.

This is the largest species group examined with 14 currently recognized species (*S. westwoodii*, *S. debile*, *S. sardoum*, *S. orousseti*, *S. kashmirense*, *S. jeriorum*, *S. petiolatum*, *S. msilanum*, *S. striatulum*, *S. lippulum*, *S. georgii*, *S. hissariunum*, *S. picetojuglandeti*, and *S. sogdianum*). Most species are distributed in southern Europe with some species found in northern Africa and southern Asia. It is highly probable current distribution patterns are a direct result of adaptations to Pleistocene glaciation. It is also likely that many of these species occupy

restricted habitats; many are known from only one or two collections. This species group may be paraphyletic. While they share a common "gestalt," no unique defineable feature was shared by all species. Lack of knowledge of reproductives and larvae may be a contributing factor to not identifying a unique feature; I believe it better to group these species together with their similar morphology until additional separatory characters can be defined.

Stenamma westwoodii Westwood

Worker Figs.: 35, 40, 46, 48, 75, 85, 328 - 330.
Queen Figs.: 331 - 334. Male Figs.: 335 - 338.
Distribution Fig. 339.

Stenamma westwoodi Westwood, 1840a: 83; 1840b: 219, 226 (Figs. 11, 12, 13, 14, 15). Male — England (Lectotype Male - OXUM) [examined].

Stenamma westwoodi; DuBois, 1993: 307 - 314 (figs. 14 - 30, 47). Worker, gyne, male.

WORKER

Measurements and associated statistics are presented in Appendix Table 1. To aid in identification, the following key statistics are presented herein (measurement mean ± standard error of mean, n). TL (3.67 ± 0.069, 11), HL (0.85 ± 0.014, 11), HW (0.72 ± 0.013, 11), CI (84.75 ± 0.767, 11), SL (0.66 ± 0.010, 11), SI (91.79 ± 1.120, 11), AL (1.11 ± 0.017, 12), PRW (0.49 ± 0.009, 12), PL (0.42 ± 0.012, 12), PH (0.22 ± 0.005, 12).

"Mandible with 7 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe emarginate; apex in lateral view almost flat. Compound eye with 4 ommatidia in greatest diameter. Propodeal spines of moderate length, almost ⅓ length of declivitous face of propodeum. Scape reaching but not surpassing occipital vertex. Metanotal impression of moderate depth, approximately ½ length of propodeal spines; over 2X as wide as deep, depth decreasing towards anterior. Propodeal plates moderately well developed, almost ½ as long as propodeal spines, directed posteriorly, and slightly upward. Anterior subpetiolar process reduced. Petiole pedunculate; stalk approximately ½ length of petiole. Anterior and posterior subpostpetiolar processes greatly reduced. Head rugose, except as follows: frontal area carinate, carinae diverging strongly towards posterior; central ⅓ (or slightly less) of frontal area (between antennal

sockets) glassy-smooth. Interstices glassy-smooth with scattered piligerous and nonpiligerous punctures. Thoracic dorsum scabrous. Thoracic pleura rugose-scabrous (approaching scabrous near dorsum). Neck of pronotum rugulose (slightly obscured by glue on specimens examined). Metanotal impression scrobiculate. Mesopleuron with scrobiculate median area. Coxae rugose; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with scabrous basal face and glassy-smooth declivitous face. Alitrunk interstices glassy-smooth with scattered piligerous and nonpiligerous punctures. Petiolar node dorsum somewhat rugose with glassy-smooth interstices; remaining surfaces faintly rugulose. Postpetiolar node dorsum glassy-smooth with several faint rugae; anterior surface dorsum with several faint carinae; sides punctulate (punctures becoming more prominent towards posterior); venter faintly rugulose. First gastral tergite with base carinate with numerous carinae diverging towards posterior (longest carinae located near midline of tergite, about ½ length of postpetiole). First gastral sternite with base with several small carinae (most prominent at juncture with postpetiole) not extending far onto the sternite. Remainder of gaster glassy-smooth (even at high magnifications), with scattered piligerous punctures. Setae on head moderately dense, decumbent to suberect, setae on alitrunk, petiole, postpetiole, and gaster erect to suberect. Setae of flexor surfaces of coxae and venter of petiole absent. Entire body brown; appendages somewhat lighter in color (approaching testaceous). Setae yellow." (DuBois, 1993: 307 - 310).

GYNE

Measurements and associated statistics are presented in Appendix Table 1. Key statistics are listed herein: TL (4.65 ± 0.057, 5), HL (0.93 ± 0.004, 5), HW (0.81 ± 0.012, 5), CI (87.31 ± 1.316, 5), SL (0.72 ± 0.009, 5), SI (89.74 ± 2.018, 5), AL (1.45 ± 0.024, 5), PRW (0.69 ± 0.015, 5), PL (0.54 ± 0.017, 5), PH (0.28 ± 0.006, 5).

"As described for worker except as follows: mandible with 8-9 teeth (apical 2 prominent); anterior clypeal margin with apex in lateral view flat. Compound eye with 16-19 ommatidia in greatest diameter. Metanotal impression absent due to thoracic modifications associated with flight. Propodeal plates well developed, over ½ as long as propodeal

spines, directed posteriorly. Anterior subpetiolar process reduced (less prominent than in worker). Thoracic dorsum scabrous-rugose (more rugose towards posterior). Thoracic pleura rugose-scabrous (approaching scabrous near dorsum and anterior margin). Neck of pronotum rugulose (slightly obscured by glue on specimens examined). Propodeal dorsum with scabrous-rugose basal face and a few faint transverse carinae near dorsum of declivitous face (remainder glassy-smooth as in worker). Petiolar node dorsum somewhat rugose with interstices punctulate; sides scabrous; venter rugulose. Postpetiolar node dorsum rugose with punctulate interstices; anterior surface dorsum with several faint carinae; sides scabrous-rugose; venter rugulose. First gastral tergite with base carinate, numerous carinae diverging towards posterior (longest carina located near midline of tergite about ½-⅓ length of postpetiole)." (DuBois, 1993: 310).

MALE

Measurements and associated statistics are presented in Appendix Table 1. Key statistics are listed herein: TL (4.08 ± 0.042, 12), HL (0.69 ± 0.007, 12), HW (0.62 ± 0.008, 12), CI (90.60 ± 1.042, 12), SL (0.27 ± 0.007, 12), SI (43.23 ± 0.964, 12), AL (1.41 ± 0.016, 12), PRW (0.69 ± 0.013, 12), PL (0.46 ± 0.007, 12), PH (0.22 ± 0.005, 12).

"LECTOTYPE Measurements. TL 4.09, HL 0.68, HW 0.64, CI 95, SL 0.27, SI 42, AL 1.42, PRW 0.71, PL 0.47, PH 0.21.

"As described for worker except as follows: Mandible with five teeth (apical 2 prominent) (one male was observed to have a reduced 6th tooth at the juncture of the basal and declivitous faces of the mandible); anterior clypeal margin in full face view with median lobe flat to slightly emarginate; apex convex in lateral view. Compound eye with more than 25 ommatidia in greatest diameter. Scape never reaching occipital vertex. Propodeal spines reduced to small tubercles at juncture of basal and declivitous faces. Metanotal impression absent due to thoracic modifications associated with flight. Propodeal plates moderately well developed, longer than spines, directed posteriorly. Anterior subpetiolar process slightly reduced. Petiole pedunculate; stalk approximately ½ length of petiole, gradually thickening towards node. Head densely punctulate except as follows: frontal area carinate, carinae diverging strongly towards posterior; central ⅓ of

frontal area (between antennal sockets) glassy-smooth; occipital vertex and gular area rugose. Interstices heavily punctulate. Thoracic dorsum moderately punctulate. Thoracic pleura densely punctulate near anterior and posterior borders (with some rugae); median area glassy-smooth with scattered nonpiligerous punctures. Neck of pronotum densely punctulate. Coxae carinate, procoxae also punctulate; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with glassy-smooth faces, basal face also with scattered nonpiligerous punctures, declivitous face with several transverse carinae. Alitrunk interstices glassy-smooth with scattered piligerous and nonpiligerous punctures. Petiolar node dorsum glassy-smooth (some specimens with a trace of rugae); side rugose; venter rugulose. Postpetiolar node dorsum glassy-smooth; remaining surfaces rugulose. First gastral tergite with base carinate with numerous carinae diverging towards posterior (longest carina located near midline of tergite, not exceeding ⅓ length of postpetiole). First gastral sternite with base with several small carinae (most prominent at juncture with postpetiole) not extending far onto the sternite. Entire body brown; head dark brown (approaching piceous); appendages testaceous." (DuBois, 1993: 310 - 311).

DISCUSSION

"*S. westwoodii* appears to be limited to England, Wales, and neighboring areas in continental Europe [only known from an unspecified locality in Belgium]. This may be an artifact of collecting. However, I have examined numerous specimens from continental Europe and have located only one exception. One worker has a locality label of Israel. Either this is a disjunct population, an accidental import, or an incorrectly labeled specimen. Further study is required to settle the issue regarding the distribution of this species. I suspect the biology of this species is quite similar to that of *S. debile*. Based upon collection records, it appears that nuptial flights occur in October." (DuBois, 1993: 313). No additional specimens of this species have been examined since my 1993 publication. Given the paucity of endemic ants to the British Isles, it is highly probable that additional specimens will be discovered in adjacent parts of Europe.

It is likely that these species have recently become

distinct and is possible that relict populations were isolated by Pleistocene glaciation for a sufficiently long period of time so they developed into different species. The related *S. debile* nuptial flights occur approximately one month earlier; this may be an artifact of the refugia climate which may have isolated various populations.

COMPARISONS. "*S. westwoodii* is most closely related to *S. debile* and shares many features in common; the two species have been regarded as synonyms for well over a century. However, it differs from the latter in the shape and sculpturing of the frontal area and shape of the petiole in females. It also differs from the latter in the number of mandibular teeth and shape of the mandibles in males." (DuBois, 1993: 313 - 314).

MATERIAL EXAMINED

"BELGIUM: [Brussels vicinity?] (2 workers — ISNB). ENGLAND: [no further collection data] (2 males, including LECTOTYPE — OXUM); [near Goy?] (1 male — OXUM); [London vicinity?] (6 males, 3 queens, 1 worker — BMNH); Capron (1 male — OXUM). AVON: Dodington (1 male — OXUM). BERKSHIRE: Bradfield (1 worker — OXUM). CAMBRIDGE: Fulbourn Fen (1 worker — CCPC). CAMBSHIRE: Huntingfield (1 male, 1 queen — OXUM). DEVON: Tavy Valley, Double Waters (1 worker — OXUM). OXFORD: Oxford (1 male 1 queen — OXUM); [no further locality data] (1 male, 2 workers — OXUM). WORCHESHIRE: Chadbury (2 workers — CCPC). ISRAEL: Eilon (1 worker — CCPC). WALES: Dyfed, Grassholm, 12 km W Skomer Island (1 worker — CCPC)." (DuBois, 1993: 314).

Stenamma debile (Foerster)

Worker Figs.: 10-17, 32-34, 36-39, 44-45, 47, 60, 69, 82, 94, 100-102.

Gyne Figs.: 103 - 105. Male Figs.: 106 - 109.

Distribution Fig. 110.

Myrmica debilis Foerster, 1850: 52-53. Worker — Germany:Rheinprovinz, Aachen. [Not examined, type could not be located].

Myrmica minkii Foerster, 1850: 63. Worker — Germany:Rheinprovinz, Crefeld [Krefeld]. [Synonymy with *Myrmica lippulum* by Mayr, 1863: 395]. [Not examined, type could not be located]. [Provisional synonymy by DuBois, 1993: 314].

Stenamma westwoodi polonicum Begdon, 1932 (1931): 113-118.

Worker, Gyne — Poland: Pomerania. [Not examined, type could not b located]. [Provisional synonymy by DuBois, 1993: 314].

Stenamma westwoodi; Atanassov and Dlussky, 1992: 103 - 10 (part).

Stenamma debile; DuBois, 1993: 314 - 321, figs. 32 - 46, 48. Worke Gyne, Male.

Stenamma golosojevi Karavaiev, 1926: 68 - 69. Worker -- U.S.S.R. UKRAINE: Golosojev Forest near Kiev, under fallen leaves, 13 VI 192 (nr. 3051), Karavaiev [Not examined, type could not be located]. **New Synonymy.**

Stenamma ucrainicum Arnol'di, 1928: 209 - 212 (Figs. 1 - 4). Worke Gyne, Male — U.S.S.R.: Ukrainian S.S.R. (East), 40 km south o Charkow (current spelling Khar'kov); Zmiev (current spelling Zmiyev) (ZMUM) [Examined]. **New Synonymy.**

As described for *S. westwoodii*, except as follows.

WORKER

Measurements and associated statistics are presented in Appendi Table 2. Key statistics are listed herein (measurement mean ± standar error of mean, n): TL (3.60 ± 0.012, 346), HL (0.83 ± 0.002, 355), HW (0.71 ± 0.002, 355), CI (85.12 ± 0.14, 355), SL (0.63 ± 0.002, 355), S (88.21 ± 0.18, 355), AL (1.09 ± 0.004, 360), PRW (0.49 ± 0.002, 360), PI (0.40 ± 0.002, 359), PH (0.22 ± 0.001, 359).

LECTOTYPE Measurements (for *S. ucrainicum*; see synonymy dis cussion below). TL 3.69, HL 0.87, HW 0.72, EL 0.08, SL 0.64, CI 83, S 89, AL 1.11, PRW 0.48, PL 0.40, PH 0.23.

The following description is based on DuBois (1993: 314 - 315). It ha been expanded to cover the entire range of variation observed in thi species. Mandible with 6 - 9 teeth; anterior clypeal margin with apex i lateral view convex (almost flat). Compound eye with 3 - 6 ommatidi in greatest diameter. Metanotal impression of variable depth, from 0.2 to 0.67 length of propodeal spines (specimens from Ukraine hav shallower impression, typically from 0.20 to 0.25 length of propodea spines). Propodeal plates well developed, approximately as long a propodeal spines. Anterior subpetiolar process prominent to somewha reduced. Head with frontal area carinae diverging towards posterio (less so than in *S. westwoodii*); central ⅓ , or greater, of frontal are (between antennal sockets) glassy-smooth. Thoracic dorsum rugose t scabrous. Propodeal dorsum with rugose basal face (a few transvers carinae between spines) and glassy-smooth declivitous face (som specimens with longitudinal carinulae). Postpetiolar node dorsum glassy-smooth to faintly rugose; anterior and posterior surfaces rugose

side rugulose, and venter rugulose to punctate. First gastral tergite with base carinate with numerous carinae diverging towards posterior (longest carina located near midline of tergite, about ⅓ to ½ length of postpetiole). First gastral sternite with base predominantly glassy-smooth with several small carinae (most prominent at juncture with postpetiole) not extending for more than 0.20 to 0.25 length of postpetiole. Head and alitrunk brown to dark brown [almost piceous]; petiole, postpetiole, and gaster brown.

GYNE

Measurements and associated statistics are presented in Appendix Table 2. Key statistics are presented herein: TL (4.35 ± 0.036, 65), HL (0.90 ± 0.006, 67), HW (0.78 ± 0.005, 66), CI (87.22 ± 0.38, 66), SL (0.67 ± 0.004, 65), SI (85.51 ± 0.46, 64), AL (1.35 ± 0.011, 68), PRW (0.67 ± 0.006, 68), PL (0.48 ± 0.006, 68), PH (0.26 ± 0.002, 68).

The following description is based on DuBois (1993: 315 - 316). It has been expanded to cover the entire range of variation observed in this species. As described for worker except as follows: mandible with 8 - 10 teeth (apical 1 or 2 prominent); anterior clypeal margin in lateral view with apex flat to convex. Thoracic dorsum rugose-carinate (more carinate towards posterior). Thoracic pleura carinate towards posterior and dorsum. Propodeal dorsum with transverse carinae on basal face; longitudinal carinae between spines, extending onto declivitous face (some specimens with glassy-smooth declivitous face). Petiolar node dorsum rugose-carinate; sides rugose. First gastral tergite with base carinate with numerous carinae diverging towards posterior (longest carina located near midline, about ¼ to ⅓ length of postpetiole). First gastral sternite with base sculpture as first gastral tergite base.

MALE

Measurements and associated statistics are presented in Appendix Table 2. Key statistics are presented herein: TL (4.07 ± 0.038, 65), HL (0.68 ± 0.007, 67), HW (0.59 ± 0.007, 67), CI (87.26 ± 0.43, 66), SL (0.27 ± 0.003, 67), SI (44.98 ± 0.47, 66), AL (1.42 ± 0.013, 68), PRW (0.73 ± 0.010, 68), PL (0.47 ± 0.005, 68), PH (0.22 ± 0.002, 68).

> "As described for worker except as follows: mandible with 3 teeth (apical tooth prominent); anterior clypeal margin in full face view with median lobe evenly convex. Compound eye with more than 20 ommatidia in greatest diameter. Anterior subpetiolar process reduced. Thoracic dorsum faintly carinate. Thoracic pleura glassy-smooth with faint carinae near dorsum and venter; median area glassy-smooth with scrobiculate suture. Coxae faintly carinate. Propodeal dor-

sum with glassy-smooth surfaces. First gastral tergite with base carinate with numerous carinae diverging towards posterior (longest carina located near midline of tergite, about 0.20 to 0.25 length of postpetiole). First gastral sternite base same as tergite base. Entire body piceous; appendages and gaster brown. Compound eyes silver; ocelli amber. Wings testaceous. DuBois (1993: 316 - 317).

NO NEOTYPE IS DESIGNATED

The rationale discussed by DuBois (1993: 317 - 318) has no changed. As no new material from the vicinity of Aachen, Germany ha been encountered and this remains the only known *Stenamma* specie in that area, I see no need to designate a neotype for this species.

SYNONYMY

Atanassov and Dlussky (1992) synonymized *S. golosojevi* and S *ucrainicum* with *S. westwoodii*. While I have been unable to locate th type of *S. golosojevi*, I accept that it is synonymous with *S. ucrainicum* Both were described from the vicinity of Kiev, Ukraine and it is unlikel that more than one species occurs in that area. DuBois (1993) restricte the known range of *S. westwoodii* to Great Britain and Belgium an resurrected the name *S. debile* for the commonly occurring centra European *Stenamma*. I agree with Atanassov and Dlussky (1992) tha synonymy exists here; however, I believe the two taxa in question ar synonyms of *S. debile*. I have examined numerous specimens of S *ucrainicum* and compared many with *S. debile* and other species. Al representatives are quite similar to *S. debile*. All measurements take of *S. ucrainicum* specimens fall within the known range of variation fo *S. debile*. One would expect that this would not be the case if they wer different species. The taxa are also quite similar and *S. ucrainicu* would need to be regarded as nearly as close a species to *S. debile* as S *westwoodii*. However, the latter two species differ in characters asso ciated with the male and to a lesser extent to characters and measure ments found with females (both gynes and workers). This is not the cas with *S. ucrainicum* and *S. debile*. Males are quite similar as are females It is because of these reasons I propose the above synonymy.

LECTOTYPE DESIGNATION

After examining the type series of *S. ucrainicum* I noted that n specimen is clearly designated holotype or "type." Although I do not viev this as a valid species, there are several collections from the type localit (from years 1923, 1926, 1928, 1931, and 1932). Since Arnoldi' description was published in 1928, the types he examined must hav been collected that year or earlier. Arnoldi (1928) indicated that th

original series had 26 specimens (consisting of workers, females, and males). Collection numbers 1026 and 1088 correspond to this number of specimens from a possible year. In order to reduce future confusion, I designated one worker as lectotype and included a red, partly handwritten label (*Stenamma ucrainicum* LECTOTYPE (bottom)). This is a fairly typical specimen, is part of the original series as I perceive them, and is covered with far less glue than remaining specimens.

DISCUSSION

"*S. debile* appears to be widely distributed throughout northern and central Europe. In most cases, literature records of *S. westwoodii* probably refer to this species (given the restricted range of the former). The biology of this species is rather typical (for what is known about *Stenamma*); nuptial flights probably occur in September throughout most of its range. Most alate gynes and males have been collected in September (some slightly earlier or later depending on the latitude and elevation). It is assumed that specimens associated with workers were collected from colonies, while those not associated were collected during (or after) their nuptial flight.

"*S. debile* exhibits a fairly wide range of altitudinal tolerance. Collections range from near sea level through 1275 m (in the majority of central Europe most collections are between 100 and 500 m). Elevational tolerance increases towards southern latitudes. For example, collections in former Yugoslavia range from 450 m through 1275 m and collections from Greece range from 700 m through 1200 m.

"Arnoldi (1975: 1826) provided additional information on the distribution of this species in Russia [called *S. westwoodii* in that publication]. He indicated that this species is widespread (particularly in mossy pine woods) in the sandy areas of the southern half of the central forest-steppe (Kursk and Voronesh regions). It then spreads into the southern forests near rivers. ... *S. debile* is rare in Crimea, but is widespread in the Caucasus in mountainous regions in broad-leaved forests, 500 meters above sea level." DuBois (1993: 320)

COMPARISON

S. debile is most similar to *S. westwoodii* and differences between these species were previously discussed.

FOSSIL RECORD

"Recently, subfossils of *Stenamma* were discovered in Great Britain (Collingwood and Hughes, 1987: 100-101). These are represented as head capsules of ants which perished during the Bronze Age. Collingwood and Hughes (1987) indicate these specimens were found at Thorne Moor which is about 160 kilometers north of the nearest collection of *Stenamma* in recent history. These specimens are clearly *S. debile* given their head sculpture and width of the glassy-smooth frontal area between the antennal insertions [(Figs. 32 - 40)]." DuBois (1993: 320 - 321).

MATERIAL EXAMINED

AUSTRIA: Wadau Prov.: Thurn (3 workers — ASPC). BELGIUM: [n further collection data] (1 male, 1 gyne — ISNB). Brussels (2 workers - MHNG). CZECH REPUBLIC: Praha (3 workers — PWPC); Varano (worker — ISNB); Veltrusy (2 gynes — XEPC); Zdice (3 workers — XEPC) ENGLAND: [no further collection data] (5 males, 8 workers — OXUM 1 worker — CCPC); [London vicinity] (2 males, 5 gynes, 2 workers - BMNH); Oxschoff (1 worker — BMNH); Oxshott (4 workers — BMNH) Parkhurd Forest (1 worker — BMNH); Tubney (1 worker — BMNH) AVON: Dodington (1 male, 1 worker — OXUM). BERKSHIRE: Bagle Wood (11 workers — OXUM); Cothill (3 workers — OXUM); Windso Forest (1 male, 4 workers — OXUM); Wytham (4 workers — OXUM) CAMBSHIRE: Huntingfield (2 males — OXUM). DEVON: Shaldon (gyne — OXUM); Yelverton (1 male, 2 workers — CCPC). DORSET Blandford (1 worker — BMNH). ERIE: Wexford (1 worker — CCPC) KENT: Brasted (1 worker — BMNH); Maidstone (4 workers — CCPC) Margate (1 male — BMNH). LEICESTER: Leicester (1 worker — BMNH) NORTHUMB: Mark (1 worker — ZMNH). OXFORD: Begbroke (1 worke — OXUM). S. HANTS: Oberheath (2 workers — OXUM). SHROPSHIRE Weston (3 gynes — CCPC). SURREY: Chobham (1 worker — OXUM) Weybridge (1 worker — OXUM) [with *Lasius fuliginosus*]. SUSSEX Ditchling (1 worker — BMNH). FRANCE: [no further collection data] (: workers — MCZ); Dieppe (1 worker — ISNB); Fontainbleau (1 gyne - CCPC); Fontainbleau Forêt (1 gyne — XEPC); Forêt de St. Germain (: workers — ISNB); Forêt du Mesnil (3 workers — MHNG); Garches (8 workers — ISNB); Grilly (2 workers — MHNG); Lagny (12 workers - ISNB); Maisons Laffitte (1 gyne — ISNB); Le R. Mesnil (1 male — ISNB) Meudon (1 worker — ISNB, 1 worker — MNHN); Romainville (1 worke — MNHN); Vernon (2 workers — ISNB); Versailles Park (3 males, 1 gyn — MNHN); Vincennes (1 gyne, 5 workers — ISNB); Vire (1 worker -

ISNB). GERMANY: Bellmunt (2 workers — XEPC); Berlin (1 gyne — ZMHB); Dresden (3 males, 4 gynes — MHNG, 1 male, 1 gyne, 1 worker — UZMH); Gengenbach (3 workers — ASPC); Laach ? (3 males, 2 workers — MHNG); Laacher See (1 male, 4 workers — MCZ); Landeskrona (1 gyne, 2 workers — CCPC); Leipzig (2 workers — MHNG); Nussdorf (4 workers — MCZ); Stuttgart (1 male — MHNG); Thoringen (1 worker — ZMHB); Wurzburg (2 males, 2 gynes, 2 workers — ASPC). GREECE: Corfu (4 workers — MCZ, 1 worker — MNHG, 1 worker — UZMH); Cyklanden (2 workers - ZMHB); Parnassos (1 worker — ASPC); Olymp., 1000 m (5 workers — ASPC); Olymp., 700 m (3 workers — ASPC); Taigedos Oros, 1200 m (2 workers — ASPC); Spilia (Ossa Mts.) (2 workers — MHNG). IRELAND: [no further collection data] (8 males, 10 workers — OXUM). NEW ROSS CO.: (15 males, 2 gynes, 12 workers — OXUM); Wexford (3 males, 2 gynes, 1 worker — OXUM). ITALY: Abbadia (1 gyne, 3 workers — MCZ); Colli Euganel (1 gyne — MCZ); Duino (1 gyne, 3 workers — MCZ); Elba Island (3 workers — MCZ); Ins. Elba, Mte. Capanne (30 workers — MCZ); Jabucinor Strzek. (1 gyne — MCZ); Lipirra ? (2 workers — MCZ); Lipizza (4 males, 2 gynes, 10 workers — MCZ); Trieste (1 male, 2 workers — ISNB); Vallombrosa (1 worker — MCSN); Villa d'Este (1 worker — CCPC); Lioni (3 workers — MCSN); Liguria, Rapallo (2 workers — XEPC); Filettino (2 workers — ISNB); Sicily, Etna (1 worker — ASPC); Vallombrosa (1 worker — UZMH). ROMANIA: Mehadia (1 worker — MNHN). RUSSIA: Rostov Oblast, Donskoye forestry, near Rostov-na-Donu, VII 1959 K. V. Arnol'di (1 worker — ZMUM); Nizhnyaya Kundryucheskaya stanitsa, 110 km NE from Rostov-na-Donu, 31 V 1953, K. V. Arnol'di (3 workers — ZMUM); Kamenskaya, Grachyova gorge, 126 km NNE from Rostov-na-Donu, 15 V 1950, 12 VI 1950, K. V. Arnol'di (3 workers — ANIC) (8 workers, 1 gyne — ZMUM); Kursk Oblast, Dubravshina, Central Black Earth Preserve, 15 - 20 km SSE from Kursk, 27 V 1962, K. V. Arnol'di (23 workers, 1 gyne — ZMUM). SPAIN: Bujardera (2 workers — CCPC); Cercedilla (2 workers — MIPC); La Castanga (2 workers — XEPC); La Hiruelo (1 gyne — MIPC); Los Barios (1 worker — XEPC); Mainena (1 gyne — ATPC); Miraflores (1 gyne, 2 workers — MIPC); Pto. del Zegri (1 worker — ATPC); Sierra Alfaguara (2 males, 4 gynes — ATPC); Sierra Grazalema (1 worker — ATPC); Sierra Nevada (1 male, 1 gyne — ATPC); Vallirana (1 worker — XEPC); Vico (1 worker — XEPC). SWITZERLAND: La Sarraz (1 gyne — BMNH); Pfynwald Wallis (1 worker — ASPC). TURKEY: Taskopru (1 gyne — CCPC). UKRAINE: Donetsk Oblast, Loess near Svyatogorskiy Cloister, Donetskaya Province, 21 km NNW from Slavyansk, 7 VI 1939, Severskiy Donets River Svyatogorsk, Svyatogorsliy Cloister, 21 km NNW from Slavyansk, 13 VII 1937, 14 VII 1937, K. V. Arnol'di (8 workers —

ZMUM); Khar'kov Oblast, Zmiev [current spelling Zmiyev], VII 1929, I V. Arnol'di (2 workers — BMNH) (1 male — MCZ), Zmiyev, Korako Ravine, 26 VIII 1923, K. V. Arnol'di, Bottom of the ravine; nest und moss near stream, 25 VIII 1926, 1926, K. V. Arnol'di, young oak grov VIII 1928, 1929, 1931, K. V. Arnol'di, young oak grove (31 worke [including LECTOTYPE], 8 gynes, 5 males — ZMUM); Voroshilovgra Oblast, Derkul' River, "Dolgoe," now Luganskaya, 5 VI 1952, K. V Arnol'di (2 workers, 1 gyne — ZMUM). FORMER YUGOSLAVIA: Mrkvist 1276 m (1 worker — ZMHB); Rtanj Pl., 600 m (2 gynes, 4 workers - MHNG); S/Krupanj, 450 m (4 gynes, 1 worker — MHNG); Stol Pl., 90 m (2 workers — MHNG); Tara Pl., 500 m (3 workers — MHNG); Tara Pl 950 m (1 gyne, 1 worker — MHNG). [Locality labels from Russia an Ukraine were in Russian and were translated by A. Antropov].

Stenamma sardoum Emery

Worker Figs. 277 - 282. Distribution Fig. 283.

Stenamma sardoum Emery, 1915: 255 - 256, pl. 4, figs. 5, 6. Worke Queen — SARDINIA (MCSNG) [Examined].

WORKER

Measurements and associated statistics are presented in Appendi Table 3. Key statistics are presented herein (measurement mean standard error of mean, n): TL (3.65 ± 0.137, 3), HL (0.89 ± 0.028, 3) HW (0.75 ± 0.014, 3), CI (84.92 ± 1.124, 3), SL (0.69 ± 0.016, 3), SI (92.1 ± 1.399, 3), AL (1.10 ± 0.047, 3), PRW (0.48 ± 0.009, 3), PL (0.39 ± 0.014 3), PH (0.21 ± 0.016, 3).

LECTOTYPE MEASUREMENTS. TL 3.50, HL 0.89, HW 0.76, EL 0.08 SL 0.67, CI 85, SI 89, AL 1.01, PRW 0.48, PL 0.39, PH 0.19.

Mandible with 9 - 10 teeth (apical 2 prominent with third tooth large than remaining teeth); anterior clypeal margin in full face view wit median lobe weakly emarginate (a small carina on each side o emargination); apex in lateral view flat. Compound eye with 5 - ommatidia in greatest diameter. Propodeal spines of moderate length approximately ⅓ length of declivitous face of propodeum. Scape no reaching occipital vertex by amount equal to length of second funicula segment. Metanotal impression shallow, depth approximately ⅓ lengt of propodeal spines; wide, approximately 2X as wide as deep, dept decreasing towards anterior. A conspicuous pit present at the posterio ventral edge of the pronotum (near procoxae). Propodeal plates approxi mately ½ as long as propodeal spines, directed posteriorly. Anterio subpetiolar process absent. Petiole pedunculate; stalk approximately ½ length of petiole, node rising gradually. Anterior and posterio subpostpetiolar processes reduced. Head rugose (most similar to th

sculpture of *S. westwoodii* and *S. debile*) except as follows: frontal area carinate, carinae diverging towards posterior; central ⅓ of frontal area (between antennal sockets) glassy-smooth; venter of head almost scabrous. Interstices shining throughout with scattered piligerous and non-piligerous punctures. Thoracic dorsum scabrous. Thoracic pleura scabrous. Neck of pronotum rugulose. Metanotal impression scabrous (almost scrobiculate). Mesopleuron with scabrous median area (almost scrobiculate). Coxae rugulose; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with scabrous basal face and glassy-smooth declivitous face (with trace of longitudinal carinulae). Alitrunk interstices glassy-smooth with scattered piligerous and non-piligerous punctures. Petiolar node dorsum smooth with faint traces of longitudinal rugae; anterior and posterior surfaces of node and side rugose (becoming rugulose near venter); venter rugulose. Postpetiolar node dorsum smooth with faint longitudinal rugae; anterior and posterior surfaces and side rugose; venter faintly rugose. First gastral tergite base carinate with numerous carinae diverging towards posterior (longest carinae located near midline, ¼ to ⅓ length of postpetiole). First gastral sternite base predominantly glassy-smooth with less than 3 small carinae (most prominent at juncture with postpetiole) which do not extend for more than ¼ length of postpetiole. Remainder of gaster glassy-smooth (even at high magnifications), with scattered piligerous punctures. Setae on head moderately dense, suberect to decumbent. Setae on scape decumbent to appressed. Setae on alitrunk and gaster erect to suberect. Setae on petiole and postpetiole suberect to decumbent. Length of setae on alitrunk greater than 2X - 3X length of setae on head. Setae on flexor surfaces of coxae and venter of petiole absent. Setae on remainder of legs suberect to appressed. Entire body concolorous testaceous. Setae yellow.

GYNE

Although Emery referred to both worker and queen when he described this species (1915: 255), no queens could be located during the course of this study; none were present in the museum (MCSNG) where the workers were stored. Both of Emery's Figs. (1915: pl. 4, figs. 5 and 6) depict a worker. Emery did indicate the female's total length is 4.5 mm.

MALE

Presently, no males of this species are known.

DISCUSSION

S. sardoum is known only from scattered localities in southern Europe. To my knowledge, no other *Stenamma* has been collected from

Sardinia. However, other species (*S. debile* and *S. striatulum*) are know from islands off the Italian coast. *S. orousseti* is known from Corsic Sardinia, and Spain. The Spanish record (of *S. sardoum*) may represe another species (undescribed?) which is morphologically similar to *sardoum*. However, additional specimens are needed to better unde stand variation within *S. sardoum* before such a statement can b verified. Further information regarding the biology of this species i unknown (including flight times for reproductives, food preference and prefered microhabitat).

COMPARISONS

This species is most closely related to *S. westwoodii* and *S. debil* based upon surface sculpturing and shape of the petiole and postpetiol Emery (1915) mentioned this in his original description and almos considered it an island subspecies. He indicated a number of character which he used to differentiate these species (*S. sardoum* and *S. debil* [which he called *S. westwoodii*]); specifically, he indicated it is large with coarser sculpture. Pubescence near the joints is strong, short, an appressed. The head is elongated with the lateral margins distinctl curved; the antennae are longer and the segments of the funiculus ar more elongated. The thorax and peduncle are longer and the propode spines project more.

Based upon this study, there are a number of minor difference (particularly sculpture and shape of petiole) which differentiate thi species from *S. debile*. I believe these are sufficient to warrant specifi status. As additional specimens are discovered and a clearer view variation within this species is known, synonymy may (or may not) b justified. However, shape of the petiolar node dorsum appears to b unique among *Stenamma* examined.

S. orousseti is known from Corsica. It differs from *S. sardoum* in tha the petiolar dorsum in lateral view is a flattened convex dome in *sardoum*.

The only other species which might be confused with *S. sardoum* ar *S. striatulum*, and *S. petiolatum*. *S. striatulum* differs in that both hea and dorsal thoracic sculpture are longitudinally carinate. Head sculp ture is particularly close set in *S. striatulum* as well. *S. petiolatum* differ in that the scape is noticeably longer (surpassing occipital vertex i most specimens) and there are numerous erect setae on the scape a well. As a general rule, *S. petiolatum* workers are larger than *S. sardou* (*S. petiolatum* TL 3.85 ± 0.109, *S. sardoum* TL 3.65 ± 0.137).

MATERIAL EXAMINED

SARDINIA: Aritzo (Dodero) [spelled Dudero on both specimen label

(2 workers — MCSNG). SPAIN: Sierra de Montserrat (1 worker — XEPC).

Stenamma orousseti Casevitz-Weulersse

Worker Figs. 214 - 217. Gyne Figs. 218 - 220.
Male Figs. 221 - 224. Distribution Fig. 225

Stenamma orousseti Casevitz-Weulersse, 1990: 137, 141 - 149, figs. 1 - 6. Worker, Gyne, Male — CORSICA: Cape Corsica, between the pass of Santa Lucia and Pino (275 m), 15 IV 1984, J. Orousset.

WORKER

Measurements and associated statistics as listed in Appendix Table 4. Key statistics are included herein (measurement mean ± standard error of mean, n): TL (3.67 ± 0.094, 11), HL (0.85 ± 0.019, 11), HW (0.71 ± 0.018, 11), CI (84.07 ± 0.750, 11), SL (0.62 ± 0.016, 11), SI (87.78 ± 1.690, 11), AL (1.07 ± 0.029, 11), PRW (0.49 ± 0.012, 11), PL (0.43 ± 0.013, 11), PH (0.23 ± 0.007, 11).

Casevitz-Weulersse published measurements differ slightly from the measurements I obtained and are repeated herein.

> "Head a little longer than wide: length of head 0.772 mm (variance 0.056, range 0.675 - 0.850 mm); width (behind eyes) 0.660 (variance 0.057, range 0.525 - 0.750 mm). Head length to head width ration 1.17 (variance 0.050, range 1.08 - 1.29).
>
> "Thorax longer than wide, index ... 1.99 (variance 0.090, range 1.88 - 2.2). Epinotal spines strong and pointed, Buschinger index 1.97 (variance 0.031, range 1.7 - 2.3)."
>
> "Petiole length 0.0342 mm (variance 0.031, range 0.275 - 0.400 mm). The two surfaces of node forming the view in profile of almost a right angle with a more or less rounded summit. Postpetiole rounded, length 0.221 mm (variance 0.028, range 0.175 - 0.300 mm), wider than long." (Casevitz-Weulersse, 1990: 144).

HOLOTYPE WORKER not examined and measured, only paratypes were loaned for examination.

Mandible with 7 teeth (apical 2 prominent); anterior clypeal margin in full face view flat; apex in lateral view flat. Compound eye with 4-5 ommatidia in greatest diameter. Propodeal spines of moderate length, slightly greater than ⅓ length of declivitous face of propodeum. Scape reaching, but not surpassing occipital vertex. Casevitz-Weulersse (1990: 144) provided a slightly different observation: "... Scape not reaching occipital margin of head (ratio of head length to scape length 1.33 (variance 0.047, range 1.22 - 1.43))." Metanotal impression shallow, slightly less than ½ length of propodeal spines; over 3X as wide as deep, depth decreasing towards anterior. Propodeal plates well

developed, almost as long as propodeal spines, directed posteriorly an slightly upward. Anterior subpetiolar process reduced to a small bum Petiole pedunculate; stalk slightly less than ½ length of petiole, noc rising gradually. Anterior and posterior subpostpetiolar processe greatly reduced. Head rugose, approaching longitudinally carinat except as follows: frontal area carinate, carinae diverging toward posterior; central ⅓ of frontal area (between antennal sockets) glassy smooth. Interstices glassy-smooth with scattered piligerous and noi piligerous punctures. Thoracic dorsum longitudinally carinate, almos scabrous, becoming more scabrous towards pronotal humeri. Thoraci pleura scabrous. Neck of pronotum rugulose. Metanotal impressio scrobiculate, approaching scabrous. Mesopleuron with scrobiculat median area. Coxae longitudinally carinulate; remainder of legs glassy smooth with scattered piligerous punctures. Propodeal dorsum wit scabrous basal face, with transverse carinae between spines, an glassy-smooth declivitous face. Alitrunk interstices glassy-smooth wit scattered piligerous and non-piligerous punctures. Petiolar node doi sum rugose, approaching scabrous on sides, with interstices glassy smooth with scattered piligerous and non-piligerous punctures; re maining surfaces rugulose. Postpetiolar node dorsum glassy-smoot with faint rugae; anterior and posterior surfaces and sides scabrou with numerous non-piligerous punctures; venter punctulate, almos rugulose. First gastral tergite base carinate with numerous carina diverging towards posterior (longest carinae located near midline c tergite, not exceeding ¼ length of postpetiole). First gastral sternite bas glassy-smooth or with minute carinulae which do not extend unt gaster. Remainder of gaster glassy-smooth (even at high magnifica tions), with scattered piligerous punctures. Setae on head mostl suberect to subdecumbent. Setae on anterior clypeal margin erect t suberect and moderately dense. Setae on scape subdecumbent t appressed. Setae on mandibles subdecumbent to appressed. Setae o alitrunk long, much longer than on head (almost 2 times), but scattere and less dense than on head, erect to suberect. Setae on legs suberec to subdecumbent. Setae on petiolar node appressed on anterior sur face, suberect to erect on posterior surface and sides. Setae of venter c petiole absent. Setae on postpetiole decumbent on anterior surfac erect to suberect on node, posterior surface and sides, setae erect o anterior edge of venter. Setae on gaster erect to suberect and moderatel dense. Entire body brown; appendages and posterior tip of gaste lighter (almost testaceous). Casevitz-Weulersse (1990: 143) provide the following color observations (the specimens may have faded or used a different light source as these colors were not observed in thi

detail on specimens I examined). "Color varies between light brown and dark yellow reddish brown, according to the individual. Top of the head (towards the rear from the frontal lamina), and top of thorax light brown or brown, always darker than front of the head. Frontal lamina, clypeus, and mandibles yellow reddish brown to clear light brown (antenna are the latter). Frontal area dark brown, like the teeth on the masticatory border of the mandible. Eyes black, very small, like all workers of *Stenamma*. Most striations comprising the general body sculpture dark brown. First tergite of gaster, which nearly covers entirely the other tergites, and median part of first sternite dark brown. The rest of the gaster yellow reddish brown. Legs likewise yellow reddish brown." Setae white to yellow.

GYNE

Measurements and associated statistics as listed in Appendix Table 4. Key statistics are presented herein: TL (4.44 ± 0.247, 4), HL (0.88 ± 0.036, 4), HW (0.77 ± 0.029, 4), CI (87.65 ± 0.460, 4), SL (0.67 ± 0.020, 4), SI (87.04 ± 1.831, 4), AL (1.34 ± 0.064, 4), PRW (0.66 ± 0.028, 4), PL (0.48 ± 0.022, 4), PH (0.27 ± 0.010, 4).

Since I was only able to examine a subset of the gynes and since I could not add materially to the original description, I offer the following translation of the original description (Casevitz-Weulersse, 1990).

> "Total length 3.7 to 3.9 mm. Color generally a little darker than worker, but always with front of the head (clypeus and mandibles) lighter than rest of the body, legs and antenna dark yellow."
>
> "Pilosity a little more abundant than in worker with similar suberect setae on the legs and scape, some setae on eyes."
>
> "Sculpture similar to that of worker, some smooth area on side [of alitrunk]. Space between epinotal spines smooth and shining, rest of epinotum with transverse striations. Petiole more punctate with striations. ... "
>
> "Head a little longer than wide. Length to width ratio 1.13 (variance 0.040, range 1.08 - 1.19). Frontal lamina, frontal area and clypeus similar to worker. Eyes black, prominent, the three colorless ocelli arranged in a triangle towards rear of the head. Mandibles striate, maxillary palps with four segments, labial palps with three. Antenna similar to that of worker. Scape not reaching occipital border, head length to scape length ration 1.25 (variance 0.10, range 1.08 - 1.40)."
>
> "Thorax longer than wide, bulging. Index ... 1.71 (vari-

ance 0.11, range 1.52 - 1.86). Metanotum projecting a little, overhanging the nearly vertical epinotum. Alary sclerites dark chestnut, wings unknown. Spines strong and sharp, Buschinger index 2.2 (variance 0.052, range 2 - 2.4)."

"Petiole and postpetiole more rounded than in worker, somewhat shining. Petiole length 0.387 mm (variance 0.019, range 0.375 - 0.425 mm). Postpetiole length 0.237 mm (variance 0.027, range 0.200 - 0.275 mm)."

"Abdomen smooth and shining with pilosity well developed."

"Three paratype queens collected with 5 workers (holotype and paratypes)." (Casevitz-Weulersse, 1990: 145; translation by this author).

MALE

Measurements as listed in Appendix Table 4 for the single specimen examined.

Since this caste is represented by a single specimen and since I could not add materially to the original description, I offer the following translation of the original description (Casevitz-Weulersse, 1990).

"Of small size (approximately 3 mm)."

"Color dark brown with the mouthparts yellow and the antenna brown. Legs dark yellow to yellow, lightening progressively from femur to tarsus. Wings translucent, pale brown with veins and stigma pale brown. Venation typical for *Stenamma*, with one large cubital cell and one discoidal cell. Sclerites articulated with the wings chestnut [in color]. Petiole, postpetiole and gaster more chestnut than rest of the body."

"Head: top and underneath with fine longitudinal striations, the top slightly shining. Clypeal striations transverse and a little shining; frontal area similar, only punctate. Eyes chestnut black, very prominent and hairy. Ocelli chestnut, each rising on a small protuberance. The space between the three with fine striations like the rest of the head. Mandibles cylindrical and smooth, with only three teeth on the masticatory border and bearing long setae. Maxillary palps of five segments, labial palps of three. Antenna of thirteen segments, like other males of *Stenamma*. Scape covered with slightly dense appressed pilosity. First segment of the funiculus globular, second elongate, the remainder twice as long as wide. The last five segments enlarged and elongated slightly forming a club."

"Thorax: long pilosity, rare pubescence. On the mesonotum Mayrian Furrows [notauli] indicated along with fine transverse striations which become longitudinal towards the rear behind the Mayrian Furrows. On the scutellum, fine longitudinal striations. Sides with slight and shining longitudinal striations. Epinotum [propodeum] elongate, smooth and shining, with superficial longitudinal wrinkles on the flanks. Epinotal angles terminating in very small pointed spines. Legs with setae ranging from appressed to suberect. Petiole and postpetiole elongate, both the same height. Gaster shining."

"Most measurements were taken in dorsal view, except the petiole which was observed in profile. Head length 0.575 mm, head width (eyes excluded) 0.500 mm, scape length 0.250 mm, thorax length 1.100 mm, thorax width 0.625 mm, petiole length 0.375 mm, postpetiole length 0.225 mm." (Casevitz-Weulersse, 1990: 145 - 146; translation by this author).

DISCUSSION

This species was originally discovered through Berlese-Tullgren funnel extractions of soil and litter. It was described from 8 gynes, and 21 workers from 15 samples of soil and litter. A single *Stenamma* male was also collected through sifting of litter and is presumed to be this species.

This is the only examined *Stenamma* species wherein the male is described as having a palpal formula of 5,3 instead of the typical 4,3. The single male I examined appeared to have the typical palpal formula of 4,3. This male does has a five segmented antennal club. Further males of this species need to be examined and collected in association with workers and gynes to verify whether this single individual is an anomaly.

COMPARISONS

The following arguments were proposed by Casevitz-Weulersse (1990: 146 - 149) in recognition of this as a separate species. I have translated and paraphrased them from the original French. Based upon the limited sample I examined, I believe this is a valid species. However, I do not believe it is restricted to the island of Corsica and have discovered additional material from the island of Sardinia. The worker and gyne reported from Spain remain problematic. I suspect the range of this species will be found to be much wider than a few islands as more specimens of *Stenamma* are collected throughout the Mediterranean

region.

Casevitz-Weulersse (1996) indicated endemism to be very low in th Corsican myrmecofauna. "For example, several species which had lon been considered as strictly cyrno-sardinian were shown by enlarge faunistic surveys and taxonomic revisions to be much more widel distributed..." (Casevitz-Weulersse, 1996: 193). With additional mat rial representing an expanded range for *Stenamma orousseti*, only on endemic Corsican species remains (*Leptothorax melas*).

Workers of this species might be confused with *S. sardoum* which wa reported from Corsica by DeBouge and Gaspard (1983). *S. sardoum* ca be separated from all other species of *Stenamma* found in the Mediter ranean region by its truncate and flattened petiolar node. This featur is unique among species found in the region.

Workers of *S. orousseti* can be separated from *S. petiolatum* in tha workers and gynes of the latter are much larger, the antennal scape are proportionally longer, and the propodeal spines are proportionall shorter than in *S. orousseti*. These species are similar in that both hav suberect setae on both antennae [scapes] and legs. However, *S petiolatum* has more erect setae in these regions.

Workers of *S. orousseti* are most similar to *S. debile* and *S. striatulum* In fact, measurements of body regions between these species overlap i nearly every count. Part of this may be due to the small sample size o *S. orousseti* compared with the large sample size of *S. debile*. Worker of *S. orousseti* can be separated by their head being a little longer tha wide, by the head length to scape length ratio (the scape never reache the occipital margin). They also have a higher Buschinger index. I general sculpture differs from *S. debile* in that the striations are mor regularly parallel and thicker while covering the greater part of the to of the head and thorax. Finally, the antennal scapes and legs carr suberect setae which are lacking in *S. debile*.

S. striatulum is similar as well, but workers of this species are smalle and also lack suberect setae on scape and legs.

TYPE LOCALITY: Cape Corsica, between the pass of Santa Lucia an Pino (275 m altitude), Orousset coll. (15 IV 1984). Holotype and fou paratype workers were collected in the same sample.

Additional worker material studied for the original descriptio included: Cape Corsica: Pass of Serra (altitude 280 m) (III 1981) Bracolaccia (120 m), Pino (150 m) and Piazze (150 m) (IV 1984) Cassalabriva (south west of Ajaccio) (30 m) (IV 1984); Matra (west o Alistro) (30 m) (X 1984); Orousset coll. (11 workers). Cucuruzzu (750 m and Mount Cagna (600 m) (IV 1982), Deuve et al coll. (4 workers). Cap Revellata (near Calvi) (50 m) (IV 1981), Debouge coll. (1 worker).

Additional gyne material studied for the original description included: Cape Corsica: Pino and Piazze (altitude 150 m) (IV 1984); Cassalabriva (southwest of Ajaccio) (30 m) (IV 1984); Matra (west of Alistro) (30 m) (X 1984); Orousset coll. (5 gynes).

The single male came from high scrub on a limestone shelf north of Bonifacio (100 m altitude), Orousset coll. (20 X 1984). No workers nor gynes were taken in association with the male. This individual was collected by sifting leaf litter.

MATERIAL EXAMINED

CORSICA: Bonifacio (1 male — MNHN); Casalabriva (1 worker, 1 gyne — MNHN); Col. Ste. Lucie (2 workers, 1 gyne — MNHN); Piazze (2 workers, 1 gyne — MNHN). SARDINIA: St. Lucia (5 workers — MCZ); SPAIN: Santander Prov., Saby, Cabal de Conde (1 worker, 1 gyne — CCPC).

Stenamma kashmirense Urbani

Worker Figs. 50, 72, 154 - 161.

Distribution Fig. 162.

Stenamma kashmirense Urbani, 1977: 415 - 420, fig. 1, 3. Worker — INDIA: Kashmir Prov., Yusmar[g], 2300 - 2400 m. [Holotype NHMB, 5 Paratypes NHMB, 1 Paratype BMNH — Examined].

WORKER

Measurements and associated statistics are presented in Appendix Table 5. Key statistics are presented herein (measurement mean ± standard error of mean, n): TL (3.42 ± 0.013, 46), HL (0.77 ± 0.003, 46), HW (0.66 ± 0.003, 46), CI (84.89 ± 0.321, 46), SL (0.57 ± 0.002, 46), SI (87.03 ± 0.368, 46), AL (1.02 ± 0.005, 46), PRW (0.45 ± 0.003, 46), PL (0.41 ± 0.003, 46), PH (0.18 ± 0.002, 46).

HOLOTYPE WORKER. TL 3.59, HL 0.80, HW 0.69, EL 0.10, SL 0.56, CI 86, SI 81, AL 1.08, PRW 0.48, PL 0.39, PH 0.19.

Mandible with 7 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe slightly emarginate; apex in lateral view convex, almost flat near mandible. Compound eye with 5 ommatidia in greatest diameter. Propodeal spines of moderate length, approximately ¼ to ⅓ length of declivitous face of propodeum. Metanotal impression well developed, nearly as deep as propodeal spines, over 2X as wide as deep, depth decreasing anteriorly. Deep pit present at posterior and ventral edge of pronotum, near procoxae. Propodeal plates slightly longer than propodeal spines, directed posteriorly and very slightly upwards. Anterior subpetiolar process reduced. Petiole pedunculate, gradually thickening towards node; stalk less than ½ length of

petiole. Anterior and posterior subpostpetiolar processes greatly r
duced. Head rugose except as follows: frontal area carinate; carina
diverging slightly posteriorly; central ⅓ of frontal area between anter
nal sockets glassy-smooth; clypeal area with 2 carinulae extendin
from each side of emargination converging towards frontal are
Interstices glassy-smooth with scattered piligerous punctures. Th
racic dorsum rugose-scabrous (with decidedly transverse orientation t
ridges). Thoracic pleura predominantly glassy-smooth with scattere
rugae (approaching punctate near venter). Neck of pronotum rugulos
and punctulate. Metanotal impression weakly scrobiculate. Mesopleuro
with very weakly scrobiculate median area. Coxae rugulose; remainde
of legs glassy-smooth with numerous piligerous punctures (som
specimens with numerous carinulae on femora and tibiae); mid- an
hind-tibia with minute spines at distal tip. Propodeal dorsum wit
scabrous basal face (with transverse orientation) and glassy-smoot
declivitous face (some with weak transverse carinulae). Alitrunk inte
stices glassy-smooth with scattered piligerous punctures. Petiolar nod
dorsum heavily punctulate with traces of longitudinal rugae; remainin
surfaces densely punctulate with some traces of longitudinal ruga
along sides. Postpetiolar node dorsum glassy-smooth (with traces
longitudinal rugae along sides); remaining surfaces densely punctulat
First gastral tergite base carinate with carinae diverging toward
posterior(longest carinae located near midline of tergite, between 0.2
and 0.25 length of postpetiole). First gastral sternite base glassy
smooth (or with several extremely short carinulae at the extreme base
Remainder of gaster glassy-smooth (even at high magnifications), wit
some piligerous punctures. Setae of head numerous, short
subdecumbent (except long, erect setae at anterior clypeal margin
Setae on alitrunk longer, suberect. Setae on petiole suberect. Setae o
postpetiole subdecumbent (erect on venter). Setae of gaster suberect t
subdecumbent. Setae of legs subdecumbent to appressed. Entire bod
shining dark brown, appendages and gaster lighter brown. Seta
yellow.

At present, no gynes nor males of this species are known.

DISCUSSION

S. kashmirense is known only from two localities (represented onl
by workers). No further information regarding its biology is known (f
example, timing of mating flights, food preferences, or microhabita
preferences).

COMPARISONS

S. kashmirense is most closely related to *S. westwoodii*, *S. debile*, an

similar species in its surface sculpture and general habitus. It may be closely related to *S. westwoodii asiatica* which was described from Turkestan. Unfortunately, no specimens of the latter taxon could be discovered. There are a number of Palaearctic and Oriental species which share similar sculpture, eye size, and petiolar node configurations.

S. kashmirense can be separated from *S. debile* and *S. westwoodii* in that the former species has transverse carinae across the thoracic dorsum.

The four Himalayan vicinity species examined (*S. kashmirense*, *S. gurkhalis*, *S. jeriorum* and *S. bhutanense*) converge in that all have a shining dark brown color. *S. kashmirense* differs from *S. jeriorum* in that the petiolar stalk is less than ½ the length of the petiole. *S. kashmirense* has propodeal plates greater than or equal to the length of propodeal spines while the propodeal plates in *S. gurkhalis* and *S. bhutanense* are (at most) ¾ the length of the propodeal spines.

MATERIAL EXAMINED

INDIA: Kashmir Prov., Yusmar[g], 5-VII-1976, 2300 - 2400 m, W. Wittmer (holotype worker and 5 paratype workers — NHMB, 1 paratype worker — BMNH). PAKISTAN: Hazara Dist., Kaghan Valley, Naran, 2 VI 1983, # 34 b [no collector listed] (46 workers — BMNH).

***Stenamma jeriorum* sp. n.**

Worker Figs. 53, 73, 148 - 152.
Distribution Fig. 153.

WORKER

Measurements and associated statistics are presented in Appendix Table 6. Key statistics are listed herein (measurement mean ± standard error of mean, n): TL (3.39 ± 0.020, 31), HL (0.77 ± 0.005, 31), HW (0.68 ± 0.004, 31), CI (89.55 ± 0.348, 31), SL (0.56 ± 0.003, 31), SI (81.82 ± 0.388, 31), AL (1.02 ± 0.007, 31), PRW (0.45 ± 0.003, 31), PL (0.38 ± 0.004, 31), PH (0.20 ± 0.001, 31).

HOLOTYPE WORKER. TL 3.45, HL 0.78, HW 0.69, EL 0.10, SL 0.56, CI 89, SI 80, AL 1.05, PRW 0.46, PL 0.39, PH 0.21.

Mandible with 7 - 9 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe weakly emarginate, apex in lateral view convex. Compound eye with 4 - 6 ommatidia in greatest diameter. Scape not reaching occipital vertex by an amount less than length of first funicular segment. Propodeal spines of moderate length, approximately ⅓ length of declivitous face of propodeum. Metanotal impression well developed; nearly ½ as deep as length of propodeal

spines; over 2X as wide as deep, depth decreasing towards anterior. prominent micro-setae lined pit present at base of procoxae; another p (lacking micro-setae) between bases of meso- and meta-coxae. Propode plates as long as propodeal spines, directed posteriorly towards petiol Anterior subpetiolar process prominent. Petiole pedunculate; stal approximately ½ length of petiole; node rising gradually. Anteri subpostpetiolar process enlarged into a prominent bump; posteri subpostpetiolar process greatly reduced. Head rugose (including vent and occipital vertex) except as follows: frontal area carinate; carina diverging posteriorly; central ⅓ of frontal area between antenn sockets glassy-smooth; clypeal area with 1 weak carinulae extendin from each side of emargination, converging towards frontal area; vent of some specimens approaching scabrous. Interstices with numerou small non-piligerous and piligerous punctures. Thoracic dorsum ru ose, except area near pronotal humeri nearly glassy-smooth. Thoraci pleura nearly smooth beneath pronotum, rugose until reaching propode pleura which are longitudinally carinate. Neck of pronotum rugulos Metanotal impression scrobiculate. Mesopleuron with scrobiculat median area. Coxae with weak longitudinal carinae. Remainder of leg smooth with scattered piligerous punctures. Propodeal dorsum wit transversely carinate basal face, some weak transverse carinae b tween spines, and usually glassy-smooth declivitous face (some spec mens with trace of transverse carinae). Alitrunk interstices shinin with numerous piligerous and non-piligerous punctures. Petiolar nod dorsum glassy-smooth with a faint trace of rugae in some specimens remaining surfaces rugose except posterior surface of node punctulat and venter rugulose. Postpetiolar node dorsum glassy-smooth; remain ing surfaces rugose, becoming rugulose towards venter. First gastr tergite base carinate with several carinae diverging towards posterio carinae not exceeding ¼ to 0.20 length of postpetiole. First gastr sternite base glassy-smooth. Remainder of gaster glassy-smooth (eve at high magnifications), with some piligerous punctures. Setae on hea moderately dense, decumbent to appressed and of irregular lengt except: setae on clypeal margin erect, setae on mandible appresse setae of scape subdecumbent to appressed (mostly subdecumbent o anterior surface), setae of funiculus mostly appressed. Setae on dorsu and side of alitrunk erect to suberect; setae on alitrunk venter ver sparse, erect to appressed. Setae on legs mostly suberect to appresse becoming more appressed towards tibiae. Setae of petiole appressed o anterior surface, erect to suberect on posterior surface, mostly subere on dorsum and side (and of varying length), setae of venter absent. Seta on postpetiolar dorsum, side, anterior and posterior surfaces of nod

decumbent to suberect; setae on venter near anterior subpostpetiolar process suberect (setae of remainder of venter absent). Setae on gaster mostly suberect. Entire body concolorous brown with appendages testaceous(gaster slightly lighter than rest of body) [some specimens are almost entirely testaceous and are presumably callow forms]. Setae yellow.

At present, no gynes nor males of this species are known.

DISCUSSION

S. jeriorum is known only from workers collected at a single locality. No further information regarding its biology is known.

ETYMOLOGY

This species is named in honor of my wife, Jeri R. DuBois. Without her support and encouragement, none of this would have been possible.

COMPARISONS

S. jeriorum is most closely related to *S. kashmirense* based upon thoracic and head sculpturing and petiolar profile and size of compound eyes. *S. jeriorum* can be separated from this species as *S. jeriorum* has a petiolar stalk ½ the length of the petiole or greater while the stalk of *S. kashmirense* is always less than ½ length of the petiole.

MATERIAL EXAMINED

PAKISTAN: Malan Jabba, # 176, Brancucci (holotype worker and 26 paratype workers — BMNH) (2 paratype workers — MBDPC) (2 paratype workers — MCZ).

Stenamma petiolatum Emery

Worker Figs. 237 - 242. Gyne Figs. 243 - 249.

Distribution Fig. 250.

Stenamma petiolatum Emery, 1897: 12. Gyne — Italy: Liri Island (by present restriction) (MCSNG). [Examined].

Stenamma petiolatum Emery, 1914: 256, pl. 4, fig. 9. Worker — Italy, Monte Argentaro (Solari) (MCSNG). [Examined].

Stenamma petiolatum; Kutter, 1971: 262, 264, figs. 16 - 21, 26, 30. Male — Italy, Northern Appenines [Not Examined].

WORKER

Measurements and associated statistics as presented in Appendix Table 7. Key statistics are presented herein (measurement mean ± standard error of mean, n): TL (3.85 ± 0.109, 20), HL (0.88 ± 0.021, 20), HW (0.74 ± 0.014, 20), CI (85.23 ± 0.733, 20), SL (0.69 ± 0.020, 20), SI (92.25 ± 1.328, 20), AL (1.17 ± 0.037, 20), PRW (0.50 ± 0.013, 20), PL (0.44 ± 0.020, 20), PH (0.23 ± 0.005, 20).

Mandible with 8 teeth (apical 2 prominent); anterior clypeal margi in full face view with median lobe emarginate; apex in lateral vie concave (or flat to concave). Compound eye with 4 - 5 ommatidia i greatest diameter. Propodeal spines of moderate length, approximatel ⅓ length of declivitous face of propodeum. Scape almost reaching b not surpassing occipital vertex (distance less than length of fir funicular segment). Metanotal impression shallow, depth approx mately ¼ - 0.20 length of propodeal spines; wide, approximately 2X a wide as long, depth decreasing towards anterior. Propodeal plates we developed, almost as long as propodeal spines, directed posteriorl Anterior subpetiolar process reduced. Petiole pedunculate; stalk a proximately ½ length of petiole. Anterior subpostpetiolar proces prominent, posterior subpostpetiolar process reduced. Head rugos with rugae anastomosing on sides and occipital vertex, except a follows: clypeus with traces of 2 carinulae extending from each side emargination and converging towards frontal area; frontal area car nate with carinae diverging posteriorly; central ⅓ of frontal are (between antennal sockets) glassy-smooth; venter of head scabrou Interstices glassy-smooth with scattered piligerous punctures. Th racic dorsum rugose (almost scabrous in center); sides carinate (wit longitudinal carinae similar to *S. striatulum*). Thoracic pleura rugose scabrous (becoming mostly scabrous near anterior and posteri borders). Neck of pronotum rugulose. Metanotal impression scrobic late. Mesopleuron with scrobiculate median area (ridges betwe hollows widely separated). Coxae transversely carinate (most prom nent on procoxae); remainder of legs glassy-smooth with small piligerou punctures. Propodeal dorsum with transversely carinate basal face an glassy-smooth declivitous face; side of declivitous face with prominen large longitudinal rugae. Large conspicuous pit at base of procoxa Alitrunk interstices glassy-smooth with scattered piligerous pun tures. Petiolar node dorsum rugose (with decidedly longitudinal orie tation) and punctate; remaining surfaces rugulose and punctate exce venter rugulose. Postpetiolar node dorsum similar to petiolar nod dorsum; sides rugulose, venter punctulate. First gastral tergite ba carinate; carinae diverging towards posterior; length of carinae n exceeding ¼ length of postpetiole. First gastral sternite base wit similar carinae, length not exceeding ¼ to 0.20 length of postpetiol Remainder of gaster glassy-smooth (even at high magnifications), wit scattered piligerous punctures. Setae of head mostly suberect appressed; setae on clypeal margin erect; setae on scape suberect erect in some specimens, decumbent or appressed in others. Setae o alitrunk, petiole, postpetiole, and gaster erect to suberect. Setae on le

decumbent to appressed (some specimens with erect to suberect setae on tibiae). Body predominantly brown to dark brown [approaching piceous] with head usually darker and color lightening towards gaster; appendages testaceous. Setae yellow.

GYNE

Measurements and associated statistics as presented in Appendix Table 7. Key statistics are presented herein: TL (4.60 ± 0.314, 3), HL (0.96 ± 0.070, 3), HW (0.84 ± 0.034, 3), CI (88.06 ± 2.853, 3), SL (0.77 ± 0.105, 3), SI (91.65 ± 8.647, 3), AL (1.42 ± 0.106, 3), PRW (0.74 ± 0.049, 3), PL (0.53 ± 0.053, 3), PH (0.25 ± 0.005, 3).

LECTOTYPE GYNE

TL 5.23, HL 1.09, HW 0.90, EL 0.23, SL 0.98, CI 82, SI 109, AL 1.63, PRW 0.84, PL 0.63, PH 0.26.

Mandible with 10 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe emarginate; apex in lateral view flat (almost concave). Compound eye with 20 or more ommatidia in greatest diameter. Propodeal spines of moderate length, approximately ⅓ length of declivitous face of propodeum. Scape surpassing occipital vertex by amount slightly greater than length of first funicular segment. Metanotal impression absent due to thoracic modifications associated with flight. Propodeal plates well developed, approximately 0.66 length of propodeal spines, directed posteriorly. Anterior subpetiolar process absent. Petiole pedunculate; stalk greater than ½ length of petiole; node rising gradually. Anterior and posterior subpostpetiolar processes greatly reduced. Head rugose, with rugae anastomosing on sides and occipital vertex, except as follows: clypeus with traces of 2 carinulae extending from each side of emargination and converging towards frontal area; frontal area carinate with carinae diverging posteriorly; central ⅓ of frontal area (between antennal sockets) glassy-smooth; occipital area rugose (almost scabrous); venter of head scabrous. Interstices glassy-smooth with scattered piligerous punctures. Thoracic dorsum rugose (almost carinate in center, scabrous by sides); sides carinate (with longitudinal carinae similar to *S. striatulum*). Thoracic pleura almost smooth in center, becoming rugose (mostly scabrous near anterior and posterior edges). Neck of pronotum rugulose and punctate. Mesopleuron with scrobiculate median area (ridges between hollows widely separated). Coxae transversely carinate (most prominent on procoxae); remainder of legs glassy-smooth with small piligerous punctures (small, faint carinulae on femora and tibiae). Propodeal dorsum with large transverse rugae (almost scabrous) on basal face and glassy-smooth declivitous face; side of declivitous face with prominent, large

longitudinal rugae. Large conspicuous pit at base of procoxae. Alitrunk interstices glassy-smooth with scattered piligerous punctures. Petiolar node dorsum rugose (almost longitudinally carinate) with glassy smooth interstices; anterior and posterior surfaces and sides rugose with punctulate interstices; venter rugulose. Postpetiolar node dorsum similar to petiolar node dorsum; sides rugulose, venter rugulose (approaching punctate). First gastral tergite base carinate; carinae diverging towards posterior; length of carinae approximately ½ length of postpetiole. First gastral sternite base with similar carinae, length not exceeding 0.20 to 0.25 length of postpetiole. Remainder of gaster glassy-smooth (even at high magnifications), with some scattered piligerous punctures. Setae on head mostly erect to decumbent; setae on clypeal margin erect; setae on scape suberect to erect in some specimens, decumbent to appressed in others. Setae on alitrunk suberect to erect. Setae on petiole and postpetiole appressed to suberect (erect on venter of postpetiole). Setae on gaster erect to decumbent. Setae of legs suberect to appressed. Body predominantly brown with head usually darker and color lightening towards gaster; appendages and gaster testaceous. Setae yellow.

MALE

No males of this species have been collected in association with queens or workers. Kutter (1971) discovered a solitary male from the Northern Appenines (Italy) which he attributed to this species. Although I have been unable to locate the specimen, the following discussion is presented from his original paper (pp. 262 - 264). Kutter's Fig. 26 clearly depicts a male mandible with 6 teeth. His Fig. shows some abnormalities in that the left forewing has two cubital cells and one open discoidal cell. Additionally, the left side of the thorax has some additional suturing (Kutter's Fig. 17) and one of the mesosternal processes (left) is reduced. Additionally, notauli are lacking in this male. Kutter provided the following brief description in his key.

> "3.9 mm in length. Petiole length 0.53 mm. Mandible with 6 teeth on the thin margin. Mayrian Furrow [notauli] lacking on the thorax. Spur on both middle and hind tibiae distinct. Majority of epinotum smooth and shining." (Kutter, 1971: 264. Translation by this author).

DISCUSSION

S. petiolatum is known only from scattered localities across Italy and Corsica. Agosti and Collingwood (1987) emphasized the erect to suberect setae as an identifying character for this species.

LECTOTYPE DESIGNATION

After examining the type of *S. petiolatum*, I noted that a type or holotype is not clearly designated. Since the species description is based upon both gyne (Emery, 1897) and worker (Emery, 1914) from different localities and since there is a large amount of variation in this species as it is currently recognized, I decided to designate the gyne I examined as LECTOTYPE. It appears to be the same specimen that Emery based his 1897 description upon. Since a gyne was described first, it seemed appropriate to designate that gyne as lectotype. This specimen bears a red, partly handwritten label (*Stenamma petiolatum* LECTOTYPE) and has been returned to MCSNG.

COMPARISONS

S. petiolatum is not likely to be confused with other species due to its size, length of scape, length and shape of the petiole, and the pilosity of both scape and body. It is placed within the *S. westwoodii* species group, but its closest relative is uncertain. It possesses several features in common with *S. debile*, such as surface sculpture. However, it has more restricted range and is known mostly from soil samples. After examining measurement data, it appears the Corsica material is distinct from the Italian material. Given the small sample sizes, I prefer to call both the same species. This is subject to change as more material is reviewed. One additional species, *S. orousseti* is also known from Corsica. *S. petiolatum* is larger and has erect setae on both legs and scape, *S. orousseti* does not.

MATERIAL EXAMINED

ITALY: Mte. Argentaria, Nordost Macchia Ober de Noviciatto, leg. Moczarski-Scheerpeltz, Aus laub und Wurzeln gesiebt, ca. 400 m, 22 March 1921 (10 workers, 2 dealate gynes — MCZ); Isla del Liri, 1896, J. Emery (1 gyne — MCSNG). FRANCE: Corsica, Zonza (6 workers — XEPC).

Stenamma msilanum Forel

Worker Figs. 187 - 193. Gyne Figs. 194 - 198.

Distribution Fig. 199.

Stenamma westwoodi var. *msilana* Forel, 1901: 347. Gyne — ALGERIA: Oran Prov., Forêt de Msila (MHNG — 1 gyne) [Examined].

Stenamma africanum Santschi, 1940: 66, fig. 2. Worker, Gyne — TUNISIA: Ain Draham [by present restriction] [Types (including lectotype worker, NHMB — Examined]. **New Synonymy.**

Stenamma africanum var. *submuticum* Santschi, 1940: 67, fig. 3. Worker — ALGERIA: Bône (NHMB) [Examined]. **New Synonymy.**

WORKER

Measurements and associated statistics are listed in Appendix Tabl 8. Key statistics (measurement mean ± standard error of mean, n) ar listed herein: TL (3.94 ± 0.060, 7), HL (0.90 ± 0.012, 7), HW (0.76 ± 0.011, 7), CI (83.79 ± 1.468, 7), SL (0.73 ± 0.025, 6), SI (96.28 ± 3.905 6), AL (1.18 ± 0.029, 7), PRW (0.52 ± 0.008, 7), PL (0.46 ± 0.012, 7), PI (0.23 ± 0.005, 7).

LECTOTYPE Measurements (for *S. africanum* lectotype, see furthe discussion in synonymy below). TL 4.12, HL 0.97, HW 0.74, EL 0.06, SI 0.85, CI 77, SI 115, AL 1.21, PRW 0.50, PL 0.48, PH 0.21.

Mandible with 7 teeth (apical 2 most prominent), basal tooth offse slightly; anterior clypeal margin in full face view with median lob slightly emarginate, apex in lateral view flat to slightly concave Compound eye with 4 ommatidia in greatest diameter. Propodeal spines of moderate length, approximately ⅓ length of declivitous face o propodeum. Metanotal impression well developed; approximately as deep as length of propodeal spines; over 2X as wide as deep, depth decreasing towards anterior. Deep pit present at posterior and ventra edge of pronotum. Propodeal plates approximately 0.67 to 1.00X as long as propodeal spines, directed posteriorly. Anterior subpetiolar process reduced to a small bump. Petiole pedunculate, gradually thickening towards node; stalk approximately ½ length of petiole. Anterior and posterior subpostpetiolar processes greatly reduced. Head carinate-rugose except as follows: frontal area carinate (almost carinulate) carinae diverging slightly posteriorly; central ⅓ of frontal area (between antennal sockets) glassy-smooth; clypeal area with 2 carinulae extending from each side of anterior median margin converging towards frontal area; occipital vertex rugose; venter scabrous. Interstices glassy-smooth with scattered piligerous and non-piligerous punctures. Thoracic dorsum scabrous. Thoracic pleura scabrous. Neck of pronotum rugulose. Metanotal impression scrobiculate (with ridges of scabrous sculpture continuing uninterrupted). Mesopleuron with weakly scrobiculate median area (with ridges of scabrous sculpture continuing uninterrupted). Coxae carinulate to rugulose (becoming more wrinkled towards rear); remainder of legs mostly glassy-smooth with numerous piligerous punctures (some specimens with traces of carinulae on femora and tibiae). Propodeal dorsum with weakly transversely carinate basal face and glassy-smooth declivitous face. Alitrunk interstices glassy-smooth with scattered piligerous punctures. Petiolar node dorsum very weakly rugose (almost glassy-smooth); anterior and posterior surfaces and sides of node rugose (almost scabrous); all surfaces of stalk and venter punctulate. Postpetiolar node dorsum very weakly

rugose (almost glassy-smooth); anterior and posterior surfaces and sides rugose (almost scabrous); venter punctate. First gastral tergite base with scattered carinae diverging towards posterior (longest carinae located near midline of tergite, approximately ⅓ to ½ length of postpetiole). First gastral sternite base same as for tergite (longest carinae exceed ½ length of postpetiole). Remainder of gaster glassy-smooth (even at high magnifications), with some piligerous punctures. Setae on head numerous, short, erect to decumbent (except setae on anterior clypeal margin long, erect). Setae on scape and mandibles suberect to decumbent. Setae on alitrunk longer (than on head), erect to suberect on dorsum and legs. Setae on petiole and postpetiole suberect to appressed. Setae on gaster suberect to decumbent. Entire body shining brown, appendages (except mandibles) light brown [almost testaceous]; mandibles and gaster slightly darker. Setae yellow.

GYNE

Measurements are listed in Appendix Table 8. Key statistics are listed herein: TL (4.96 ± 0.161, 2), HL (0.97 ± 0.040, 2), HW (0.84 ± 0.064, 2), CI (85.82 ± 3.065, 2), SL (0.76 ± 0.048, 2), SI (90.48 ± 1.190, 2), AL (1.50 ± 0.066, 2), PRW (0.73 ± 0.105, 2), PL (0.56 ± 0.008, 2), PH (0.29 ± 0.016, 2).

LECTOTYPE Measurements. TL 4.80, HL 0.93, HW 0.77, EL 0.23, SL 0.71, CI 83, SI 92, AL 1.43, PRW 0.63, PL 0.55, PH 0.27.

Mandible with 9 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe slightly emarginate; apex in lateral view convex. Compound eye with 18 ommatidia in greatest diameter. Basal 2 segments of antennal club with small tubercle on outer margin. Propodeal spines of moderate length, approximately ⅓ length of declivitous face of propodeum. Metanotal impression absent due to thoracic modifications associated with flight. Wing venation unknown as wings are lacking in only known specimen. Anterior subpetiolar process greatly reduced. Petiole pedunculate; stalk comprising almost ½ length of petiole. Anterior subpostpetiolar process greatly reduced. Head entirely rugose except as follows: frontal area carinate; carinae diverging slightly posteriorly. Interstices glassy-smooth with scattered piligerous and non-piligerous punctures. Thoracic dorsum costate. Thoracic pleura rugose to carinate (approaching glassy-smooth near procoxae). Neck of pronotum rugulose. Mesopleuron with weakly scrobiculate median area. Coxae smooth to weakly carinate; remainder of legs glassy-smooth with piligerous punctures. Propodeal dorsum transversely costate. Alitrunk interstices glassy-smooth with scattered piligerous and non-piligerous punctures. Petiolar dorsum (including

node) rugose to punctulate; remaining surfaces rugulose. Postpetiola node dorsum glassy-smooth; remaining surfaces rugose to punctulat (with most punctures located near posterior surface and venter). Firs gastral tergite base with numerous small carinae; carinae divergin towards posterior (longest carinae located near midline of tergite, lengt not exceeding ⅓ length of postpetiole). First gastral sternite base glassy smooth. Remainder of gaster glassy-smooth (even at high magnifica tions), with scattered piligerous punctures. Setae on most surface moderately dense, suberect to decumbent. Setae on flexor surfaces o coxae and venter of petiole absent. Head, dorsum of alitrunk, and firs gastral tergite very dark brown [almost piceous], appendages lighter Setae yellow. Forel (1901) described the color as dark brown, excep feet, antennae, and mandibles yellow-brown [testaceous] or reddish Type specimen may have darkened with age.

The male is currently unknown in this species.

DISCUSSION

S. msilanum is known from scattered localities throughout northern Africa. Label information (on the lectotype) indicates the single gyn was collected in May (1868?). Further details concerning the biology o this species are unknown.

Stenamma africanum was previously known only from scattered localities in Algeria, Tunisia, and Morocco. No biological information was published with the original description and only two isolated workers have been collected since.

SYNONYMY

Santschi described the variety *submuticum* from a single worker from Algeria (collected by Dr. Normand). He mentions the same locality for a specimen of *africanum— sensu stricto*; however, this specimen could not be located. Since I located all remaining specimens in NHMB, I suspect the above locality was a mistake in the original publication. No additional specimens have been collected and the variances between Santschi's forms are minimal. Contrary to his description, the thoracic sculpture is quite similar; the propodeal spines are somewhat shorter but are not outside of the supposed range of intraspecific variation. In a similar manner the single gyne of *S. msilanum* and *S. africanum* are quite similar in general appearance (including measurements). Given the scarcity of specimens known from northern Africa and the fact that the sole remaining species from this area is highly distinct, I believe that all three names represent the same species. Additional gynes and males discovered in association with workers may modify these conclusions. The name *msilanum* has priority.

LECTOTYPE DESIGNATION. Upon examining the sole type of this species, it became apparent that there was no indication that this was a type specimen. Therefore, I attached a red, partly handwritten label indicating *Stenamma msilanum* Forel LECTOTYPE. This specimen has been returned to the MHNG. The single specimen is in rather poor condition with the head glued separately on the card.

Only one gyne (of *S. africanum*) has been collected. It was collected without direct association of workers and differs slightly from the known workers in several characters (such a lack of the offset basal mandibular tooth and different sculpture on the basal portion of the gaster). Given that *S. msilanum* is known only from a gyne, I am reluctant to place the gyne as the lectotype of the synonymized *S. africanum*. However, I believe the type series (and type locality) should be restricted given the fact that Santschi treated both gyne and workers as cotypes. Therefore, I have designated a lectotype worker for this species *S. africanum*. The restricted locality is TUNISIA: Ain Draham. The specimen bears a red, partly handwritten label: *Stenamma africanum* LECTOTYPE and has been returned to NHMB.

COMPARISONS

Stenamma msilanum is most closely related to *S. westwoodii*, *S. debile*, and *S. punctiventre* based upon sculpture and petiolar morphology. Given the small sample size, it is most like *S. debile* in sculpture. It differs in the presence of small tubercles on the antenna (basal two segments of antennal club). *S. punctiventre* differs with its prominent bump as the anterior subpetiolar process.

Forel (1901) considered this species most closely related to *S. westwoodii* [*S. debile* based upon this revision] describing it as a new variety which differed in its color (noticeably darker), with a lower petiolar node and longer propodeal spines.

MATERIAL EXAMINED

ALGERIA: Oran Prov., Forêt de Msila (1 gyne — MHNG). Additional handwritten information on the label as follows: régâts surve mus au cours du voyage Alger, Genève V 68 [presumably May 1868]; Bône, Dr. Normand (1 worker — NHMB). MOROCCO: Moyen Atlas, 1660 m (1 worker — XEPC). TUNISIA: Ain Draham (LECTOTYPE worker) [actual label reads A. Draham] (1 worker — NHMB); Camp Santé [actual label reads T. C. de la Sante] (1 worker — NHMB); Camp Bugeaud [Santschi indicated 2 workers, only 1 found] (1 worker — NHMB); Cons Adekar (2 workers — NHMB); Col de Talmet [actual label reads C. Col. de Tapmetz] (1 gyne — NHMB) (all above specimens from Tunisia collected by Dr. Normand). (FRPC - 1 worker).

Stenamma striatulum Emery

Worker Figs. 59, 64, 81, 93, 290 - 295.
Gyne Figs. 296 - 298. Male Figs. 299 - 308.
Distribution Fig. 309.

Stenamma westwoodi var. *striatulum* Emery, 1895: 300. Worke Gyne — ITALY: Naples, in dry leaves, several small workers and 1 gyn 1894; 1 queen from Piedmont region collected by Herrn Gribodo; queen from Rome (MCSNG). [Not examined].

Stenamma striatula Emery; Müller, 1923: 46. [Raised to species].

Stenamma westwoodi tscherkessicum Arnol'di, 1928: 214, Figs. 5, 6 Gyne — U.S.S.R., North Coast of Black Sea, vicinity of Noworossijs [current spelling is Novorossiysk], in shaded woods, 28 August 1924 [This is located near Caucasus Mountains]. [Provisional synonymy b Arnol'di, 1975: 1822 - 1823]. [Not examined, curator indicates they ma be lost].

Stenamma striatula; Kutter, 1971: 259, 263 - 264, Figs. 1 - 6, 22, 25 27, 28, and 31. Worker, queen, male. [Provisional synonymy with S *westwoodi*, but still discussed as *S. striatula*].

WORKER

Measurements and associated statistics are listed in Appendix Tabl 9. Key statistics (measurement mean ± standard error of mean, n) ar listed herein: TL (3.37 ± 0.044, 28), HL (0.79 ± 0.010, 28), HW (0.68 0.010, 28), CI (86.35 ± 0.475, 28), SL (0.61 ± 0.005, 28), SI (89.91 0.724, 28), AL (1.01 ± 0.013, 28), PRW (0.46 ± 0.007, 28), PL (0.37 0.005, 28), PH (0.22 ± 0.003, 28).

Mandible with 9 teeth (apical 2 prominent); anterior clypeal margi in full face view with median lobe weakly emarginate (traces of severa carinulae extending on each side of emargination, between emargin ation center and a small carinula which is also present on each side o emargination); apex in lateral view convex to almost flat. Compound ey with 5 ommatidia in greatest diameter. Propodeal spines of moderat length, approximately ⅓ length of declivitous face of propodeum. Scap not surpassing occipital vertex by amount equal to length of firs funicular segment. Metanotal impression shallow, depth approxi mately ⅓ length of propodeal spines; wide, approximately 2X as wide a deep, depth decreasing towards anterior. A small pit present at th posterior ventral edge of the pronotum (near procoxae), not nearly a conspicuous as found in *S. debile* and *S. sardoum*. Propodeal plate approximately ⅓ to ½ as long as propodeal spines, directed posteriorl and slightly upward. Anterior subpetiolar process reduced to a smal bump. Petiole pedunculate; stalk approximately ½ length of petiol

original description with any illustrations of either worker or queer Emery does indicate that the female's total length is 3.5 mm and cite minor sculptural and size differences in describing the female.

As described for worker except as follows: mandible with 7 - 8 teeth anterior clypeal margin in full face view with median lobe emarginate apex in lateral view flat. Compound eye with approximately 18 - 2(ommatidia in greatest diameter. Propodeal spines large, approximatel ½ length of declivitous face of propodeum. Scape nearly reaching bu not exceeding occipital vertex. Metanotal impression absent due t thoracic modifications associated with flight. Propodeal plates directe posteriorly. Anterior subpostpetiolar process prominent; posterio subpostpetiolar process reduced. Head carinate (approaching rugos near occipital vertex), except as follows: frontal area smooth with smal carinulae (especially near clypeal emargination), carinulae divergin towards posterior; central ⅓ (actually greater than ⅓ of area) of fronta area (between antennal sockets) glassy-smooth; venter of head rugose Thoracic dorsum carinate with decided longitudinal orientation. Tho racic pleura glassy-smooth near center; carinate (almost rugose) nea edges. Neck of pronotum rugulose. Mesopleuron with smooth media area. Coxae weakly rugose (with transverse orientation); femur weakl carinate. Propodeal dorsum with weakly transversely carinate (almos glassy-smooth) declivitous face (always smooth near petiole). Petiola node dorsum rugose and punctulate; anterior and posterior surface and sides of node rugulose and punctulate; venter rugulose. Postpetiola node dorsum rugose and punctulate; remaining surfaces rugose. Firs gastral tergite base carinate with scattered small carinae divergin towards posterior (longest carinae located near midline of tergite abou 0.20 to 0.25 length of postpetiole). Setae on head moderately dens decumbent to appressed setae. Setae on scape appressed. Setae o alitrunk suberect to appressed. Setae of petiole, postpetiole, and gaste suberect. Setae of flexor surfaces of coxae and venter of petiole absent setae on remainder of legs decumbent to appressed. Entire body brown head and alitrunk dark brown [almost piceous]; appendages ligh brown [almost testaceous].

MALE

Kutter (1971) provided the first description of the male of *S. striatulum* This was based upon a single male discovered in the garden by Prof Schneider-Orelli in San Nazzaro [northern Italy?] in early October 1962. Kutter examined the original description of *S. westwoodii* and *S. striatulum* and discovered that the former was described from a mal with 5 mandibular teeth and males of the latter were unknown. Kutte then (incorrectly, I believe) provisionally synonymized *S. westwood*

node rising gradually. Anterior and posterior subpostpetiolar processes greatly reduced. Head rugose (most similar to the sculpture of *S. debile*) except as follows: frontal area smooth with small carinulae (especially near clypeal emargination), carinulae diverging towards posterior; central ⅓ (actually slightly less than ⅓ of area) of frontal area (between antennal sockets) glassy-smooth; center of head rugose. Interstices glassy-smooth throughout with scattered piligerous and non-piligerous punctures. Thoracic dorsum rugose (almost carinate) with decided longitudinal orientation. Thoracic pleura rugose (almost carinate) with decided longitudinal orientation. Neck of pronotum rugulose. Metanotal impression weakly scrobiculate. Mesopleuron with scrobiculate median area. Coxae rugose (with transverse orientation); femur weakly carinate; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with transversely carinate basal face and weakly longitudinally carinate (almost glassy-smooth) declivitous face. Alitrunk interstices glassy-smooth with scattered piligerous punctures. Petiolar node dorsum rugose; anterior and posterior surfaces of node rugose; side and venter rugulose. Postpetiolar node dorsum smooth with faint longitudinal rugae; anterior and posterior surfaces and side rugose; venter punctate. First gastral tergite base carinate with numerous carinae diverging towards posterior (longest carinae located near midline of tergite about ¼ to ⅓ length of postpetiole). First gastral sternite base predominantly glassy-smooth with small carinae which do not extend beyond juncture onto gaster. Remainder of gaster glassy-smooth (even at high magnifications), with scattered piligerous punctures. Setae on head moderately dense, suberect to appressed. Setae on scape decumbent to appressed. Setae on alitrunk and gaster erect to suberect setae. Setae on petiole and postpetiole appressed to suberect, setae on venter of postpetiole almost erect. Length of setae on alitrunk about 2X length of setae on head. Setae of flexor surfaces of coxae and venter of petiole absent, setae on remainder of legs suberect to appressed. Entire body concolorous brown [almost testaceous]; appendages testaceous. Setae yellow.

GYNE

Measurements and associated statistics are listed in Appendix Table 9. Key statistics are presented herein: TL (3.94 ± 0.079, 8), HL (0.81 ± 0.015, 9), HW (0.71 ± 0.015, 9), CI (88.37 ± 0.792, 9), SL (0.63 ± 0.011, 9), SI (87.68 ± 0.783, 9), AL (1.21 ± 0.024, 9), PRW (0.61 ± 0.012, 9), PL (0.43 ± 0.012, 9), PH (0.25 ± 0.005, 9).

Although Emery referred to both worker and queen (1895: 300) when he described this species (in a footnote), only a few queens could be located during the course of this study. Emery did not accompany his

striatulum based upon this single character. He noted that workers, queens, and males had never been discovered in the same nest for *S. striatulum*. Kutter (1971) listed the following features (description) for males of this species in his brief key to Swiss *Stenamma*:

> "Length 3.2 mm. Petiole length 0.37 mm. Mandible triangular with 5 teeth on the side. [Propodeal] dorsum with transverse sculpturing. Spur on mid- and hind-tibia indistinct." (Kutter, 1971: 264. Translation by this author).

Since I recently encountered additional males of this species (through the generosity of Mr. Andreas Shultz), I offer the following description.

Measurements and associated statistics are listed in Table 9. Key statistics are listed herein: TL (3.30 ± 0.038, 3), HL (0.57 ± 0.005, 3), HW (0.47 ± 0.005, 3), CI (82.74 ± 1.541, 3), SL (0.18 ± 0.009, 3), SI (37.31 ± 2.184, 3), AL (1.13 ± 0.016, 3), PRW (0.62 ± 0.005, 3), PL (0.35 ± 0.000, 3), PH (0.21 ± 0.003, 3).

As described for worker except as follows: mandible with 5 teeth (apical tooth prominent); anterior clypeal margin in full face view with median lobe convex (lacking traces of carinulae on each side of emargination); apex in lateral view convex. Compound eye with greater than 30 ommatidia in greatest diameter. Propodeal spines reduced to prominent bumps, approximately ¼ length of declivitous face of propodeum. Scape not reaching occipital vertex [not even reaching level of anterior ocellus]. Metanotal impression obscured by thoracic modifications associated with flight. A small micro-setae lined pit present at the posterior ventral edge of the pronotum (near procoxae), not nearly as conspicuous as found in workers of this species. Pit between meso- and meta-coxae also reduced. Propodeal plates approximately 1.5 times as long as propodeal spines, directed posteriorly. Anterior subpetiolar process absent (or greatly reduced). Petiole pedunculate; stalk less than ½ length of petiole, node rising gradually from thickening stalk. Anterior and posterior subpostpetiolar processes greatly reduced to small bumps. Head densely punctulate with traces of longitudinal carinae except as follows: frontal area densely punctulate, venter of head rugose. Interstices densely punctulate throughout (approaching glassy-smooth on venter) with scattered piligerous punctures. Thoracic dorsum longitudinally carinate. Thoracic pleura glassy-smooth. Neck of pronotum densely punctulate. Mesopleuron with scrobiculate median area. Coxae weakly longitudinally carinate; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with densely punctulate basal face and transversely carinate declivitous face (area between propodeal bumps transversely carinate as well). Alitrunk interstices densely punctulate (particularly near dorsal mid-line), be-

coming glassy-smooth on sides with scattered piligerous punctures Petiolar node dorsum glassy-smooth with faint traces of rugae; remain ing surfaces rugose with numerous small punctures. Postpetiolar nod dorsum smooth with faint traces of rugae; remaining surfaces rugose First gastral tergite base glassy-smooth. First gastral sternite base witl carinae diverging towards posterior (longest carinae located nea midline of tergite, not exceeding ¼ length of postpetiole). Setae on hea moderately dense suberect to decumbent setae. Setae on clypea margin erect to suberect. Setae on scape and mandible decumbent t appressed. Setae on dorsum and side of alitrunk erect to decumbent Setae on legs suberect to appressed. Setae on petiole and postpetiol dorsa suberect. Setae on venter of petiole absent. Setae on postpetiola venter suberect. Setae on gaster erect to suberect. Setae of flexo surfaces of coxae and femora absent. Entire body piceous except petiol and postpetiole which are dark brown. Appendages (legs, mandibles antenna) testaceous. Wings gray brown [almost infuscate], compoun eyes gray. Setae white.

DISCUSSION

S. striatulum is known from scattered localities across Europ (including western Russia). Further information regarding the biolog of this species is not known.

Arnol'di (1928) described a separate variety (*S. westwoodii* var *tscherkessicum*) and later (1975) placed this variety as a synonym of *S striatulum*. Although I was unable to examine the type of Arnol'di's variety, nor additional material from the Black Sea region which fi Arnol'di's description, I accept his provisional synonymy of *S. westwoodi tscherkessicum* with *S. striatulum*. There are minor differences betwee his description of *S. tscherkessicum* and specimens of *S. striatulum* have examined. Specifically, Arnol'di described specimens as having a scape which does not reach the occipital vertex. The specimens I hav examined from Italy have the scape reaching or surpassing the occipita vertex. Arnol'di described a keel-shaped rugae extending from each spine and stretching across the basal face of the propodeum. Th specimens I examined do not show this character. Arnol'di described the petiole as short with a long node. The specimens I examined hav a petiolar node which is approximately ½ the length of the petiole. Furthermore, Arnol'di described the petiolar node as almost triangular in profile. I did not find this to be the case in the specimens I examined. Finally, the total length of the specimens Arnol'di examined is signifi cantly less than the total length of the specimens I examined (3.2 mm maximum vs. 3.7 mm minimum for specimens from Italy). Either w were looking at characters which are different at either end of this

species' range [clinal variation], or there is an additional species present along the Black Sea coast. This question can be better answered by someone with access to that region who can collect additional specimens.

COMPARISONS

Stenamma striatulum might be confused with the following species which inhabit portions of its range: *S. lippulum*, *S. georgii*, and *S. debile*.

S. lippulum resembles *S. striatulum* particularly in the decided longitudinal orientation of its thoracic sculpture. However, *S. striatulum* has more longitudinal and close set carinae near the midline of the head in full face view. This area is more rugose with the wrinkles not so close set in *S. lippulum*. Additionally, *S. lippulum* rugae form concentric loops above the eyes in the area of the occipital vertex. *S. lippulum* has a more prominent petiolar bump. On average, *S. striatulum* has longer propodeal spines and the longitudinal sculpture of the dorsum and side of the thorax are more closely spaced. The thoracic sculpture of *S. lippulum* is more rugose while that of the latter is more carinate.

S. georgii (which is quite similar to *S. lippulum*) is also similar to *S. striatulum*. The above discussion of differences between the latter two species applies to *S. georgii* as well. The sculpture of *S. georgii* is actually more rugose than that of *S. lippulum*. Additionally, the metanotal impression is wider in *S. striatulum* than in *S. georgii*.

S. debile occurs in much the same range as *S. striatulum* across southern Europe and differs from *S. striatulum* in that the former has more rugose thoracic dorsal sculpture. Additionally, the head sculpture is more rugose. On occasional specimens, the head sculpture and thoracic sculpture of *S. debile* approaches carinate. However, it always remains much coarser than that of *S. striatulum* and is not as closely set. Emery (1895) mentioned that this species is closest to *S. westwoodi* [*S. westwoodii* and *S. debile* in this revision] based upon surface sculpturing and shape of both petiole and postpetiole. Emery originally considered this taxon a subspecies of *S. westwoodii*. Given that they share the same range and have presumably similar habits, these species are either synonyms or valid distinct species. I believe the latter is the case.

MATERIAL EXAMINED

NOTE: Five localities could not be located on any map and labels provided no further clues as to specific country. These are listed first. Boncinio (4 workers, 1 queen — ISNB); Gabrovizza (1 worker — MCZ); Moldaere val Berlad (2 workers — ZMHB); Pence Gol (1 worker — MCZ); Pola, Lianor, Mialur (4 workers — MCZ). ITALY: Capidomonte (2 workers

— MCSN); Cherso, Ravasini (1 queen dealate — MCZ); Istria Rossa (worker — MCZ); Lazio (Mte. Cimino) (1 worker — MCZ); Lipizzo Stac (1 queen dealate — MCZ); Naples (1 worker — MHNG); Selvadi (Pivr (1 worker — MCZ); Vallo. Lucania, Solari (2 workers — MCSNG). SPAIN La Castanya, Montseny (2 workers, 1 queen — XEPC). SWITZERLANI Yvorne (4 workers — MHNG). TURKEY: Trabson, Esiroglu (2 workers 1 queen — ASPC). FORMER YUGOSLAVIA: Crecventia bei Rijek (males — ASPC).

Stenamma lippulum (Nylander)

Worker Figs. 54, 66, 76, 88, 170 - 177. Gyne Figs. 178 - 182.
Worker (*S. hirtulum*) Lectotype Figs. 184 - 186.
Distribution Fig. 183.

Myrmica lippula Nylander, 1849: 41. Worker — Southern Russia (Lectotype worker-UZMH) [examined].

Stenamma westwoodi var. *hirtula* Emery, 1898: 135. Worker – Russia, Lenkoran (Lectotype worker-MCSN) [examined]. [Synonymy b DuBois, 1993: 321].

Stenamma caucasicum Arnol'di, 1975: 1823, Fig.. Worker, Gyne – U.S.S.R.: Russian S.F.S.R.: Caucasus, KrasnayaPolyana, VIII-1933 (K V. Arnol'di). (Lectotype worker, 11 paratype workers, 1 allotype gyne ZMUM) [examined]. [Synonymy by DuBois, 1993: 321].

Stenamma lippulum; DuBois, 1993: 321 - 330, figs. 49 - 70. Worker gyne.

WORKER

As described for *S. westwoodii* except as follows.

Measurements and associated statistics are presented in Appendi Table 10. Key statistics (measurement mean ± standard error of mean n) are listed herein: TL (3.79 ± 0.019, 85), HL (0.87 ± 0.004, 85), HW (0.75 ± 0.004, 85), CI (85.57 ± 0.273, 85), SL (0.65 ± 0.003, 85), SI (86.9 ± 0.316, 85), AL (1.16 ± 0.007, 88), PRW (0.52 ± 0.003, 88), PL (0.40 ± 0.003, 88), PH (0.23 ± 0.002, 88).

"LECTOTYPE WORKER (*S. lippulum*). TL 3.56, HL 0.82, HW 0.72, C 88, SL 0.61, SI 84, AL 1.03, PRW 0.48, PL 0.40, PH 0.22.

"LECTOTYPE WORKER (*S. hirtulum*). TL 3.88, HL 0.90, HW 0.74, C 82, SL 0.72, SI 97, AL 1.18, PRW 0.50, PL 0.40, PH 0.23.

"LECTOTYPE WORKER (*S. caucasicum*). TL 3.69, HL 0.85, HW 0.74 CI 87, SL 0.61, SI 83, AL 1.18, PRW 0.52, PL 0.35, PH 0.23.

"Mandible with 7-8 teeth, rarely 10; anterior clypeal margin with apex convex in lateral view with a small concavity (near mandible). Propodeal spines of moderate length, ap-

proximately ½ length of declivitous face of propodeum (shorter in some specimens). (Arnol'di described these as short.) Scape not reaching occipital vertex. (Arnol'di indicated it did not reach by 1.5 X its diameter). Metanotal impression shallow, wide, depth approximately a length of propodeal spines; approximately 3 X as wide as deep, depth decreasing towards anterior. Posterior ventral edge of the pronotum (near procoxae) with large pit lined with microsetae. Propodeal plates approximately same length as, or slightly shorter than, propodeal spines, directed posteriorly. Anterior subpetiolar process usually a prominent bump. Anterior subpostpetiolar process a prominent bump, posterior subpostpetiolar process reduced. Head (most similar to the sculpture of *S. westwoodi* and *S. debile*) except as follows: frontal area smooth with small carinulae (especially near clypeal margin), carinulae diverging towards posterior; slightly less than a distance (between antennal sockets) glassy-smooth; venter of head rugose (almost scabrous); occipital area with anastomosing rugae usually forming concentric loops. (Arnol'di described these as loop-like rugae). Thoracic dorsum rugose (almost carinate) decidedly longitudinal (similar to *S. striatulum*). Humeral angles almost smooth and devoid of sculpture. Thoracic pleura rugose (almost forming network near center) decidedly longitudinal. Propodeal side and pronotal side with longitudinal carinae. Mesopleuron with weakly scrobiculate median area. Coxa mostly smooth (or with weak transverse carinae); femur with faint longitudinal carinae; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with transversely carinate basal face and glassy-smooth declivitous face (with faint longitudinal carinae in some specimens). Petiolar node dorsum faintly rugose; anterior and posterior surfaces rugose. Postpetiolar node dorsum smooth with faint rugae; anterior and posterior surfaces rugose (almost scabrous); side and venter rugulose. First gastral tergite with base carinate with numerous carinae diverging towards posterior (longest carina located near midline of tergite, ¼ to a length of postpetiole). First gastral sternite with base predominantly glassy-smooth with small carinae which do not extend beyond juncture onto gaster. Setae on head moderately dense suberect to decumbent (almost appressed), erect setae on clypeus. Setae on scape decumbent to subdecumbent (on funiculus decumbent to

appressed). Setae of petiole appressed on dorsum of stalk, erect to suberect on node. Setae of postpetiole erect to appressed; setae on venter erect. Head, alitrunk, petiole, and postpetiole ferrugineous, gaster and appendages testaceous." DuBois (1993: 322 - 323).

GYNE

Measurements and associated statistics are presented in Appendi Table 10. Key statistics are presented herein: TL (4.63 ± 0.198, 3), H (0.94 ± 0.22, 3), HW (0.82 ± 0.019, 3), CI (87.69 ± 0.624, 3), SL (0.71 0.016, 3), SI (86.29 ± 1.003, 3), AL (1.43 ± 0.077, 3), PRW (0.74 ± 0.04 3), PL (0.50 ± 0.005, 3), PH (0.28 ± 0.023, 3).

"As described for worker except as follows: mandible with 6-7 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe weakly emarginate; apex in lateral view flat to slightly concave. Compound eye with 15-18 ommatidia in greatest diameter. Propodeal spines of moderate length, approximately a length of declivitous face of propodeum. Scape almost reaching occipital vertex (missing by amount less than length of first funicular segment). Petiole pedunculate; stalk slightly less than ½ length of petiole. Thoracic dorsum longitudinally carinate (similar to *S. striatulum*). Thoracic pleura glassy smooth near center, longitudinally carinate towards either end. Neck of pronotum punctulate. Mesopleuron with scrobiculate median area. Coxae transversely carinate. Petiolar node dorsum rugose; anterior and posterior surfaces rugose. Postpetiolar node dorsum glassy-smooth; remaining surfaces rugose. First gastral tergite with base carinate with numerous carinae diverging towards posterior (longest carina located near midline of tergite, 0.20 to 0.25 length of postpetiole)." DuBois (1993: 323).

"MALE. Arnol'di (1975: 1826) briefly described the male of this species (which he called *S. hirtulum*). To the best of my knowledge, this description was based upon specimens Arnol'di examined from Russia. I do not believe he consulted the type worker for comparison. Since this description is in Russian and I was unable to locate any specimens (in ZMUM or elsewhere), I provide the following translation.

'Scape is narrow, slightly bent at the base, with long setae as in worker. Eyes are bulging and equal in size to the temples. Propodeum is typical. Main surface is depressed. Slanted surface is slightly concave. Both surfaces are covered

with net-like pattern of rugae and [are] shining.' (Arnol'di, 1975: 1826. Translation by S. Goldgof).

"Wing venation is unknown in this species (only 3 gynes have been collected to date, all were dealate). The male described by Arnol'di (as *S. hirtulum*) could not be located. Details concerning mating flights are also unknown." DuBois (1993: 324 - 325).

COMPARISONS

Stenamma lippulum might be confused with *S. georgii*, *S. striatulum*, and *S. debile* as all species may occur in the Caucasus Mountains.

"*S. georgii* seems to be most closely related to *S. lippulum*. Both species have similar longitudinal carinae on their thoracic dorsa and sides (reminiscent of *S. striatulum*). *S. georgii* has more prominent longitudinal carinae on the thoracic sides, particularly the pronotal humeri. The mesopleural medial area in *S. georgii* is smoother, while the same area in *S. lippulum* is more punctate. *S. lippulum* has more setae (greater density) on the thoracic dorsum and on both petiolar and postpetiolar node dorsa. The metanotal impression in *S. georgii* is shallower and not as wide as in *S. lippulum*. Additionally, the postpetiolar node dorsal profile (when viewed from the rear) is flatter in *S. lippulum*. It should be noted that Arnol'di (1975: 1824) indicated that *S. georgii* might be considered a subspecies of *S. lippulum* (=*S. caucasicum* Arnol'di)." DuBois (1993: 329).

S. striatulum "is more similar to *S. lippulum* [of the wider ranging species of *Stenamma*]. Carinae located near the midline on the head of *S. striatulum* are more close-set in *S. striatulum* with separating troughs the same size or smaller than the ridges. This is also true of the longitudinal carinae on the dorsum and sides of the thorax. *S. lippulum* has a more prominent anterior petiolar process while *S. striatulum* specimens have longer propodeal spines [on average]." DuBois (1993: 330).

"The final species which might be encountered in the vicinity is *S. debile* (=*S. westwoodi* of Arnol'di). Most often, the head and thoracic sculpture of *S. debile* consists of more anastomosing rugae rather than longitudinal carinae. However, some specimens of *S. debile* exhibit longitudinal tendencies in their rugae (although the rugae still exhibit some wavyness). The anterior petiolar process is extremely reduced in *S. debile* and the basal face of the propodeum usually lacks

transverse ridges (ridges are also usually lacking between the spines). The metanotal impression of *S. debile* is usually deeper than than of *S. lippulum*." DuBois (1993: 330).

MATERIAL EXAMINED

"AZERBAIJAN: Lenkoran (1 worker — MCSN); Nagorno-Karabakh A. O., Alazatin, 800-1000 m, Talyshskiye Gory [28 km SW from Lenkoran], K. V. Arnol'di (19 workers — ZMUM); Talyshskiye Gory, Nyudis-galasi Mountain [31 km SW from Lenkoran], K. V. Arnol'di (1 worker — ZMUM). GEORGIA: Daba [in Georgian-most probably Dgvaba], T. I. Zhizhilashvili (1 worker, 1 gyne — ZMUM); Dmanisi 616, Georgia, T. I. Zhizhilashvili (1 worker — ZMUM); 117 Tsagveri, T. I. Zhizhilashvili (1 worker — ZMUM). RUSSIA: Krasnodar Kray, Tchab Mountain, Kotsegur Mountain Range, Krasnodarskiy Kray [72 km SW from Krasnodar], K. V. Arnol'di (2 workers — ZMUM); Krasnoyarsk Kray, Krasnaya Polyana, NW Caucasus, Beshenki, K. V. Arnol'di (61 workers, 2 gynes — ZMUM). [Above labels in Russian and Georgian were translated by A. Antropov]." DuBois (1993: 330).

Stenamma georgii Arnol'di

Worker Figs. 4 - 9, 55, 62, 77, 89, 111 - 119.

Gyne Figs. 120 - 124. Distribution Fig. 125.

Stenamma georgii Arnol'di, 1975: 1823 - 1824, fig. Worker, Gyne - U.S.S.R.: Black Sea shore in Caucasus, Tuapse, Georgy Woods, V-VI 1954 (K. Arnol'di). (ZMUM) [examined].

WORKER

Measurements and associated statistics as presented in Appendi Table 11. Key statistics (measurement mean ± standard error of mean n) are included herein: TL (3.68 ± 0.040, 17), HL (0.86 ± 0.008, 18), HV (0.73 ± 0.008, 18), CI (85.48 ± 0.604, 18), SL (0.65 ± 0.006, 18), SI (89.0 ± 0.629, 18), AL (1.13 ± 0.014, 18), PRW (0.49 ± 0.006, 18), PL (0.40 0.006, 18), PH (0.22 ± 0.003, 18).

LECTOTYPE. TL 3.82, HL 0.89, HW 0.74, EL 0.08, SL 0.66, CI 84, S 89, AL 1.19, PRW 0.50, PL 0.42, PH 0.21.

Mandible with 7 - 10 teeth (apical 2 prominent); anterior clypea margin in full face view with median lobe emarginate (with two smal carinulae extending on each side of emargination); apex in lateral viev convex to nearly flat. Compound eye with 3 - 4 ommatidia in greates diameter. Scape reaching or almost surpassing occipital vertex (differ ence less than length of first funicular segment). Propodeal spine varying, of moderate length, most approximately ⅓ to ¼ of less lengtl

of declivitous face of propodeum. Metanotal impression shallow, depth approximately ⅓ length of propodeal spines; wide, slightly over 3X as wide as deep, becoming more shallow towards anterior. A large pit at the posterior ventral edge of the pronotum (near procoxae) is lined with microsetae. This pit is unusually large for *Stenamma* workers. Propodeal plates approximately same length as (or slightly longer than) propodeal spines, directed posteriorly and slightly upward. Anterior subpetiolar process reduced to a small bump. Petiole pedunculate; stalk slightly less than ½ length of petiole, node rising gradually. Anterior subpostpetiolar process usually reduced to a small bump (more prominent in some specimens), posterior subpostpetiolar process reduced. Head rugose (most similar to the sculpture of *S. lippulum*) except as follows: frontal area smooth with small carinulae (especially near clypeal emargination), carinulae diverging towards posterior; central ⅓ (or slightly less than ⅓ of area) of frontal area (between antennal insertions) glassy-smooth; venter of head almost scabrous near midline; occipital area with rugae not forming concentric loops as in *S. lippulum*. In a few specimens, there is a strong pair of carinae extending from the mid-line frontal area to the occipital border. Interstices glassy-smooth throughout with scattered piligerous and non-piligerous punctures. A few specimens with numerous non-piligerous punctures, leading to a granular appearance. Thoracic dorsum carinate (almost rugose) with decided longitudinal orientation (similar to *S. striatulum*). Thoracic pleura carinate (or slightly rugose) with decided longitudinal orientation. Carinae with longitudinal orientation on propodeal side and side of pronotum. Neck of pronotum rugulose to punctulate. Metanotal impression scrobiculate to weakly scrobiculate with ridges blending with surrounding sculpture. Mesopleuron with scrobiculate median area (ridges blending with surrounding sculpture). Coxae mostly smooth with piligerous punctures except procoxae which are transversely carinate; femur with faint longitudinal carinae; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with transversely carinate basal face and glassy-smooth declivitous face. Alitrunk interstices glassy-smooth with scattered piligerous punctures. Petiolar node dorsum smooth or with traces of longitudinal carinae; remainder rugose, becoming rugulose towards venter. Postpetiolar node dorsum smooth with traces of longitudinal carinae; side rugose, venter rugulose. First gastral tergite base with numerous carinae diverging towards posterior (longest carinae located near midline of tergite); length of longest carinae 0.20 to 0.25 length of postpetiole. First gastral sternite base predominantly glassy-smooth with no trace of carinae. Remainder of gaster glassy-smooth (even at

high magnifications), with scattered piligerous punctures. Setae o head moderately dense, decumbent to appressed, setae on clypeu erect, setae on scape suberect to appressed, setae on funiculu decumbent to appressed. Setae on alitrunk, petiole and postpetio suberect to decumbent (some scattered erect setae on alitrunk do sum). Setae on flexor surfaces of coxae absent. Setae on remainder legs suberect to appressed. Setae on gaster erect to suberect. Most body concolorous brown, appendages yellow brown. Setae yellow.

GYNE

Measurements as listed in Appendix Table 11 for the single gyn examined.

As described for worker except as follows: mandible with 9 teet (apical 2 prominent, gap between apical 2 teeth and remaining denticl almost equal in size to length of second apical tooth); anterior clypea margin in full face view with median lobe emarginate; apex in latera view convex (becoming concave near mandible). Compound eye with 2 ommatidia in greatest diameter. Scape almost reaching occiput (miss ing by amount less than length of second funicular segment). Propodea spines of moderate length, approximately ⅓ length of declivitous fac of propodeum. Metanotal impression obscured by thoracic modifica tions associated with flight. Anterior subpetiolar process reduced to small bump (obscured by glue in the single specimen examined). Petiol pedunculate; stalk slightly less than ½ length of petiole. Thoraci dorsum longitudinally carinate (similar to S. striatula). Thoracic pleur glassy-smooth near center, longitudinally carinate towards dorsun Neck of pronotum rugulose (almost punctulate). Mesopleuron wit scrobiculate median area. Coxae transversely carinate. Petiolar nod dorsum weakly scabrous, posterior surface of node scabrous; dorsu of stalk punctulate. Postpetiolar node dorsum glassy-smooth; side scabrous, venter punctulate. First gastral tergite base carinate wit numerous carinae diverging towards posterior (longest carinae locate near midline of tergite, longest carinae located near midline of tergit length of longest carinae 0.20 to 0.25 length of postpetiole). First gastra sternite base glassy-smooth with no trace of carinae. Color dark brow (almost piceous), gaster yellow brown.

The male is currently unknown in this species.

DISCUSSION

Arnol'di (1975) provided the following comments regarding thi species:

> "The species *S. georgii* inhabits Black Sea shore in Caucasus, Tuapse, Georgy Woods, V-VI, 1954 (K. Arnol'di),

type worker, 10 paratypes and allotype queen. Male is not known. It is possible that 3 workers from Hot Key, Krasnodar Region belong to this species, IV 1952 (K. Arnol'di). This species is very similar to *S. caucasicum*. It could even be classified as a subspecies. It often inhabits chestnuts of the sea shore zones." (Arnol'di, 1975: 1824. Translation by S. Goldgof).

LECTOTYPE DESIGNATION

After examining the type series of *S. georgii*, I noted that no specimen is clearly designated holotype or "type." Additionally, there are several collections from near Tuapse (or 15 km ENE Tuapse) with several dates of collection all mixed together with the type series. Unfortunately, Arnol'di did not indicate separate measurements for the holotype. In order to reduce possible future confusion, I designated one worker as lectotype and included a red, partly handwritten label (*Stenamma georgii* LECTOTYPE (top)) as this is the top specimen on a pin. It is a fairly typical specimen. Although there is some dirt on the specimen, it is covered by much less glue than on the remaining specimens and is less damaged.

COMPARISONS

This species might be confused with *S. lippulum*, *S. striatulum*, and *S. debile* as all species may occur in the Caucasus'. *S. georgii* seems to be most closely related to *S. lippulum*. Both species have similar longitudinal carinae on their thoracic dorsum and sides (like *S. striatulum*). *S. georgii* has more prominent longitudinal carinae on the thoracic sides, particularly the pronotal humeri. The mesopleural medial area in *S. georgii* is smoother, while the same area in *S. lippulum* is more punctate. *S. lippulum* has more setae (which are more dense) on the thoracic dorsum and on the petiolar and postpetiolar node dorsa. The metanotal impression in *S. georgii* is shallower and not as wide as in *S. lippulum*. Additionally, the postpetiolar node dorsal profile (when viewed from the rear) is flatter in *S. lippulum*.

Comparisons with remaining species are discussed further under *S. lippulum*. Characters listed for *S. lippulum* also apply to *S. georgii*, except for the differences listed above.

MATERIAL EXAMINED

GEORGIA: 299, T. I. Zhizhilashvili (1 worker — ZMUM); Tsagveri (in Georgian) 17 VI 1964, (1 worker — ZMUM); Tsagveri, 17 VI 1964, T. I. Zhizhilashvili (4 workers — ZMUM). RUSSIA: Goryachiy Klyuch Cuban', 7.4.52, K. V. Arnol'di (3 workers — ZMUM); Blanket, Georgievskoe forestry, 24 block, Tuapsinskiy region, 15 km ENE from Tuapse,

Caucasus, 19 V 1954, K. V. Arnol'di (ZMUM); Blanket of chestnut fores Georgievskoe forestry, 24 block, Tuapsinskiy region, 15 km ENE fro Tuapse, Caucasus, 21 V 1954, K. V. Arnol'di (ZMUM); Chestnut fores Georgievskoe forestry, 24 block, Tuapsinskiy region, 15 km ENE fro Tuapse, Caucasus, 6 V 1954, 21 V 1954, K. V. Arnol'di (ZMUM Cossach'ya shel', Georgievskoe forestry, 71 block, chestnut fores Tuapsinskiy region, 15 km ENE from Tuapse, Caucasus, 7 V 1954, K V. Arnol'di (11 workers — ZMUM); Tuapsinskoe forestry, young ches nut forest, Kurcheva, near Tuapse, 12 V 1954 (1 gyne — ZMUM). [Abo labels in Russian and Georgian were translated by A.Antropov].

Stenamma hissarianum Arnol'di

Worker Figs. 18, 19, 56, 67, 78, 90, 131 - 135.
Gyne Figs. 136 - 140. Male Figs. 141 - 146.
Distribution Fig. 147.

Stenamma hissarianum Arnol'di, 1975: 1824, Fig.. Worker, Gyn Male — USSR: Tagikistan, Karateginsky Mountain Range, Ramit, V. Yanushev. (ZMUM) [Examined].

WORKER

Measurements and associated statistics as listed in Appendix Tab 12. Key statistics (measurement mean ± standard error of mean, n) a listed herein: TL (3.44 ± 0.034, 18), HL (0.80 ± 0.008, 18), HW (0.67 0.006, 18), CI (84.63 ± 0.460, 18), SL (0.61 ± 0.009, 18), SI (90.41 0.841, 18), AL (1.03 ± 0.011, 18), PRW (0.46 ± 0.005, 18), PL (0.36 0.007, 18), PH (0.21 ± 0.003, 17).

LECTOTYPE WORKER. TL 3.35, HL 0.77, HW 0.66, EL 0.11, SL 0.5 CI 85, SI 88, AL 0.98, PRW 0.47, PL 0.37, PH 0.21.

Mandible with 8 - 9 teeth (apical 2 prominent); anterior clype margin in full face view with median lobe emarginate (with single cari extending on each side of emargination); apex in lateral view convex, fl near mandible. Compound eye with 5 - 6 ommatidia in greate diameter. Scape not reaching occiput (by amount greater than or equ to length of first funicular segment). Scape bent slightly at base [Arnol'di described]. Propodeal spines short, approximately 0.20-0.2 length of declivitous face of propodeum. Metanotal impression shallo depth approximately equal to length of propodeal spines; wide, approx mately 3X as wide as deep, depth decreasing towards anterior. A lar pit is present at the posterior ventral edge of the pronotum (ne procoxae) and is lined with microsetae. Propodeal plates approximate 2X length of propodeal spines, directed posteriorly and slightly upwar Anterior subpetiolar process reduced to a small bump. Petiole pedu culate; stalk approximately ½ length of petiole, node rising graduall

Anterior subpostpetiolar process reduced, but still a moderate bump. Posterior subpostpetiolar process reduced. Head rugose (most similar to the sculpture of *S. westwoodii* and *S. debile*) except as follows: frontal area smooth with small carinulae (especially near clypeal emargination), carinulae diverging towards posterior; central ⅓ (actually slightly less than ⅓ of area) of frontal area (between antennal sockets) glassy-smooth; venter of head rugose (almost scabrous near midline). Interstices glassy-smooth with scattered piligerous and non-piligerous punctures. Thoracic dorsum rugose (almost scabrous) with decided longitudinal orientation. Thoracic pleura rugose with decided longitudinal orientation. Propodeal side and side of pronotum carinate with carinae having longitudinal orientation. Neck of pronotum punctulate at anterior edge, becoming rugulose towards alitrunk. Metanotal impression scrobiculate. Mesopleuron with scrobiculate median area. Coxae mostly smooth (procoxae with weak transverse carinae, meso- and metacoxae smooth); femur with faint longitudinal carinae; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with transversely carinate basal face (including area between spines) and weakly transversely carinate declivitous face (a few specimens have this area glassy-smooth). Alitrunk interstices glassy-smooth with scattered piligerous and non-piligerous punctures. Petiolar node dorsum faintly rugose; anterior and posterior surfaces of node and side rugulose; dorsum of stalk and venter rugulose. Postpetiolar node dorsum faintly rugose; anterior and posterior surfaces and side rugulose (becoming punctate towards venter); venter rugulose. First gastral tergite base carinate with numerous carinae diverging towards posterior (longest carinae located near midline of tergite, greatest length 0.20 to 0.25 length of postpetiole). First gastral sternite base predominantly glassy-smooth with small carinae which do not extend onto gaster. Remainder of gaster glassy-smooth (even at high magnifications), with scattered piligerous punctures. Setae on head moderately dense, decumbent to appressed (erect on anterior clypeal margin). Setae on mandible, scape, and funiculus decumbent to appressed. Setae on alitrunk mostly suberect. Setae on legs decumbent to appressed. Setae on petiole appressed on anterior surface of node, setae absent from dorsum and venter, setae suberect on posterior surface and side. Setae on postpetiole suberect to decumbent on anterior surface, dorsum, posterior surface, and side, erect to suberect on venter. Setae on gaster suberect to decumbent. Entire body concolorous yellow brown (alitrunk slightly darker in some specimens), appendages slightly lighter. Compound eyes black. Setae yellow.

GYNE

Measurements and associated statistics as presented in Append Table 12. Key statistics are presented herein: TL (4.05 ± 0.217, 2), F (0.83 ± 0.008, 2), HW (0.73 ± 0.008, 2), CI (88.35 ± 0.113, 2), SL (0.6 ± 0.024, 2), SI (86.79 ± 2.343, 2), AL (1.19 ± 0.113, 2), PRW (0.63 ± 0.01 2), PL (0.44 ± 0.008, 2), PH (0.27 ± 0.008, 2).

As described for worker except as follows: mandible with 7 - 9 teet (apical 2 prominent); anterior clypeal margin in full face view wit median lobe emarginate (with one prominent carina and one wea carina on each side of emargination); apex in lateral view convex to fl (near mandible). Compound eye with 15 - 17 ommatidia in greate diameter. Scape reaching but not exceeding occipital vertex (by amou less than length of second funicular segment). Propodeal spines moderate length, approximately ⅓ - ¼ length of declivitous face propodeum. Metanotal impression obscured by thoracic modificatio associated with flight. Propodeal plates almost as long as propode spines. Pit at base of procoxae not as prominent as in worker or in gyn of other species of *Stenamma*. Anterior subpetiolar process reduced a small bump. Petiole pedunculate; stalk less than ½ length of petiol thick, node rising gradually. Anterior and posterior subpostpetiol processes are obscured by glue on one gyne and postpetiole is missi on the other. Thoracic pleura carinate, almost rugose, with decid longitudinal orientation. Neck of pronotum punctulate. Mesopleuro with weakly scrobiculate median area. Propodeal dorsum with fai traces of transverse carinae between spines, declivitous face glass smooth. Petiolar node dorsum rugulose, leading to a foveolate appea ance; anterior and posterior surfaces of node and side rugose; vent rugulose. Postpetiolar node dorsum faintly rugose; side rugose; vent obscured by glue. First gastral tergite base carinate with numero carinae diverging towards posterior (longest carinae located nea midline of tergite, length 0.20 to 0.25 length of postpetiole). First gastr sternite base obscured by glue [presumably similar to worker]. Col similar to worker, but darker brown throughout.

MALE

Measurements as listed in Appendix Table 12 for the sole mal examined.

As described for worker except as follows: mandible with 3 teet anterior clypeal margin in full face view with median lobe evenly conv (with a slight emargination with no trace of carinae on either side emargination); apex in lateral view convex. Compound eye with 2 ommatidia in greatest diameter. Scape not reaching occipital vert (does not reach level of anterior ocellus). Propodeal spines reduced

small bumps. Metanotal impression obscured by thoracic modifications associated with flight. Pit at base of procoxae not as prominent as in worker or in males of other species of *Stenamma*. Anterior subpetiolar process reduced to a small bump. Petiole pedunculate; stalk slightly less than ½ length of petiole, node rising gradually. Anterior and posterior subpostpetiolar processes are reduced to small bumps. Head densely punctulate, punctures forming concentric loops; occipital vertex densely punctulate; frontal area (between antennal sockets, actually central ½ of area) glassy-smooth. Thoracic dorsum longitudinally carinate (reminiscent of *S. striatulum*). Thoracic pleura longitudinally carinate near dorsum, becoming glassy-smooth towards venter. Neck of pronotum punctulate. Mesopleuron with scrobiculate median area. Propodeal dorsum with faint trace of transverse carinae on basal face and between spines, declivitous face glassy-smooth. Coxae longitudinally carinate. Petiolar node dorsum glassy-smooth; remaining surfaces punctulate. Postpetiolar node dorsum glassy-smooth; remaining surfaces punctulate. First gastral tergite base carinate with numerous carinae diverging towards posterior (longest carina located near midline of tergite, length less than 0.20 length of postpetiole). First gastral sternite base with small carinae not extending onto gaster. Setae on head decumbent to appressed (except setae on anterior clypeal margin erect); setae on scape, funiculus, and mandible decumbent to appressed. Setae on alitrunk suberect to decumbent. Setae on legs decumbent to appressed. Setae on petiole appressed on anterior surface of node, suberect on dorsum of node and posterior surface, absent elsewhere. Setae on postpetiole decumbent to appressed on anterior surface, absent from dorsum of node, erect to suberect on posterior surface and venter. Setae on gaster mostly suberect. Body concolorous piceous brown; appendages yellow. Wings clear, veins yellow brown. Petiole, postpetiole, and gaster lighter (brown) especially on dorsum. Eyes black. Setae yellow.

DISCUSSION

Arnol'di (1975: 1824) indicated the following localities for this species "Tagikistan, Karateginsky Mountain Range, Ramit, type worker, 6 paratype workers and allotype gyne; Gissarski Mountain Range, Hodge-Obi-Garm (11 workers and one gyne), Obi-Safed, 11-IX-1969 androtype ? male (Yanushev)." Translation by S. Goldgof). All specimens were collected from under stones. Further details regarding the biology of this species are unknown.

LECTOTYPE DESIGNATION. After examining the type series of *S. hissarianum* I noted that no specimen is clearly designated holotype or "type." Arnol'di designated the type locality as Ramit, but there are 7

workers and one gyne in this series. In order to reduce possible futu confusion, I designated one worker as lectotype and included a re partly hand-written label (*Stenamma hissarianum* LECTOTYPE (top)) this is the top specimen on a pin of three workers. It is a fairly typic specimen. Although there is some dirt on the specimen, it is covered l much less glue than the remaining specimens and it is the lea damaged.

COMPARISONS

This species might be confused with *S. westwoodii asiatica*, *picetojuglandeti*, or *S. sogdianum* as all species occur in south-centr Asia. All known specimens of *S. westwoodii asiatica* are lost an comparisons based on the original description are inconclusive. *hissarianum* is most likely to be confused with *S. picetojuglandeti*. Tl thoracic dorsum is more rugose in the latter species while *S. hissarianu* has a more longitudinal orientation to the thoracic sculpture. The ar between the propodeal spines has some transverse rugae in *picetojuglandeti* and is glassy-smooth in *S. hissarianum*.

S. sogdianum has more prominent carinae on the first gastral tergit The metanotal impression is deeper and the basal face of the propodeu has transverse rugae in *S. sogdianum* as well.

MATERIAL EXAMINED

TAJIKSTAN: Gissarskiy Khrebet, Obi-Safed Gorge, 40 km N fro Dushanbe, Kondara Canyon, 11 IX 1969, V. V. Yanushev, a single ma from under a stone on a stream bank (ZMUM — 1 male); Gissarsk Khrebet, Hodzha-Obi-Garm, 80 km ENE from Dushanbe, 14 VIII 197 V. V. Yanushev, flood lands of the stream , ant nest under stone (ZMU — 11 workers, 1 gyne); Ramit Preserve, 1800 - 2000 m, sparse forest maple and nut trees, 27 IV 1969, V. V. Yanushev, ant nest under sto (ZMUM — 7 workers, 1 gyne). [Above labels in Russian were translate by A. Antropov].

Stenamma picetojuglandeti Arnol'di

Worker Figs. 20, 21, 57, 63, 79, 91, 251 - 255.
Gyne Figs. 256 - 261. Male Figs. 262 - 267.
Distribution Fig. 268.

Stenamma picetojuglandeti Arnol'di, 1975: 1821 - 1822, Fig. Worke Gyne, Male — USSR: KAZAKHSTAN: Arkit, River Chodzha-at Chatkal'skiy Khrebet, 230 km NNE from Tashkent, 14-16 IX 1945, I V. Arnol'di (ZMUM) [Examined].

WORKER

Measurements and associated statistics as listed in Appendix Tab

13. Key statistics (measurement mean ± standard error of mean, n) are listed herein: TL (3.64 ± 0.059, 3), HL (0.85 ± 0.005, 3), HW (0.72 ± 0.009, 3), CI (85.46 ± 1.596, 3), SL (0.62 ± 0.005, 3), SI (85.23 ± 1.784, 3), AL (1.06 ± 0.033, 3), PRW (0.47 ± 0.014, 3), PL (0.38 ± 0.005, 3), PH (0.21 ± 0.005, 3).

LECTOTYPE WORKER. TL 3.70, HL 0.85, HW 0.72, EL 0.10, SL 0.61, CI 85, SI 84, AL 1.06, PRW 0.45, PL 0.37, PH 0.21.

Mandible with 8 - 9 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe emarginate (with 2 small carinulae extending on each side of emargination); apex in lateral view convex to flat. Compound eye with 4 - 5 ommatidia in greatest diameter. Propodeal spines of moderate length, approximately ½ to ⅓ length of declivitous face of propodeum. Scape not reaching occipital vertex by amount equal to length of first funicular segment. [Arnol'di indicated scape was thick and did not reach occiput by 2X its diameter. Arnol'di also indicated that all segments of funiculus, except the last are transverse. I observed that the first segment is also not transverse]. Metanotal impression shallow, depth approximately ⅓ length of propodeal spines; wide, approximately 2 - 3X as wide as deep, depth decreasing towards anterior. A large pit is present at the posterior ventral edge of the pronotum (near procoxae) and is lined with microsetae. Another pit is present between the bases of meso- and meta-coxae. Propodeal plates approximately same length as propodeal spines, directed posteriorly. Anterior subpetiolar process reduced to a small bump. Petiole pedunculate; stalk approximately ½ length of petiole, node rising gradually. Anterior subpostpetiolar process reduced to a moderate bump, posterior subpostpetiolar process reduced. Head rugose (most similar to the sculpture of *S. westwoodii* and *S. debile*) except as follows: central ⅓ of frontal area (between antennal sockets) glassy-smooth; venter of head rugose (almost scabrous). Interstices glassy-smooth throughout with scattered piligerous and non-piligerous punctures. Thoracic dorsum rugose (almost carinate) with decided longitudinal orientation (similar to *S. striatulum*). Thoracic pleura rugose with decided longitudinal orientation near propodeum. Propodeal side and side of pronotum carinate with longitudinal orientation. Neck of pronotum rugulose. Metanotal impression scrobiculate to weakly scrobiculate. Mesopleuron with scrobiculate median area. Coxae mostly smooth (or with weak longitudinal carinae); femur with faint longitudinal carinae; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with transversely carinate basal face (including area between spines) and glassy-smooth declivitous face. [Arnol'di indicated that the basal face is almost 2X length of declivitous face. I observed this to be

the case in two specimens]. Alitrunk interstices glassy-smooth wit scattered piligerous punctures. Petiolar node dorsum faintly rugos anterior and posterior surfaces of node, side of stalk, and dorsum stalk rugulose; venter of stalk punctulate; venter of node rugulos Postpetiolar node dorsum smooth with faint rugae; anterior an posterior surfaces and side rugose; venter punctulate. First gastr tergite base carinate with numerous carinae diverging towards post rior (longest carinae located near midline of tergite, length ¼ to ⅓ lengt of postpetiole). First gastral sternite base glassy-smooth with sma carinae which do not extend beyond juncture onto gaster. Remaind of gaster glassy-smooth (even at high magnifications), with scatter piligerous punctures. Setae on head moderately dense, suberect t decumbent (erect on clypeus). Setae on scape decumbent to appresse (mostly appressed on funiculus). [Arnol'di indicated setae on scape wer very short, almost appressed]. Setae on mandible decumbent t appressed. Setae on alitrunk dorsum and side erect to suberect. Seta on legs suberect to appressed on legs. Setae on petiole appressed o dorsum of stalk, suberect to erect on node. Setae on postpetiol suberect to erect on node, erect on venter. Setae on flexor surfaces coxae and venter of petiole absent. Setae on gaster suberect t decumbent. Head, alitrunk, petiole, postpetiole and gaster brown appendages yellow brown. Setae yellow.

GYNE

Measurements and associated statistics as listed in Appendix Tabl 13. Key statistics are presented herein: TL (4.25 ± 0.040, 6), HL (0.8 ± 0.005, 6), HW (0.76 ± 0.006, 6), CI (86.28 ± 0.419, 6), SL (0.64 ± 0.007 6), SI (84.81 ± 0.644, 6), AL (1.30 ± 0.015, 6), PRW (0.64 ± 0.007, 6), P (0.44 ± 0.010, 6), PH (0.24 ± 0.005, 6).

As described for worker except as follows: mandible with 7 - 8 teet (apical 2 prominent). [Arnol'di indicated 1st through 3rd segments o antennal club clearly transverse; however, I observed the third segmen to be quadrate]. Compound eye with 15 - 17 ommatidia in greates diameter. Metanotal impression obscured by thoracic modification associated with flight. Some sculpture on head deflected by prominen ocelli. Thoracic dorsum longitudinally carinate (similar to *S. striatulum*) Thoracic pleura with decided longitudinal orientation to rugae a approach dorsum, glassy-smooth or with a few wrinkles below suture Mesopleuron with weakly scrobiculate median area (ridges not a prominent as in other species). Procoxae with more prominent longitu dinal rugae than in worker; remainder of coxae and legs as in worker Propodeum with transversely carinate basal face and faintly transvers declivitous face (including area between spines). Color mostly as i

worker, except alitrunk, petiole, and postpetiole are a darker brown.

MALE

Measurements and associated statistics as listed in Appendix Table 13. Key statistics are presented herein: TL (3.63 ± 0.060, 5), HL (0.59 ± 0.007, 6), HW (0.53 ± 0.003, 6), CI (89.61 ± 1.209, 6), SL (0.25 ± 0.003, 6), SI (46.70 ± 0.607, 6), AL (1.29 ± 0.016, 6), PRW (0.62 ± 0.007, 6), PL (0.39 ± 0.012, 5), PH (0.21 ± 0.000, 5).

As described for worker except as follows: mandible with 3 teeth; anterior clypeal margin in full face view with median lobe flat; apex in lateral view convex with small concavity near mandible. Compound eye with 25 - 30 ommatidia in greatest diameter. [Arnol'di indicated the head is noticeably narrowed behind the eyes. I find this to be true for most *Stenamma* males]. Propodeal spines reduced to small bumps. Scape not reaching occiput by amount equal to (or exceeding) length of first funicular segment. [Arnol'di indicated scape was only as long as first three funicular segments. Arnol'di also indicated that second segment of funiculus was ⅓ longer than third segment. I observed these to be equal in length]. Metanotal impression obscured by thoracic modifications associated with flight. Pit at base of procoxae not as prominent as in worker and gyne. Notauli prominent. Propodeal plates significantly longer than bumps representing spines, directed posteriorly. Petiole pedunculate; stalk less than ½ length of petiole, node rising gradually. [Arnol'di indicated the petiole is very short and thick. I find this to be typical for *Stenamma* males]. Anterior subpostpetiolar process reduced to a small bump. Head faintly carinate and heavily punctate except as follows: central ⅓ of frontal area (between antennal sockets) with small longitudinal carinulae and numerous punctures; venter of head heavily punctate; occipital region heavily punctate and with some longitudinal carinae which almost form concentric loops (somewhat reminiscent of *S. lippulum*). Interstices heavily punctate throughout. Thoracic dorsum longitudinally carinate and heavily punctate. Thoracic pleura rugose (almost carinate) with decided longitudinal orientation; katepisternum glassy-smooth near venter. Neck of pronotum punctulate. Mesopleuron with scrobiculate median area. Propodeal dorsum with carinate basal face (carinae arranged in form of inverted "V" when viewed from rear with concentric and smaller "v's" between spines) and glassy-smooth declivitous face. Alitrunk interstices punctulate throughout, most are non-piligerous punctures. Petiolar node dorsum glassy-smooth; sides rugulose and punctate; anterior and posterior surfaces of node, stalk, and venter punctate. Postpetiolar node dorsum glassy-smooth; side rugulose and punctate; anterior and posterior surfaces and venter punctulate. First gastral tergite base

carinate with numerous small carinae diverging towards posteri which do not extend beyond base of tergite. First gastral sternite bas glassy-smooth with no trace of carinae. Remainder of gaster glassy smooth (even at high magnifications), with scattered piligerous punc tures. Setae on head moderately dense, decumbent to appressed (a fe suberect setae scattered throughout), setae on clypeus erect, setae o mandible and scape decumbent to appressed (also appressed o funiculus). Setae on alitrunk dorsum and side suberect to decumben setae on legs decumbent to appressed. Setae of petiolar dorsum of stal and anterior surface of node appressed, erect to decumbent on remain der of node dorsum. Setae on postpetiolar node decumbent to ap pressed, suberect to erect on venter. Setae on gaster suberect t decumbent. Head piceous brown, darkening towards alitrunk. Append ages yellow brown to yellow. Eyes black. Alitrunk, petiole, postpetiol and gaster piceous brown, gaster lightening towards distal end (nea genitalia). Visible parts of genitalia yellow brown. Setae white to gray

DISCUSSION

Arnol'di briefly described the range and habitat of this species:

> "Mountain Range Tyan-Shan: Fergansky, Chatkalsky, Karzan-Tau (worker), many paratypes (Chatcul, Arkit, IX 1945, K. Arnol'di). Large population of workers and females inhabits Kara-Alma and Kizil-Ungur, VI - VII 1945, males inhabit near Humsan, V 1974 (Yanushev)."
>
> "This species is widespread in the southern ranges of Tyan-Shan, 1300 to 2300 meters above sea level; it is numerous in the nut forests of Fergan Range, particularly in the mixed nut-fir forests of Chatcul near Sara-Chilek Lake and further down." (Arnol'di, 1975: 1821 - 1822. Translation by S. Goldgof).

LECTOTYPE DESIGNATION

After examining the type series of *S. picetojuglandeti*, I noted that n specimen is clearly designated holotype or "type." There are 6 speci mens on one pin with a label of "Holotypus." Since Arnol'di cited severa localities in his original description and since numerous specimens ar included on each pin, I designate the middle worker on the abov mentioned pin as lectotype and have attached a red, partly handwritte label (*Stenamma picetojuglandeti* LECTOTYPE (middle worker)). It is a fairly typical specimen and is covered with significantly less glue tha other specimens.

COMPARISONS

Several other species have been described from south central Russia

S. westwoodii asiatica, *S. hissarianum*, and *S. sogdianum*. Since the type of *S. asiatica* has been lost, the original description is inadequate, and no further specimens have been discovered, no comparisons can be made with that species. *S. picetojuglandeti* is most similar in general appearance with *S. hissarianum*. The former species has more rugae on the thoracic dorsum whereas the latter has more longitudinal carinae (like *S. striatulum*). There are transverse rugae between propodeal spines in *S. picetojuglandeti* and this area is glassy-smooth in *S. hissarianum*. Other than the above mentioned differences, these species are quite similar. They may be subspecies. However, additional material must be examined to better understand the range of variation within these taxa.

S. sogdianum differs from *S. picetojuglandeti* in that it has more prominent carinae on the first gastral tergite. The metanotal impression is wider in *S. picetojuglandeti* and the carinae between propodeal spines are bent in *S. picetojuglandeti* while they are straight in *S. sogdianum*.

MATERIAL EXAMINED

KAZAKSTAN: Arkit, River Chodzha-ata, Chatkal'skiy Khrebet, 230 km NNE from Tashkent, 14 - 16 IX 1945, K. V. Arnol'di (3 workers, 5 gynes, 6 males — ZMUM). KIRGHIZIA: Kara-alma, Ferganskiy Khrebet, 42 km NE from Dzhalal-Abad, 1500 m, 1 VIII 1945, K. V. Arnol'di (1 gyne — ZMUM). [Above localities translated from Russian by A. Antropov].

Stenamma sogdianum Arnol'di

Worker Figs. 58, 68, 80, 92, 284 - 288.

Distribution Fig. 289.

Stenamma sogdianum Arnol'di, 1975: 1824 - 1825, Fig.. Worker — U.S.S.R.: Tachta-Karacha Pass near Aman-Kutan, south of Samarkand, 1700 m (K. Arnol'di, V 1942). (ZMUM) [Examined].

WORKER

Measurements and associated statistics as listed in Appendix Table 14. Key statistics (measurement mean ± standard error of mean, n) are listed herein: TL (3.41 ± 0.019, 21), HL (0.76 ± 0.003, 21), HW (0.65 ± 0.003, 21), CI (85.25 ± 0.391, 21), SL (0.58 ± 0.004, 21), SI (90.53 ± 0.489, 21), AL (0.98 ± 0.008, 21), PRW (0.44 ± 0.003, 21), PL (0.35 ± 0.005, 21), PH (0.19 ± 0.002, 21).

LECTOTYPE WORKER. TL 3.36, HL 0.76, HW 0.64, EL 0.10, SL 0.59, CI 84, SI 92, AL 0.93, PRW 0.45, PL 0.34, PH 0.18.

Mandible with 7 - 9 teeth, usually 8 (apical 2 prominent); anterior clypeal margin in full face view with median lobe emarginate (with single pair of carinae extending on each side of emargination); apex in lateral

view convex to flat. Compound eye with 4 - 6 ommatidia in greate diameter. Scape not reaching occiput by just less than length of fir funicular segment. Propodeal spines of moderate length, approximatel ½ length of declivitous face of propodeum (with very sharp points Metanotal impression deep, depth nearly equal to length of propode spines; approximately 2X as wide as deep, depth decreasing toward anterior. A large pit is present at the ventral edge of the pronotum (ne procoxae) and is lined with microsetae. Propodeal plates approximatel ½ length of propodeal spines, directed posteriorly and slightly upwar Anterior subpetiolar process reduced to a small bump. Petiole pedu culate; stalk slightly less than ½ length of petiole, node rising abruptl almost triangular in outline. Anterior subpostpetiolar process reduce to a small bump, posterior subpostpetiolar process reduced. Hea rugose (most similar to the sculpture of *S. westwoodii* and *S. debil* except as follows: frontal area carinate with carinae diverging toward posterior; central ⅓ (actually greater than ⅓ of area) of frontal are (between antennal sockets) glassy-smooth; venter of head rugos (almost scabrous); occipital margin rugose. Interstices heavily punc tate, leading to a granular appearance with scattered piligerous punc tures. Thoracic dorsum rugose (almost scabrous) with decided longitu dinal orientation. Thoracic pleura rugose with decided longitudin orientation. Neck of pronotum punctulate and rugulose. Metanot impression scrobiculate with rugae forming part of deep hollow Mesopleuron with deeply scrobiculate median area, forming larg trench like hollows. Coxae transversely carinate (almost rugose t rugulose); remainder of legs with no noticeable carinae, but heavil punctulate throughout. Propodeal dorsum with rugose basal face an transversely carinate basal face (with some rugae between propode spines). Alitrunk interstices heavily punctulate, leading to a granula appearance with scattered piligerous punctures. Petiolar node dorsu punctate; remaining surfaces heavily punctate to punctulate, becom ing more punctulate towards venter. Postpetiolar node dorsum punc tate with a faint trace of rugae; remaining surfaces heavily punctate t punctulate, becoming more punctulate towards venter. First gastr tergite base prominently carinate with numerous carinae divergin towards posterior (longest carinae located near midline of tergite, lengt of longest carinae exceeding ½ length of postpetiole). First gastr sternite base carinate (longest carinae located near midline of sternit length of longest carinae 0.20 to 0.25 length of postpetiole). Remainde of gaster smooth with scattered piligerous punctures; a faint rugulos pattern is most prominent on first tergite. Setae on head moderatel dense, suberect to appressed (erect on clypeus). Setae on scap

suberect to appressed [there is more variation in setal inclination on scape than Arnol'di described]. Setae on funiculus and mandible decumbent to appressed. Setae on alitrunk erect to suberect. Setae of flexor surfaces of coxae absent; setae on remainder of legs suberect to appressed with setae more appressed toward distal end of legs. Setae of petiole appressed on anterior surface of stalk, suberect on dorsum of node and posterior surface, absent from venter. Setae on postpetiole suberect to decumbent except setae on venter erect. Setae on gaster suberect to appressed, becoming more appressed towards distal end. Color uniformly yellow-brown or reddish-brown (the latter color is rarer); head slightly darker with appendages slightly lighter. Setae yellow.

Neither gyne nor male are currently known in this species.

DISCUSSION

Arnol'di provided the following information regarding the collection of the original series:

> "Tachta-Karacha Pass near Aman-Kutan, south of Samarkand, 1700 m. type worker and 19 paratype workers (K. Arnol'di, V 1942). Male and queen are not known." (Arnol'di, 1975: 1824 - 1825. Translation by S. Goldgof).

LECTOTYPE DESIGNATION

Upon examining the type series of *S. sogdianum*, I noted that no specimen is clearly designated type. Six specimens are labelled "holotypus" and some are in worse condition than others. In order to reduce future confusion and to emphasize the most typical specimen, I designate the bottom worker next to the pin as lectotype and included a red, partly handwritten label (*Stenamma sogdianum* LECTOTYPE (bottom by pin)). This is a fairly typical specimen and is covered with significantly less glue than remaining specimens.

COMPARISONS

Three other species have been described from south central Asia: *S. westwoodi asiatica*, *S. hissarianum*, and *S. picetojuglandeti*. Since the type of *S. asiatica* is lost, comparisons are made with the remaining species. In terms of overall sculpture, *S. sogdianum* should not be easily confused with any other *Stenamma* from this region. It is the only one with rugose sculpture and densely punctate interstices leading to a granular appearance. It is also the only Palaearctic or Oriental *Stenamma* which has the rugulose network on the first gastral tergite.

S. hissarianum differs from *S. sogdianum* in that the gastral carinae are much less prominent in the former species. The basal face of the propodeum has transverse rugae in *S. sogdianum*. Additionally, the

metanotal impression is much deeper in *S. sogdianum*.

S. picetojuglandeti is more similar to *S. hissarianum* than *S. sogdianum* The gastral carinae are much less prominent in the former species. Th rugae between propodeal spines are straight in *S. sogdianum* and ben in *S. picetojuglandeti*. Furthermore, the metanotal impression is muc deeper in *S. sogdianum* and much wider in *S. picetojuglandeti*.

MATERIAL EXAMINED

UZEBEKISTAN: Aman-kutan, 17 km S from Samarkand, 1950 n [not 1700 m as Arnol'di originally indicated], 28 V 1942, K. V. Arnol'd (21 workers — ZMUM). [Above locality translated from Russian by A Antropov].

Stenamma punctiventre Species Group

Palaearctic ants with predominantly rugose head and occipita margin. Alitrunk predominantly rugose with heavily punctate inter stices. Anterior subpetiolar process significantly enlarged (much large than Oriental *S. kashmirense* and *S. jeriorum*). In single known gyne branch of median vein occurs proximal to stigma. Petiole thickene throughout, stalk less than ½ length of petiole, node rising abruptly Base of first gastral tergite lacking any significant carinae (whic usually extend from the postpetiolar juncture).

This species group contains a single species (*S. punctiventre*). Thi species is sufficiently distinct and does not appear to have any clos relatives (based on morphology). Although it shares selected feature with certain Oriental species (listed above), I believe it must be mos closely related to members of the *S. westwoodii* species group (give overall appearance and collection localities). I believe it highly probabl that this species present distribution is a result of changes in th environment during the Pleistocene. Its lack of discovery since th earlier part of this century may indicate that its required habitat ha been eliminated (and the species is extinct) or that this species i typically present at certain times of the year when entomologists woul not expect it to be active (and are not looking for it).

Stenamma punctiventre Emery

Worker Figs. 269 - 271. Gyne Figs. 272 - 275.

Distribution Fig. 276.

Stenamma punctiventre Emery, 1908: 309. Gyne — MOROCCO Tanger, August, 1896, Vaucher (MCSNG?). [Not examined]. [1 gyne a NHMB, but not labeled as type, no museums contacted know locatio of Emery's type].

Theryella myops Santschi, 1921: 68. Worker — MOROCCO (NHMB)

[Provisional synonymy by Santschi, 1923: 136]. [Holotype worker examined].

WORKER

Measurements as listed below for the single known worker.

HOLOTYPE WORKER (*T. myops*). TL 3.03, HL 0.77, HW 0.66, EL 0.06, SL 0.58, CI 85, SI 88, AL 0.92, PRW 0.44, PL 0.32, PH 0.22.

Mandible with 6 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe emarginate, apex in lateral view convex. Compound eye with 4 ommatidia in greatest diameter. Propodeal spines of moderate length, approximately ⅓ length of declivitous face of propodeum. Metanotal impression shallow; less than ½ as deep as length of propodeal spines; slightly less than 2X as wide as deep. Deep pit present at posterior and ventral edge of pronotum. Propodeal plates approximately 0.67 as long as propodeal spines, directed posteriorly. Anterior subpetiolar process enlarged into significant knob, projecting towards anterior. Petiole pedunculate, node rising gradually from stalk; stalk approximately ½ length of petiole. Anterior and posterior subpostpetiolar processes greatly reduced. Head rugose except as follows: frontal area carinate (almost carinulate); carinae diverging slightly posteriorly; central ⅓ of frontal area between antennal sockets glassy-smooth; clypeal area with 2 carinulae extending from each side of emargination converging towards frontal area; occiput rugose (wrinkles almost concentrically following outline of head). Interstices glassy-smooth with scattered piligerous and non-piligerous punctures. Thoracic dorsum rugose. Thoracic pleura rugose (and heavily punctate). Neck of pronotum rugulose-punctulate. Metanotal impression scrobiculate. Mesopleuron with rugose-punctulate median area. Coxae carinate (almost smooth); remainder of legs glassy-smooth with traces of carinae and numerous piligerous punctures. Propodeal dorsum with transversely carinate basal face and glassy-smooth declivitous face. Alitrunk interstices heavily punctulate (mostly non-piligerous punctures). Petiolar node dorsum very weakly punctulate (almost glassy-smooth); anterior and posterior surfaces and sides of node rugulose; all surfaces of stalk and venter densely punctulate. Postpetiolar node dorsum densely punctulate (including venter). First gastral tergite base carinate with scattered very short carinae diverging towards posterior; carinae barely extending onto surface of gaster. First gastral sternite base same as described for tergite. Remainder of gaster minutely rugulose with some piligerous punctures. Setae on head numerous, short, suberect to decumbent (except setae on anterior clypeal margin long and erect); setae of scape subdecumbent. Setae on alitrunk longer, suberect on dorsum and legs. Setae on petiole subdecumbent. Setae on

postpetiole erect to subdecumbent. Setae on gaster suberect. Enti body brown, legs and gaster yellow brown. Setae yellow.

GYNE

Measurements as listed herein for the single known gyne: TL 4.0 HL 0.82, HW 0.82, EL 0.19, SL 0.71, CI 100, SI 86, AL 1.26, PRW 0.6 PL 0.35, PH 0.27.

As described for worker except as follows. Compound eye with l ommatidia in greatest diameter. Metanotal impression absent due t thoracic modifications associated with flight. Small pit present a posterior and ventral edge of pronotum. Propodeal plates approximatel ½ length of propodeal spines, directed posteriorly. Petiole pedunculat node rising gradually from stalk. Venter of head scabrous. Mesopleuro with scrobiculate and punctulate median area. Propodeal dorsum wit minute transverse carinulae on declivitous face. Petiolar node dorsun rugose and heavily punctulate. Postpetiolar node dorsum rugose an heavily punctulate. Alitrunk dorsum dark brown, appendages yellow brown.

The male is currently unknown in this species.

DISCUSSION

S. punctiventre is known only from localities in Morocco. No biologica information was published with the original descriptions and no furthe collections of this species have been reported.

This species is most closely related to members of the *S. westwoodi* complex due to its similar thoracic sculpture (and head sculpture) an petiolar node profile. However, the anterior petiolar process is greatl enlarged (unlike any other *Stenamma* examined to date). Given th paucity of specimens coupled with its unique feature, I believe thi species belongs in a separate species group.

MATERIAL EXAMINED

MOROCCO: Rabat, Thery, I-1920 (1 worker — NHMB); Tanger (ex. museo H. Vaucher), X-1896 (1 gyne — NHMB).

Stenamma owstoni Species Group

Oriental ants with enlarged eyes and variable head and thoracic sculpture. Most species with a high degree of punctation on the body (in various locations). Petiole pedunculate, with stalk approximately ½ length of node, node rising gradually. In known reproductives, branch of median vein occurs apically to base of stigma. Base of first gastral tergite with distinct carinae extending from juncture with the postpetiole.

This is the second largest species group examined with six currently recognized species (*S. owstoni*, *S. nipponense*, *S. kurilense*, *S. ussuriense*,

S. bhutanense, and *S. gurkhalis*). The first four species appear closely related (perhaps sharing a common ancestor). The remaining two species are similar morphologically and are included herein for that reason. Given the significant separation of these two speices from the remainder, this species group was either much more widespread inthe past or this species group is paraphyletic. I have grouped these together based on similar morphology until additional separatory characters can be defined and until additional collections are made in intervening areas. I have searched several areas of Yunnan Province, China, as well as Hainan Island, but was unable to obtain additional specimens of *Stenamma*.

Stenamma owstoni Wheeler

Worker Figs. 49, 71, 84, 226 - 228. Gyne Figs. 229 - 235.
Distribution Fig. 236.

Stenamma owstoni Wheeler, 1906: 314. Worker — JAPAN: Suruga, Yamanaka, 2000 feet, Hans Sauter, in rotten wood (MCZ — 1 worker) [examined].

WORKER

Measurements and associated statistics are listed in Appendix Table 15. Key statistics (measurement mean ± standard error of mean, n) are presented herein: TL (4.12 ± 0.138, 10), HL (0.91 ± 0.026, 14), HW (0.81 ± 0.026, 14), CI (88.75 ± 0.881, 14), SL (0.72 ± 0.018, 14), SI (88.73 ± 1.254, 14), AL (1.20 ± 0.028, 15), PRW (0.52 ± 0.013, 15), PL (0.47 ± 0.014, 15), PH (0.22 ± 0.005, 15).

LECTOTYPE WORKER. TL 4.28, HL 0.97, HW 0.90, EL 0.16, SL 0.77, CI 93, SI 86, AL 1.27, PRW 0.58, PL 0.52, PH 0.23.

Mandible with 7-8 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe emarginate (less than in *S. nipponense*); apex in lateral view flat to slightly concave. Compound eye with 8-9 ommatidia in greatest diameter. Propodeal spines short, less than ¼ length of declivitous face of propodeum. Metanotal impression well developed; depth approximately equal to length of propodeal spines. Anterior subpetiolar process greatly reduced. Petiole pedunculate; stalk gradually thickening towards node (much thicker than in *S. nipponense*). Anterior subpostpetiolar process present; posterior subpostpetiolar process greatly reduced. Head entirely rugose except as follows: frontal area carinulate; carinae diverging posteriorly. Interstices with numerous small piligerous punctures. Thoracic dorsum and thoracic pleura scabrous. Neck of pronotum rugulose. Metanotal impression scrobiculate. Mesopleuron with scrobiculate median area. Coxae faintly rugulose; remainder of legs glassy-smooth with sparse carinae. Propodeal

dorsum transversely carinate. Alitrunk interstices glassy-smooth wit small piligerous and non-piligerous punctures. Petiolar dorsum an sides (including node) carinate, lower ½ of sides and remaining surface punctulate. Postpetiolar dorsum and sides (including node) carinat lower 0.67 of sides and remaining surfaces punctulate. First gastr tergite base carinate; carinae diverging towards posterior; length c carinae not exceeding ¼ length of postpetiole. First gastral sternite bas punctulate with several minute carinulae. Remainder of gaster glassy smooth (even at high magnifications), with scattered piligerous punc tures. Body surfaces with moderately dense, suberect to decumben setae. Setae of flexor surfaces of coxae and venter of petiole absent Entire body dark brown [almost piceous]; distal ⅓ of head an appendages brown. Setae gray to white.

GYNE

Measurements and associated statistics are listed in Appendix Tabl 15. Key statistics are presented herein: TL (5.34 ± 0.011, 3), HL (1.0 ± 0.025, 3), HW (0.91 ± 0.011, 3), CI (90.11 ± 3.303, 3), SL (0.83 ± 0.028 3), SI (91.26 ± 3.965, 3), AL (1.63 ± 0.032, 3), PRW (0.83 ± 0.030, 3), PI (0.62 ± 0.021, 3), PH (0.28 ± 0.005, 3).

As described for worker with ocelli and usual thoracic modification associated with flight, except as follows: mandible with 8 teeth; anterior clypeal margin in full face view with median lobe emarginate; apex in lateral view flat. Compound eye with 17 ommatidia in greatest diameter. Propodeal spines of moderate length, approximately ⅓ length of declivitous face of propodeum. Metanotal impression absent due to thoracic modifications associated with flight. Petiole pedunculate; stalk approximately ½ length of petiole, gradually thickening towards node (not as much as worker). Anterior and posterior subpostpetiolar processes greatly reduced. Head interstices glassy-smooth with numerous small piligerous punctures. Thoracic dorsum costate. Thoracic pleura smooth near center of thorax, approaching carinate towards dorsum, approaching costate towards either end. Mesopleuron with weakly scrobiculate median area. Coxae carinate; remainder of legs glassy-smooth. Propodeal dorsum with transversely carinate basal face and glassy-smooth declivitous face. Postpetiole dorsum weakly carinate (almost smooth), remaining surfaces carinate, including venter.

No males of this species are currently known.

DISCUSSION

S. owstoni is known only from scattered localities across Japan and one in China and it is rarely encountered throughout its range; it is usually found in broad-leaved deciduous forest or evergreen forest

ranging from plains to mountainous regions (from 80 meters up to 1450 meters). This species is most often collected in mountainous regions. Nests have been found in rotting logs, leaf litter, in litter and humus around the base of a tree, and under stones (all in rather wet environments). Most specimens are discovered through funnel extraction of litter and humus (M. Terayama and K. Onoyama pers. comm.). It appears this species is most active during the winter months with most specimens collected during November - February (based on collections examined).

A single gyne is known from mainland China (Szechwan Prov.). Based upon the size of the specimen, size of the eyes, and comparisons with other gynes from Japan (*S. owstoni* and *S. nipponense*) and from Russia (*S. ussuriense*), I believe this specimen is *S. owstoni*. This single specimen should be compared with additional gynes associated with workers when additional specimens are collected from appropriate Chinese and Russian areas.

Prof. Kazuo Ogata (pers. comm.) reported that *S. owstoni* stores seeds within its nest. This was first discovered by Mr. Masao Kubota (Prof. Ogata was also present at the initial discovery). Prof. Ogata kindly provided an English translation of the original article ("Arito arayuru ari no hanashi" by Mr. Masao Kubota, 1987, Kodansha, Tokyo, pp. 23 - 24).

> "...*Stenamma owstoni* occurs in Hokkaido, Honshu and Kyushu, and is restricted to mountainous regions in latter two areas. The species is rare and its biology has not been known."
>
> "I had a chance to find the nest of *S. owstoni* in Unzen (800 m alt.), Kyushu. The nest is smaller in size with a[n] entrance about the same size as a little finger and is constructed under soil about 30 cm in depth. To my surprise, its chambers were full of seeds! Then my question is what plant of seeds is that. Generally, it is difficult to identify plants by seeds. So, after [I] germinated and raised them, which spent almost 2 years, I finally got the answer. The seed is that of *Clethra barbinervis* Sieb. et Zucc."
>
> "The plant is a deciduous tree, distributed in mountainous regions from Hokkaido to Kyushu. The flowers are white, forming a bunch in summer. In my observation, *S. owstoni* collects seeds only of this plant."
>
> "It has been five years since I found this and now the tree grows about same height as me in my garden..."

Prof. Ogata added that *Clethra* belongs to the family Clethraceae. It is common in deciduous forests in Japan and is also found on Jejudo

Island, Korea. A full grown plant measures 3 - 7 m in height. I am mo appreciative to Prof. Ogata for calling this behavior to my attention.

LECTOTYPE DESIGNATION

Although this species is rather distinct, there are "cotypes" scatter in various museums. Since there seems to be some confusion regardin the type locality and there is some degree of variation, I believe appropriate to designate a lectotype. Accordingly, I have placed a re partly handwritten label (*Stenamma owstoni* LECTOTYPE) on th appropriate specimen (MCZ). Of the "cotypes" examined, this specime is the most complete.

COMPARISONS

S. owstoni is most closely related to *S. nipponense* in its thoracic an head sculpturing and petiolar node profile. It can be quickly separate from *S. nipponense* in that the latter has heavily punctate sides and i generally much smaller.

S. owstoni might also be confused with *S. kurilense* or *S. ussuriense* In comparing *S. owstoni* and *S. kurilense*, the petiolar and postpetiola nodes are more shallow (and rise more gradually) in the former species The compound eyes in *S. owstoni* are significantly larger. The anterio clypeal emargination is more shallow in the former species. The glassy smooth area between the antennal insertions is narrower in the forme species. The sides of the alitrunk are more punctate and rugose rathe than scabrous as in *S. owstoni*. Both petiolar and postpetiolar nod dorsa are more punctate in the former species. The carinae on the firs gastral tergite do not extend as far as in *S. kurilense*. Propodeal spine of some specimens are shorter than in *S. kurilense* (however, the lengt of these spines is variable within species for most *Stenamma*). The faint transverse carinae are lacking on the declivitous face of the propodeum in *S. owstoni* (this area is glassy-smooth in that species). Thoracic dorsa are equally scabrous and rugose in both species, except there are mor longitudinally oriented ridges in *S. kurilense*. The metanotal impression is wider in *S. owstoni* than in *S. kurilense*. Additionally, the anterio petiolar process is larger in *S. kurilense*.

S. owstoni should not be readily confused with *S. ussuriense*. It has significantly larger eyes (for its size) and it is significantly larger. The petiolar dorsal profile (when viewed from the posterior) is flatter. There are no basal carinae between the propodeal spines and the metanotal impression is deeper and wider in *S. owstoni*.

MATERIAL EXAMINED

CHINA: Szechwan Prov., Chao Kung Mt. Kuanhsich, 8000', W. L. Brown, Jr. (1 gyne — MCZ). JAPAN: Hokkaido (2 workers — MHNG); H.

Sauter # 3057 (1 worker - Lectotype — MCZ - cotype 20593); Honshu Tottori Pref., Sugano, Kokfu Chô, S. Nomara (2 workers — KEUC); Ibaraki Pref., M. Terayama (2 workers — MTPC); Kyoto Pref., Kyoto, Sakyo-ku, Mt. Yoshidayama, 80 m, K. Onoyama (1 gyne - KEUC), 90 m, K. Onayama (1 worker — KEUC) (1 worker — MBDPC); Kyushu, Hirao, Fukuoka City, Esaki, Hori, Fujino, Nakahara, Takeya, Cho, Hashimoto, Yasumatsu (1 gyne — KEUC), Saigusa (2 workers — KEUC); Kyushu, Oita Pref., Mt. Kurodake, Kuju, S. Nomura (3 workers — KEUC); Mie Pref., A. Kawazoe (1 worker — MTPC); Nagasaki Pref., Mt. Taradake, Todoroki Vall., S. Nomura (1 worker — KEUC) (1 worker — MBDPC).

Stenamma nipponense Yasumatsu and Murakami

Worker Figs. 52, 70, 86, 200 - 202.
Gyne Figs. 203 - 206. Male Figs. 207 - 208.
Distribution Fig. 209.

Stenamma nipponense Yasumatsu and Murakami, 1960: 28 - 30, Fig. 1A, Plate 7, Fig. 1. Worker, Gyne — JAPAN: Fukuoka Prefecture, Kyushu, Hikosan (Mt. Hiko) (Holotype worker — July 28, 1939, K. Yasumatsu leg; paratypes — dealate female, February 23, 1935, Ehime Prefecture, Shikoku, Saragamine (Mt. Sara); one worker, July 28, 1939, Hikosan; one worker, June 4, 1941, Hikosan; one worker, May 15, 1955, Saragamine; 5 workers, May 13, 1957, Hokkaido, Oshoro). [Holotype and paratypes examined].

WORKER

Measurements and associated statistics as listed in Appendix Table 16. Key statistics (measurement mean ± standard error of mean, n) are listed herein: TL (3.80 ± 0.070, 20), HL (0.84 ± 0.012, 26), HW (0.73 ± 0.007, 26), CI (86.95 ± 0.628, 26), SL (0.67 ± 0.011, 26), SI (91.01 ± 1.135, 26), AL (1.15 ± 0.014, 26), PRW (0.51 ± 0.006, 26), PL (0.46 ± 0.009, 26), PH (0.21 ± 0.003, 26).

HOLOTYPE WORKER. TL 4.09, HL 0.90, HW 0.72, EL 0.10, SL 0.69, CI 80, SI 96, AL 1.22, PRW 0.50, PL 0.53, PH 0.21.

Mandible with 11 teeth; anterior clypeal margin in full face view with median lobe emarginate, apex in lateral view slightly convex. Compound eye with 4 ommatidia in greatest diameter. Propodeal spines of moderate length, approximately ⅓ length of declivitous face of propodeum. Metanotal impression well developed; depth slightly less than ½ length of propodeal spines. anterior subpetiolar process greatly reduced. Petiole pedunculate; stalk almost ½ length of petiole. Anterior and posterior subpostpetiolar processes greatly reduced. Head entirely rugose (approaching rugulose near occipital vertex in some specimens) except as follows: frontal area carinulate; carinulae diverging posteri-

orly. Interstices glassy-smooth with scattered small piligerous punc tures. Thoracic dorsum rugose. Thoracic pleura rugose. Neck c pronotum rugulose. Metanotal impression scrobiculate. Mesopleuro with scrobiculate median area. Coxae rugulose; remainder of leg glassy-smooth with sparse carinae. Propodeal dorsum transversel carinate. Alitrunk interstices glassy-smooth with small piligerou punctures. Petiolar node dorsum rugose; remaining surfaces punctulat Postpetiolar node dorsum and anterior surface of node rugose; remain ing surfaces punctulate. First gastral tergite base carinate, carina diverging towards posterior (longest carinae near midline of tergite length not exceeding ½ length of postpetiole). First gastral sternite bas with similar carinae; length of carinae not exceeding ⅓ length o postpetiole. Remainder of gaster glassy-smooth (even at high magnifi cations), with scattered piligerous punctures. Setae on most body surfaces moderately dense, suberect to decumbent. Setae of flexo surfaces of coxae, peduncle, and venter of petiole absent. Entire body dark brown [almost piceous]; appendages and gaster brown. Setae gray to white.

GYNE

Measurements and associated statistics as listed in Appendix Table 16. Key statistics are presented herein: TL (4.60 ± 0.116, 4), HL (0.91 ± 0.004, 4), HW (0.79 ± 0.013, 4), CI (87.12 ± 1.508, 4), SL (0.70 ± 0.008. 4), SI (88.85 ± 1.772, 4), AL (1.40 ± 0.040, 4), PRW (0.71 ± 0.021, 4), PI (0.51 ± 0.023, 4), PH (0.24 ± 0.007, 4).

Similar to worker, with ocelli and usual thoracic modifications associated with flight, except as follows: mandible with 10 teeth, apical two prominent. Compound eye with 14 ommatidia in greatest diameter. Metanotal impression absent due to thoracic modifications associated with flight. Thoracic dorsum and pleura rugose to carinate. Anterior neck of pronotum rugulose. Mesopleuron with faintly scrobiculate median area. Dorsum of petiolar node rugulose (approaching rugose at apex of node); remaining surfaces punctulate.

MALE

Measurements and associated statistics as listed in Appendix Table 16. Key statistics are presented herein: TL (3.75 ± 0.138, 3), HL (0.64 ± 0.009, 3), HW (0.53 ± 0.019, 3), CI (82.45 ± 1.697, 3), SL (0.24 ± 0.009, 3), SI (45.63 ± 2.993, 3), AL (1.27 ± 0.056, 3), PRW (0.68 ± 0.014, 3), PL (0.41 ± 0.038, 3), PH (0.21 ± 0.014, 3).

Mandible with 3 - 4 teeth, apical tooth prominent; anterior clypeal margin in full face view with median lobe evenly convex, apex in lateral view slightly concave. Compound eye with 20 ommatidia in greatest

diameter. Frontal lobes not completely covering antennal insertions. Metasternum with median, elongate, blunt, conical projection (pilose at tip), visible between meso- and meta-coxae. Wing venation is of two types. One type is associated with males having 3 mandibular teeth, the other is associated with males having 4 mandibular teeth. Propodeal spines reduced to small bumps, approximately ¼ (sometimes less) length declivitous face of propodeum. Metanotal impression absent due to thoracic modifications associated with flight. Anterior subpetiolar process reduced. Petiole pedunculate; stalk almost ½ length of petiole, thick, approximately ½ thickness of petiolar node. Anterior and posterior subpostpetiolar processes reduced. Head faintly rugulose, with numerous non-piligerous punctures (leading to a granular appearance), except as follows: frontal area carinulate, carinulae diverging posteriorly. Interstices densely punctulate. Thoracic dorsum costate. Thoracic pleura weakly shining (approaching rugulose near dorsum of some specimens), remainder of sides costate (including propodeal pleura). Neck of pronotum rugulose. Mesopleuron with deeply scrobiculate median area. Coxae carinate; remainder of legs glassy-smooth. Propodeal dorsum with costate to punctate basal face and transversely carinate declivitous face. Meso-propodeal suture scrobiculate. alitrunk interstices weakly shining with small piligerous punctures. Petiolar node dorsum glassy-smooth (rugulose in some specimens); stalk costate; venter rugulose with numerous punctures. Postpetiolar node dorsum and anterior surface of node glassy-smooth (rugulose in some specimens); anterior base of node carinate, carinae diverging around node; posterior surface and venter of node punctulate. First gastral tergite base carinate; carinae diverging posteriorly (longest carinae located near midline of tergite, length not exceeding ⅓ length of postpetiole). First gastral sternite base with similar, exceedingly short, carinae (length of carinae not exceeding 0.20 length of postpetiole). Remainder of gaster glassy-smooth (even at high magnifications), with scattered piligerous punctures. Setae on clypeal margin, mandibles, occipital vertex, ocellar triangle, and gular region erect. Setae on remainder of head decumbent to appressed. Setae on thoracic dorsum and coxae erect to suberect. Setae on remainder of alitrunk decumbent to appressed. Setae on side of petiolar node suberect; setae on remaining petiolar surfaces decumbent to appressed except setae of venter absent. Setae on all surfaces of postpetiole (including venter) decumbent to erect. Setae on gaster (including genitalia) erect to suberect. Entire body brown, except head and anterior portion of thorax dark brown [almost piceous], appendages light brown [almost testaceous]. Setae gray to yellow.

DISCUSSION

S. nipponense is known only from scattered localities across Japa and it is rarely encountered throughout its range; it is usually found i broad-leaved deciduous forest ranging from plains to mountainou areas (20 meters to 1500 meters). However, this species is most ofte collected in mountainous regions. Nests have been found in rotting log leaf litter, and under stones (all in rather wet environments). Mos specimens are discovered by funnel extraction from litter and humus some by hand sorting of litter and humus (M. Terayama and K Onoyama, pers. comm.). It appears this species is most active near th surface during May and early June and again in September and Octobe (based upon collection records).

Nuptial flights presumably occur in September in early morning a specimens (males and females) were collected as they descended t earth on Mt. Moiwa at 530m elevation (K. Onoyama, pers. comm.). Th sample I examined contained 1 alate female and 4 males. No additiona information is known regarding the nuptial flights of this species.

COMPARISONS

S. nipponense is most closely related to *S. owstoni* with its simila head and thoracic sculpturing. However, it differs in that is has smalle eyes and the thoracic sculpture has significantly more punctures in *S nipponense*. The only other species which might be confused with *S nipponense* is *S. kurilense*. Specimens of the latter have much large compound eyes and much less punctures.

It is possible that a cryptic species of *Stenamma* is represented b some of the males I have examined. There are two distinct wing venatio types with no intermediate forms. Typically, mandibles have either 3 o 4 teeth; specimens with 4 teeth are always associated with the secon type of wing venation. Such arguments lead to my investigation of th *Stenamma westwoodii* versus *S. debile* problem (DuBois, 1993). How ever, sample sizes are so small that they may represent populatio variation. When sufficient males are associated with workers and gynes, this issue should be reexamined.

MATERIAL EXAMINED

JAPAN: Kyushu, Hikosan (3 workers — KEUC); Ehime Pref., Ishizuchi N. Park, Mt. Ishizuchi, C. Besuchet (1 worker — MHNG); Gunma Pref., Tsumagoi 4 km SW, 1050 m, Lobl (1 worker — MTPC); Hokkaido, [no further locality information] (1 worker — KEUC); Oshoro, S. Sakagami (2 workers — KEUC); Tomakomai, 20 m, K. Onoyama (1 worker — KEUC), 90 m, K. Onoyama (1 gyne — KEUC); Sappo, Mt. Moiwa, 530 m, K. Onoyama (1 gyne, 3 males — KEUC); Hakodate, Mt. Hakodateyama,

M. Munakata (1 worker — KEUC); Honshu, Akita Pref., Mt. Chokai, Zenjin, S. Nomura (2 workers — KEUC); Hiroshima Pref., Mt. Garyusan, S. Nomura (3 workers — KEUC); Hyogo, Otomizu - Leikoku, S. Nomura (1 worker — KEUC); Kyoto, Ashuu, Mt. Mikuniyama, 670 m, K. Onoyama (1 worker - KEUC); Osaka, Minoo, M. Goto (1 worker — BMNH); Shikoku, Mt. Sara, K. Morikawa (1 gyne, 1 worker — KEUC); Tochigi Pref., K. Murata (6 workers — MTPC); Toyama, Kaminikawa, Arimine, 1150 m, Lobl (1 gyne, 1 worker — MHNG).

Stenamma kurilense Arnol'di

Worker Figs. 163 - 168.

Distribution Fig. 169.

Stenamma kurilense Arnol'di, 1975: 1825 - 1826, Fig.. Worker — USSR: Kurilsky Islands, Island of Kunashir, August, 1970, A. L. Tichomirova, found in unheated forest blanket (presumably litter) near Lake Goryachee. (ZMUM) [Examined].

WORKER

Measurements and associated statistics as listed in Appendix Table 17. Key statistics (measurement mean ± standard error of mean, n) are listed herein: TL (3.53 ± 0.081, 2), HL (0.81 ± 0.008, 2), HW (0.69 ± 0.016, 2), CI (85.18 ± 2.824, 2), SL (0.60 ± 0.008, 2), SI (87.28 ± 3.193, 2), AL (1.05 ± 0.016, 2), PRW (0.47 ± 0.016, 2), PL (0.40 ± 0.032, 2), PH (0.24 ± 0.000, 2).

HOLOTYPE Measurements. TL 3.44, HL 0.80, HW 0.70, EL 0.11, SL 0.59, CI 88, SI 84, AL 1.03, PRW 0.48, PL 0.37, PH 0.24.

Mandible with 7 teeth (apical 2 prominent); anterior clypeal margin in full face view with median lobe emarginate; apex in lateral view flat. Compound eye with 5 ommatidia in greatest diameter. Propodeal spines of moderate length, slightly less than ½ length of declivitous face of propodeum. Scape not reaching occiput (by amount slightly less than length of first funicular segment). [All funicular segments missing on holotype, left scape also damaged]. Metanotal impression of moderate depth, depth approximately ½ length of propodeal spines; extremely wide, approximately 3X as wide as deep, depth decreasing towards anterior. Propodeal spiracle unusually large for the size of the specimen. Propodeal plates well developed, over ½ as long as propodeal spines, directed posteriorly and slightly upward. Anterior subpetiolar process reduced. Petiole pedunculate, stalk approximately ½ length of petiole, node rising gradually. Anterior and posterior subpostpetiolar processes reduced to small bumps (almost obscured by glue in both specimens). Head rugose to scabrous except as follows: clypeus with four carinulae (2 on each side of emargination) converging towards frontal area; frontal

area carinate, carinae diverging posteriorly; central ⅓ of frontal ar((between antennal sockets) glassy-smooth; occipital area rugose; ve1 ter rugose to scabrous, becoming more scabrous towards gula ar midline of venter. Interstices glassy-smooth with piligerous and no1 piligerous punctures. Thoracic dorsum scabrous (almost carinate o pronotal humeri). Thoracic pleura scabrous (almost rugose towar(anterior and posterior borders). Neck of pronotum rugulose. Metanot: impression scrobiculate. Mesopleuron with scrobiculate median are: Coxae with faint, transverse carinae; remainder of legs smooth wit faint longitudinal carinae on femora. Propodeal dorsum with faintl rugose basal face, two transverse carinae between spines, and fai transverse carinae on declivitous face. Alitrunk interstices glass) smooth with scattered piligerous and non-piligerous punctures. Pet olar node dorsum faintly rugose; remaining surfaces scabrous excep venter of petiolar peduncle rugulose. Postpetiolar node dorsum rugos (almost scabrous); remaining surfaces scabrous (with a distinct longi tudinal orientation). First gastral tergite base carinate; carinae diverg ing towards posterior (longest carinae located near midline of tergit length almost equal to ½ length of postpetiole). First gastral sternit base with numerous short carinae, length of carinae not exceeding ½ length of postpetiole. Remainder of gaster glassy-smooth (even at higl magnifications), with scattered piligerous punctures. Setae on hea(erect to suberect (with a few decumbent setae on sides). Setae on scap(erect to suberect. Setae on alitrunk mostly erect to suberect. Setae o1 legs mostly appressed. Setae on petiole, postpetiole, and gaster mostly erect to suberect, except setae appressed on anterior surface of petiola node. Entire body brown in color; propodeum, petiole, and postpetiol(darkest with color turning lighter towards anterior and posterior Gaster and appendages yellow brown. Setae yellow.

Neither gyne nor male are currently known in this species.

COMPARISONS

S. kurilense is known only from its type locality and only from tw(workers. Therefore comparisons with other species are based on limited known variation. *S. kurilense* is most closely related to *S. ussuriense* based upon gross morphology (including surface sculpture). I believe it best to treat this as a separate species until additional specimens (including reproductives) are known (and we have a better understanding of variation within this species). Since only four species (*S. ussuriense*, *S. owstoni*, *S. nipponense*, and *S. kurilense*) occur in this part of Asia, the following comparisons were made.

S. kurilense is most likely to be confused with *S. ussuriense* in terms of overall sculpture and color. Both species have a punctate mesopleuron

and a bump representing the anterior petiolar process. Both also have medium sized eyes (as contrasted with the large eyes of *S. owstoni* and the small eyes of *S. nipponense*). However, the metanotal impression is not as wide in *S. ussuriense*. The postpetiolar node dorsum (when viewed from the rear) is flatter than that of *S. ussuriense*. Additionally, the declivitous face of the propodeum in *S. kurilense* has mode transverse carinae.

In comparing *S. owstoni* and *S. kurilense*, the petiolar and postpetiolar nodes are more shallow (and rise more gradually) in the former species. The compound eyes in *S. owstoni* are significantly larger. The anterior clypeal emargination is more shallow in the former species. The glassy-smooth area between the antennal insertions is narrower in the former species. The sides of the alitrunk are more punctate and rugose rather than scabrous as in *S. owstoni*. Both petiolar and postpetiolar node dorsa are more punctate in the former species. The carinae on the first gastral tergite do not extend as far as in *S. kurilense*. Propodeal spines of some specimens are shorter than in *S. kurilense* (however, the length of these spines is variable within species for most *Stenamma*). The faint transverse carinae are lacking on the declivitous face of the propodeum in *S. owstoni* (this area is glassy-smooth in that species). Thoracic dorsa are equally scabrous and rugose in both species, except there are more longitudinally oriented ridges in *S. kurilense*. The metanotal impression lacks the punctures of *S. nipponense* in both species and is wider in *S. owstoni* than in *S. kurilense*. Additionally, the anterior petiolar process is larger in *S. kurilense*.

When comparing *S. nipponense* and *S. kurilense*, the compound eye is considerably smaller in the former species. There are transverse carinae between the propodeal spines in both species, but they continue on the declivitous face of the propodeum in *S. nipponense* while the same area ia glassy-smooth in *S. kurilense*. The anterior clypeal emargination is more shallow in the former species. The procoxae and venter of both petiole and postpetiole are more punctate in the former species and more carinate (procoxae) and rugulose (venter) in the latter. There are significantly fewer carinae on the base of the first gastral tergite and they extend much less than in *S. kurilense*. Both petiolar and postpetiolar node dorsa are more punctate in the former species. The petiole is larger and the petiolar node dorsum (when viewed from the rear) is flatter in *S. nipponense*. The thoracic dorsum has more longitudinal orientation to the wrinkles in *S. kurilense* and the anterior ½ of the metanotal impression is more punctate in *S. nipponense*. Additionally, the metanotal impression is wider in *S. nipponense*. Both species have similar faint transverse carinae on the declivitous face of

the propodeum. The most significant difference in surface sculpture that *S. nipponense* is much more punctate than *S. kurilense*.

MATERIAL EXAMINED

RUSSIA: Kurilsky Islands, Kunashir Island, 8 August 1970, A. I Tichmirova, found in unheated forest blanket (presumably litter) nea Lake Goryachee (ZMUM — 2 workers).

Stenamma ussuriense Arnol'di

Worker Figs. 61, 65, 83, 95, 310 - 314.
Gyne Figs. 315 - 320. Male Figs. 321 - 326.
Distribution Fig. 327.

Stenamma ussuriense Arnol'di, 1975: 1825, Fig.. Worker, Gyne, Mal — USSR: "Kedrovaya Pad'" Preserve, Primorskiy Kray, August - Septem ber, 1964, G. M. Dlussky. (ZMUM) [Examined].

WORKER

Measurements and associated statistics as listed in Appendix Tabl 18. Key statistics (measurement mean ± standard error of mean, n) ar listed herein: TL (3.62 ± 0.048, 16), HL (0.82 ± 0.010, 17), HW (0.71 ± 0.010, 17), CI (86.08 ± 0.733, 17), SL (0.61 ± 0.007, 17), SI (86.55 ± 0.811, 17), AL (1.10 ± 0.014, 17), PRW (0.48 ± 0.007, 17), PL (0.42 ± 0.008, 17), PH (0.20 ± 0.002, 17).

LECTOTYPE WORKER. TL 3.86, HL 0.87, HW 0.74, EL 0.11, SL 0.66 CI 85, SI 89, AL 1.16, PRW 0.50, PL 0.43, PH 0.21.

Mandible with 7 - 9 teeth (apical two prominent), gap after secon apical tooth before denticles start (gap approximately same size a tooth). Anterior clypeal margin in full face view with median lobe weakl emarginate (with single prominent carinae extending on each side o emargination); apex in lateral view convex, then flat (near mandible) [Arnol'di indicated sides of head are slightly protuberant. I find the hea to be almost oval in outline. Arnol'di also indicated the compound eye to be smaller than the second funicular segment. I observed them to b larger than the first funicular segment (which is significantly large than the second funicular segment).] Compound eye with 7 - 8 ommatidia in greatest diameter. Scape not reaching occiput (lacking by amount equal to length of second funicular segment). [Arnol'di indi cated it did not reach by 1 - 1.5X its diameter.] Propodeal spines o moderate length, approximately ⅓ length of declivitous face of propodeun (shorter in some specimens). [Arnol'di indicated that basal face o propodeum is much longer than declivitous face]. Metanotal impressior very shallow, depth approximately ¼ length of propodeal spines; wide approximately 4X as wide as deep, depth decreasing towards anterior

A large pit is present at the posterior ventral edge of the pronotum (near procoxae) and is lined with microsetae. A similar pit is present between the bases of the meso- and meta-coxae. This latter pit is not lined with micro-setae. Propodeal plates approximately the same length as (or slightly shorter than) propodeal spines, directed posteriorly. Anterior subpetiolar process reduced to a small bump. Petiole pedunculate; stalk approximately ½ length of petiole, node rising gradually. Anterior subpostpetiolar process reduced to a small bump, posterior subpostpetiolar process reduced (nearly absent in some specimens). Head rugose (most similar to the sculpture of *S. westwoodii* and *S. debile*) except as follows: frontal area smooth with small carinulae (especially near clypeal emargination), carinulae diverging towards posterior; central ⅓ of frontal area (between antennal sockets) glassy-smooth; venter of head rugose; occipital area rugose. Interstices glassy-smooth throughout with scattered piligerous and non-piligerous punctures. Thoracic dorsum rugose with decided longitudinal orientation. Thoracic pleura rugose with decided longitudinal orientation, especially on side of propodeum and on humeral angles with mesopleuron densely punctulate to rugulose. Neck of pronotum punctulate. Metanotal impression weakly scrobiculate with surrounding sculpture blending into sculpture of impression. Mesopleuron with weakly scrobiculate median area. Procoxae transversely carinate, meso- and meta-coxae longitudinally carinate to smooth; femora with faint longitudinal carinae; remainder of legs glassy-smooth with scattered piligerous punctures. Propodeal dorsum with rugose (almost rugulose) basal face (with rugulose sculpture or transverse carinae between spines) and glassy-smooth declivitous face. Alitrunk interstices with granular appearance due to dense non-piligerous punctures. Petiolar node dorsum rugose (or faintly rugose); remaining surfaces heavily punctulate. Postpetiolar node dorsum rugose (or faintly rugose); remaining surfaces heavily punctulate. First gastral tergite base carinate with numerous carinae diverging towards posterior (longest carinae located near midline of tergite, ½ length of postpetiole). First gastral sternite base glassy-smooth with almost no trace of carinae. Remainder of gaster glassy-smooth (even at high magnifications), with scattered piligerous punctures. Setae on head suberect to appressed. Setae on clypeus erect, setae on mandible decumbent to appressed. Setae on scape and funiculus appressed. Setae on alitrunk erect to suberect, setae on legs mostly decumbent to appressed with a few suberect setae on coxae. Setae on anterior surface of petiolar node appressed, setae on dorsum, posterior surface and side decumbent to suberect. Setae of venter of petiole absent. Setae on postpetiole suberect to decumbent on all

surfaces, becoming more decumbent on anterior surface of node. Set on gaster suberect to decumbent. Color predominantly brown wi alitrunk dark brown and appendages yellow brown. Tip of gaster al yellow brown. Compound eyes black. Setae yellow.

GYNE

Measurements and associated statistics as listed in Appendix Tab 18. Key statistics are listed herein: TL (4.50 ± 0.063, 4), HL (0.90 0.012, 4), HW (0.79 ± 0.013, 4), CI (88.44 ± 2.592, 4), SL (0.66 ± 0.00 4), SI (83.79 ± 0.753, 4), AL (1.38 ± 0.032, 4), PRW (0.66 ± 0.010, 4), I (0.54 ± 0.008, 4), PH (0.25 ± 0.006, 4).

As described for worker except as follows: mandible with 8 - 10 teet (apical 2 prominent); anterior clypeal margin in full face view wit median lobe weakly emarginate (with one prominent and one fai carina on each side of emargination). Compound eye with 16 - 1 ommatidia in greatest diameter. Scape not reaching occiput (lacking b amount equal to length of first and second funicular segments Propodeal spines of moderate to short length, approximately ¼ lengt of declivitous face of propodeum. Metanotal impression obscured b thoracic modifications associated with flight. Petiole pedunculate an thick; stalk slightly less than ½ length of petiole. Thoracic pleur glassy-smooth (on mesopleuron below suture). Mesopleuron with weakl scrobiculate median area (almost a long trough with few ridges Propodeal dorsum with transversely carinate basal face, transvers carinae between spines, and glassy-smooth declivitous face. Firs gastral tergite base carinate with numerous carinae diverging toward posterior (length of longest carina ⅓ length of postpetiole).

MALE

Measurements and associated statistics as listed in Appendix Tabl 18. Key statistics are presented herein: TL (3.55 ± 0.040, 2), HL (0.6 ± 0.016, 2), HW (0.50 ± 0.032, 2), CI (81.50 ± 3.119, 2), SL (0.22 ± 0.020 2), SI (44.28 ± 1.176, 2), AL (1.23 ± 0.024, 2), PRW (0.59 ± 0.008, 2), PI (0.41 ± 0.008, 2), PH (0.19 ± 0.004, 2).

As described for worker except as follows: mandible with 3 teeth anterior clypeal margin in full face view evenly convex (and lackin carinae); apex in lateral view convex. Compound eye with greater thai 25 ommatidia in greatest diameter. Scape not reaching occiput (and no reaching level of anterior ocellus by amount equal to length of secon and third funicular segments). Propodeal spines reduced to smal bumps. Metanotal impression obscured by thoracic modification associated with flight. A small pit is present at the posterior ventral edg of the pronotum (near procoxae) and is lined with microsetae. A simila

pit is present between the bases of the meso- and meta-coxae. This latter pit is not lined with setae. Notauli present, but not prominent. Propodeal plates just less than ⅓ length of declivitous face of propodeum, directed posteriorly. Petiole pedunculate; stalk less than ½ length of petiole, thick. Head faintly rugose and densely punctate to punctulate, leading to a granular appearance (rugae nearly obscured by punctures) except as follows: central ⅓ of frontal area (between antennal sockets) punctate to punctulate. Interstices punctate to punctulate with numerous non-piligerous punctures. Thoracic dorsum rugose with decided longitudinal orientation. Thoracic pleura faintly rugose with decided longitudinal orientation (almost obscured by heavy punctures). Neck of pronotum densely punctulate. Mesopleuron with scrobiculate median area. Propodeal dorsum with rugulose basal face (with transverse carinae between spines) and transversely carinate declivitous face. Alitrunk interstices with granular appearance due to dense non-piligerous punctures. Petiolar node dorsum glassy-smooth; remaining surfaces rugulose, becoming punctulate near venter, venter punctulate. Postpetiolar node dorsum glassy-smooth; remaining surfaces rugulose, becoming punctulate near venter, venter punctulate. First gastral tergite base weakly carinate with some carinae diverging towards posterior (longest carinae located near midline of tergite, length ¼ to ⅓ length of postpetiole). First gastral sternite base glassy-smooth with no trace of carinae. Setae on head decumbent to appressed. Setae on clypeus erect. Setae on mandible suberect to appressed. Setae on scape and funiculus decumbent to appressed. Setae on alitrunk erect to appressed (mostly appressed), setae of legs decumbent to appressed with a few suberect setae on coxae. Setae on anterior surface of petiolar node appressed, setae on dorsum, posterior surface, and side suberect. Setae absent from venter of petiole. Setae of postpetiole suberect on all surfaces except setae erect on venter. Setae on gaster suberect to decumbent. Head, alitrunk, and petiole dark brown, postpetiole and gaster brown, appendages yellow brown. Wings gray. Setae mostly white to gray on head and alitrunk, setae yellow on gaster.

DISCUSSION

Little is known concerning the biology of this species. Arnol'di provided the following information.

> "Primorskiy Kray, 'Kedrovaya Pad' Preserve. Type worker, allotype queen and male and paratypes (5 workers). Loose cedar leaves, August - September of 1964 (by Mr. Dlussky). 8 workers, 3 queens, 1 male found in Suputinsky Preserve by Tichmirova and Dlussky."

> 'The appearance [of this species] is similar to *S. nipponense*, but there are many distinctions. In our species all segments of the funiculus starting with the second one are transversal (in [*S.*] *nipponense* 8th segment is square). Shoulders of the thorax are rounded on top and do not protrude to the sides. There are sharp differences in their petioles. *S. ussuriense*'s segments are much heavier; its node is higher and sharper at the top, and obviously longer than cylindrical part, and both segments of the petiole are transversely rugate. The species is more similar to *S. westwoodii* [*S. debile* in this revision] but there are sharp differences in size and shape of setae on the legs.' (Arnol'di, 1975: 1825. Translation by S. Goldgof).

This species has been collected several times in Kedrovaya Pad. Thi is a small preserve in the Khasanskiy Province of Primorskiy Kra [southern maritime region in far east Russia; Vladivostok is th capital.]. Kedr is the Siberian name for some species of *Pinus*. *Pinu koraiensis* is the only kedr in far east Russia. Pad is a term used i Siberia and the Far East as a name for ravines and valleys of stream and small rivers between high, but gently sloping hills [which have th native name sopka]. This preserve lies in the valley of the small riv Kedrovaya. (A. Antropov, pers. comm.).

LECTOTYPE DESIGNATION

After examining the type series of *S. ussuriense*, I noted that n specimen is clearly designated holotype or type. The type localit appears to be Primorisky Kray, based upon the translation of Arnol'di' work. There are several collections from different dates from thi locality. Arnol'di did not indicate separate measurements for th holotype. In order to reduce possible future confusion, I designated on worker as lectotype and included a red, partly handwritten lab (*Stenamma ussuriense* LECTOTYPE (middle)) as this is the middl specimen on the pin. It is a fairly typical specimen. Although there i some dirt on the specimen, it is covered by much less glue than th remaining specimens. The lectotype has been returned to the ZMUV

COMPARISONS

This species might be confused with *S. kurilense*, *S. owstoni*, or *S nipponense*. *S. kurilense* is most likely to be confused with *S. ussuriens* based upon general body appearance, color and sculpture. Both hav a punctate lower mesopleuron. They have a similar sized bump on th petiolar venter and both have medium sized eyes (for *Stenamma*). Th metanotal impression is not as wide in *S. kurilense*. The dorsal profil

of the postpetiole is flatter in *S. ussuriense* and the declivitous face of the propodeum has more transverse carinae in *S. kurilense*.

S. owstoni will not be as readily confused with *S. ussuriense*. It has significantly larger eyes (for its size) and it is significantly larger. The petiolar dorsal profile (when viewed from the posterior) is flatter. There are no basal carinae between the propodeal spines and the metanotal impression is deeper and wider in *S. owstoni*.

S. nipponense might also be confused with *S. ussuriense*. However, the propodeal spines are larger and the petiole is longer (with a longer peduncle) and the node has less height than *S. ussuriense*. The anterior subpetiolar process is more reduced in *S. nipponense* and the pit at the base of the procoxae is more prominent in *S. nipponense* as well.

MATERIAL EXAMINED

RUSSIA: Primorskiy Kray, Kedrovaya Pad Preserve, 24 VIII 1964, G. M. Dlussky (ZMUM — 1 worker); Kedrovaya Pad Preserve, oak forest, 24 VIII 1964, G. M. Dlussky, 64-132 (ZMUM — 3 workers); Kedrovaya Pad Preserve, 3 IX 1964, G. M. Dlussky, 64-171 (ZMUM — 1 worker, 1 male); Kedrovaya Pad Preserve, southern slope, 6 IX 1964, G. M. Dlussky (ZMUM — 2 workers, 1 gyne); Suputinka, [32 - 35 km SE Ussuriysk], source, 18 V 1967, A. L. Tichmirova (ZMUM — 4 workers, 1 gyne); Suputinka, [32 - 35 km SE Ussuriysk], valley of the saline source, 28 V 1967, A. L. Tichmirova (ZMUM — 5 workers); Suputinka, [32 - 35 km SE Ussuriysk], 19 IX 1964, G. M. Dlussky, 64-223 (ZMUM — 2 workers, 2 gynes, 1 male). [Above labels translated from Russian by A. Antropov].

Stenamma bhutanense Urbani

Worker Figs. 96 - 98.

Distribution Fig. 99.

Stenamma bhutanense Urbani, 1977: 420 - 422, figs. 2, 4. Worker — BHUTAN: Dechhia Paka, ca. 5 km West of Pelela, 3300 m. [Holotype NHMB, 7 Paratypes NHMB, 1 Paratype BMNH — Examined].

WORKER

Measurements and associated statistics are listed in Appendix Table 19. Key statistics (measurement mean ± standard error of mean, n) are listed herein: TL (3.49 ± 0.029, 9), HL (0.76 ± 0.008, 9), HW (0.67 ± 0.008, 9), CI (87.57 ± 0.691, 9), SL (0.52 ± 0.004, 9), SI (78.33 ± 0.684, 9), AL (1.00 ± 0.005, 9), PRW (0.48 ± 0.005, 9), PL (0.38 ± 0.005, 9), PH (0.27 ± 0.003, 9).

HOLOTYPE Measurements. TL 3.59, HL 0.79, HW 0.69, EL 0.13, SL 0.53, CI 88, SI 77, AL 1.01, PRW 0.50, PL 0.39, PH 0.27.

Mandible with 9 teeth (apical 3 prominent); anterior clypeal margin

in full face view with median lobe flat; apex in lateral view fla Compound eye with 6 ommatidia in greatest diameter. Propodeal spin of moderate length, approximately ⅓ length of declivitous face propodeum. Metanotal impression shallow; nearly half as deep lengt of propodeal spines; over 2 times as wide as deep, depth decreasi towards anterior. Deep pit present at posterior and ventral edge pronotum (near procoxae). Propodeal plates approximately half as lor as propodeal spines, directed posteriorly and slightly upwards. Anteri subpetiolar process reduced. Petiole pedunculate, node rising abrupt from stalk, stalk less than ½ length of petiole. Anterior and posteri subpostpetiolar processes greatly reduced. Head carinate (includin frontal area; carinae diverging towards posterior) except as follow central ⅓ of frontal area (between antennal sockets) glassy-smoot clypeal area with 2 carinulae extending from each side of median are converging towards frontal area; occiput almost costate; gular are weakly carinate, almost glassy-smooth near mandibles. Interstic glassy-smooth with scattered piligerous and non-piligerous puncture Thoracic dorsum costate to rugose (most ridges longitudinally parallel Thoracic pleura costate. Neck of pronotum rugulose to rugose. Metanot impression very weakly scrobiculate, almost obscured by predomina sculpturing. Mesopleuron median area with only predominant thorac sculpture (not scrobiculate). Coxae carinulate to rugulose (more rug lose towards posterior); remainder of legs glassy-smooth with nume ous piligerous punctures. Propodeal dorsum with transversely costat basal face and weakly transversely costate declivitous face (approac ing glassy-smooth near posterior). Alitrunk interstices glassy-smoot with scattered piligerous punctures. Petiolar node dorsum punctat and rugose; anterior and posterior surfaces and sides heavily rugos venter rugulose. Postpetiolar node dorsum punctate and rugos anterior and posterior surfaces and sides rugose; venter punctate. Firs gastral tergite base carinate with carinae diverging towards posterio (longest carinae located near midline of tergite, length not exceedin 0.20 to 0.25 length of postpetiole). First gastral sternite base similar t first gastral tergite. Remainder of gaster glassy-smooth (even at hig magnifications), with scattered piligerous punctures. Setae on hea numerous, short, subdecumbent to suberect (except long erect setae o anterior clypeal margin); setae on scape suberect. Setae on alitrun much longer, erect to suberect. Setae on petiole, postpetiole and gaste suberect to subdecumbent. Setae on legs decumbent to appressed Entire body shining dark brown, appendages and posterior tip of gaste lighter brown. Setae yellow.

At present, no gynes nor males of this species are known.

DISCUSSION. *S. bhutanense* is known from a single locality. No further information regarding its biology is known.

COMPARISONS. *S. bhutanense* appears to be most closely related to *S. owstoni* based upon head and thoracic sculpturing and petiolar profile. However, *S. owstoni* is much larger.

The four Himalayan species examined (*S. gurkhalis*, *S. kashmirense*, *S. jeriorum*, and *S. bhutanense*) converge in that all have a shining dark brown color. All four species also have a deep pit at the posterior and ventral edge of the pronotum. Although this feature is found in all *Stenamma* examined, it appears to be most prominent in these three.

S. kashmirense and *S. jeriorum* have propodeal plates greater than or equal to the length of propodeal spines while the propodeal plates in *S. gurkhalis* and *S. bhutanense* are (at most) 0.75 the length of the propodeal spines.

S. bhutanense differs from *S. gurkhalis* in those characters previously mentioned in the keys. For example, the compound eyes of *S. bhutanense* are larger (0.11 mm or greater in length), while the compound eyes of *S. gurkhalis* are typically 0.10 mm or less less in length. The antennal scape of the former species is significantly shorter (0.53 mm or less) than the antennal scape of *S. gurkhalis*.

MATERIAL EXAMINED

BHUTAN: Dechhia Paka, 5 km W Pelela, 3300 m, 19-20 VI 1972, NHMB - Bhutan Expedition (holotype worker and 7 paratype workers — NHMB; 1 paratype worker — BMNH).

***Stenamma gurkhalis* sp. n.**

Worker Figs.: 51, 74, 87, 126 - 129.
Distribution Fig. 130.

WORKER

Measurements and associated statistics are listed in Appendix Table 20. Key statistics (measurement mean ± standard error of mean, n) are listed herein: TL (3.34 ± 0.206, 4), HL (0.87 ± 0.037, 4), HW (0.72 ± 0.036, 4), CI (82.32 ± 0.816, 4), SL (0.66 ± 0.027, 4), SI (92.85 ± 1.023, 4), AL (1.11 ± 0.054, 4), PRW (0.49 ± 0.027, 4), PL (0.43 ± 0.021, 4), PH (0.19 ± 0.010, 4).

HOLOTYPE Measurements. TL 3.76, HL 0.95, HW 0.80, EL 0.10, SL 0.72, CI 85, SI 90, AL1.24, PRW 0.55, PL 0.47, PH 0.21.

Mandible with 6 - 8 teeth (apical 3 most prominent); anterior clypeal margin in full face view with median lobe emarginate (edges of emargination approaching teeth); apex in lateral view convex, almost flat near mandible. Compound eye with 5 ommatidia in greatest diameter.

Propodeal spines of moderate length, approximately ½ length declivitous face of propodeum. Metanotal impression well developed nearly ½ as deep as length of propodeal spines; over 2X as wide as deep depth decreasing towards anterior. Propodeal plates almost 0.75 a long as propodeal spines, directed posteriorly. Anterior subpetiol process prominent. Petiole pedunculate, stalk almost ½ length petiole. Anterior and posterior subpostpetiolar processes greatly r duced. Head carinate - rugulose, approaching costate near mandibl and occipital vertex except as follows: frontal area carinulate, carinul diverging posteriorly; central ⅓ of frontal area between antenn sockets glassy-smooth; clypeal area with 2 carinulae extending fro each side of emargination converging towards frontal area. Interstic with numerous small non-piligerous and piligerous punctures. Th racic dorsum rugose (with well developed rugae). Thoracic pleur punctate (density of punctures increasing towards center of pleura Neck of pronotum punctate (approaching punctulate) with some rug extending partly onto neck. Metanotal impression scrobiculate (a proaching rugose on dorsum near anterior portion of impressio Mesopleuron with scrobiculate median area. Procoxae carinulate o anterior surface, approaching punctulate on posterior surface, remai ing coxae rugulose with numerous non-piligerous punctures. Remai der of legs punctulate throughout. Propodeal dorsum rugose (wit numerous small non-piligerous punctures in some specimens). Alitrun interstices with numerous small piligerous and non-piligerous pun tures. Petiolar node dorsum carinate (approaching rugose toward posterior); remaining surfaces densely punctate and punctulate (i cluding dorsum and venter of stalk). Postpetiolar node dorsum carina (approaching rugose towards posterior); remaining surfaces punctulat First gastral tergite base carinate with carinae diverging toward posterior (longest carinae located near midline of tergite, not exceedin ⅓ length of postpetiole). First gastral sternite base glassy-smooth (o with several carinulae at the extreme edge). Remainder of gaster glassy smooth (even at high magnifications), with some piligerous punctures Setae on most body surfaces moderately dense, erect to decumben and of irregular length. Setae on peduncle and venter of petiole absen Entire body dark brown, appendages and gaster lighter. Setae yellow

At present, no gynes nor males of this species are known.

DISCUSSION

Holotype bears a red, partly handwritten label *Stenamma gurkhali* HOLOTYPE.

S. gurkhalis is known only from a single locality. No further informa tion regarding its biology is known. It is suspected the dark coloratio

may be an adaptation to conserve thermal energy given the elevation from which this species was collected.

ETYMOLOGY

This species is named after one of the groups of people living in the area where it was first collected (Nepal), the Gurkhas. I am especially thankful for the support provided while collecting ants in 1997, especially to Narbahudar Limbu.

COMPARISONS

This species is most closely related to *S. owstoni* based upon thoracic and head sculpture and petiolar profile. It can be separated from the latter species due to the smaller size of the former.

MATERIAL EXAMINED

NEPAL: Phulchoki, 30 V 1983, 2800 m elevation, M. Brendell (BMNH - 3 workers, including holotype) (MCZ - 1 worker).

Stenamma orientale Species Group

Oriental ants with foveolate thoracic and propodeal dorsa. Anterior subpetiolar process greatly reduced. Wing venation presently unknown (since males and gynes unknown).

This species group contains a single species, *S. orientale* which is sufficiently distinct and does not appear to have any close relatives (based on morphology and geographic isolation). These ants appear hypogaeic (currently known only from soil samples). Although presently known from scattered localities on Borneo, this species may have a wider distribution (perhaps the area surrounding the Sunda Shelf). It may have been overlooked due to its secretive nature.

***Stenamma orientale* sp. n.**

Worker Figs 41 - 43, 210 - 212.
Distribution Fig. 213.

WORKER

Measurements and associated statistics are listed in Appendix Table 21. Key statistics (measurement mean ± standard error of mean, n) are listed herein: TL (3.27 ± 0.104, 7), HL (0.87 ± 0.003, 7), HW (0.60 ± 0.006, 7), CI (84..26 ± 0.010, 7), SL (0.58 ± 0.004, 7), SI (95.83 ± 0.008, 7), AL (0.85 ± 0.024, 7), PRW (0.49 ± 0.008, 7), PL (0.40 ± 0.007, 7), PH (0.23 ± 0.005, 7).

HOLOTYPE Measurements. TL 3.32, HL 0.71, HW 0.61, EL 0.14, SL 0.58, CI 86, SI 95, AL 1.14, PRW 0.50, PL 0.40, PH 0.24.

Mandible with 6 teeth (badly worn in one specimen examined);

anterior clypeal margin in full face view with median lobe convex, apc in lateral view convex. Compound eye with 7 ommatidia in greate diameter. Propodeal spines of moderate length, approximately ⅓ lengt of declivitous face of propodeum. Scape not surpassing occiput. Metanot impression well developed; nearly equal in depth to length of propode spines. Propodeal plates of approximately equal length to propode spines, directed somewhat dorsally (giving the appearance of a additional set of propodeal spines). Anterior subpetiolar process great reduced, almost nonexistent. Petiole pedunculate; stalk almost ' length of petiole. Anterior and posterior subpostpetiolar processe absent. Head carinate (with most ridges weakly defined), approachin costate in occipital area, except as follows: frontal area carinulat carinulae diverging posteriorly; clypeal area smooth, almost glassy smooth. Interstices glassy-smooth with some small piligerous punc tures. Thoracic dorsum foveolate. Thoracic pleura foveolate-reticulat Neck of pronotum glassy-smooth. Metanotal impression glassy-smoot Mesopleuron with weakly foveolate (almost smooth) median area. Coxa and remainder of legs glassy-smooth with irregular piligerous punc tures. Propodeal dorsum weakly foveolate (almost smooth). Alitrun interstices glassy-smooth with irregular, small piligerous puncture Petiolar node dorsum glassy-smooth with a few well rounded carina remaining surfaces glassy-smooth except venter near anterior subpetiol process variolate. Postpetiolar node dorsum foveate (edges somewh rounded); remaining surfaces glassy-smooth. First gastral tergite bas glassy-smooth with a trace of carinae diverging towards posterior. Firs gastral sternite base glassy-smooth. Remainder of gaster glassy smooth (even at high magnifications), with some piligerous puncture Setae on most body surfaces moderately dense, erect to decumben setae of irregular length. Setae of peduncle and venter of petiole absen Entire body brown. Setae yellow.

Neither gyne nor male are presently known in this species.

DISCUSSION

S. orientale is known only from two localities (as isolated specimens It has been collected as part of a soil core in mixed dipterocarp fores and in Berlese Funnel extractions of leaf mold. No other informatio regarding its biology is known. This species is unique in that it is th only member of *Stenamma* which is known from this region. R. Taylo (who collected the majority of specimens) indicated he has taken funn samples in many parts of western Malaysia, Sarawak, Sabah, an Singapore but took *Stenamma* only in Sarawak (pers. comm.).

COMPARISONS

This species is not closely related to any known *Stenamma*; hence its placement within its own species group. I have not attempted to place it near another species group; such a placement should wait until the ants in surrounding regions are better known and additional specimens (including queens and males) are available.

MATERIAL EXAMINED

Type Locality. SARAWAK: First Division, Semengoh Forest Reserve, c. 19 km SW of Kuching (1.33 N, 110.20 E) (c. 2 km S of 10th mile Bazaar, on Kuching-Penrissen Road). Type specimens collected 28-31 V 1968 by Robert W. Taylor (Acc. 68.196) consisting of holotype worker and three paratype workers. Holotype deposited in ANIC (no. 7772) along with paratype worker. One paratype worker from the above series deposited in MHNG and one paratype worker deposited in MDPC. All specimens were collected from leaf mould berlesate in rainforest and are mounted on points (except one worker discussed below).

One additional paratype worker from type locality was collected on 1-4 VI 1968 (deposited in ANIC — Acc. 68.262), one paratype worker from type locality was collected on 28-31 VI 1968 (deposited in ANIC — Acc. 68.204), and one paratype worker from type locality was collected on 28-31 V 1968 (in alcohol, deposited in ANIC — Acc. 68.199). Holotype worker is coated with gold-palladium for SEM, one paratype worker is mounted beneath holotype as this depicts colors closest to those of holotype before coating. One additinal paratype worker: Fourth Division, Gunong Mulu National Park, II 1978, N. M. Collins (BMNH).

Species Incertae Sedis

No specimens which appear to represent these two species could be discovered during the course of this study. It appears probable that the types have been lost. Given the original descriptions and lack of suitable identifying characters coupled with large gaps in the known distribution of *Stenamma* (geographically and over time), it appears best to regard these taxa as *incertae sedis*.

Stenamma westwoodii asiatica Ruzsky

Stenamma westwoodii asiatica Ruzsky, 1905: 711 - 712. Worker — TURKESTAN, Ser-Darinskya District, Aulieata [type specimen has been lost — Prof. G. M. Dlussky, pers. comm.]

Since no specimens of this subspecies are known to presently exist and the only description is in Russian, I provide the following translation. No known illustrations of this species exist (and the description below would benefit from line drawings). It appears that there may be

a unique form of *Stenamma* in Turkestan. Further collecting should l attempted to determine whether some of the other *Stenamma* speci are synonyms of this form (such as *Stenamma sogdianum* fro Samarkand or *S. debile*).

"WORKER. Head is wide, wider than thorax, oblong, with slightly prominent sides, slightly narrowing in the back, with occipital margin straight. Antennal scape almost reaching occiput; the surface of the scape has fine, longitudinal rugae; the first segment of the funiculus is long, three times longer than the others combined; the second segment is the smallest one, it is very short and wide; the rest of the segments up to the seventh are wider than long, gradually and increasing and developing into a four segmented club. Mandibles are shining, with heavy lengthwise rugae and punctures; first two teeth are large, others are very small. Little eyes are centered on the sides of the head, slightly closer to the front. Facial shield [frontal lobes?] has fine rugae and two keel shaped lengthwise, slightly diverging rugae; little space between them is depressed and rather shining, back side of facial shield, depressed between wide forehead rollers [antennal insertions ?] and bordering forehead, is very narrow, smooth and shining. Forehead is smooth and shining. There is deep suture between meso-metanotum. Most of the epinotum is straight, with rather straight profile. Teeth of the epinotum are not big, pointed upward, similar to the ones in typical *westwoodi* [*S. debile* in this revision]. The first segment of the pedicel is long with narrow cylindrical front, with small tooth; its node is slightly elevated in the shape of the right curved angle with equally sloping sides; second node is almost as wide as long. Dull, abdomen is smooth and shining. Sides [of head?] and occiput have fine, but heavy net-like rugae. There is thick, lengthwise rugae on the forehead and crown. Thorax is rugose; there is lengthwise rugae on the sides, that continues on the front part, pronotum, and main surface, meso-metanotum; rugae changes into sideways pattern and becomes lengthwise rugae on the top of the promesonotum; although the rugae on the thorax (in the area of the meso-metasternum) is vague. Sloping surface of the epinotum is sideways rugose. There is fine rugae on the first node; the top of the second one and its sides are smooth or almost smooth and shining. Head is covered with short, semi-sticking [decumbent?] hair which partly stick out (on oc-

ciput); thorax, petiole and abdomen have sticking out [suberect or erect?] hair; there is fine hair on the first two parts of the body and thick pointed backwards hair on the first two parts of the body and thick pointed backwards hair on the abdomen. There is thick sticking [appressed?] hair on the legs and antenna (hair is finer on the scape of the antenna). Head and thorax are reddish and yellowish-brown; petiole, abdomen and legs are dirty yellow (or yellowish-brown); there is a brown spot on the top of the first very large segment of the abdomen. Length is 3 mm. "

"This subspecies is similar to *St. westwoodi neoarcticum* Mayr (from North America) by the nature of the build of the head and thorax, but it differs from it by its light coloring, shape and build of the second node. It is very similar to the typical *St. westwoodi*; it is noted not only for its body coloring, but also by dull coloring of the head and thorax, and its smaller in size. Males and females are not known.

"Inhabitance: Turkystan, Ser-Darinskya district, city Aulieata, worker found in a loose garden soil near a tree, 2.XI.1900 (Retuger)." (Ruzsky, 1905: 711 - 712 — translated by S. Goldgof).

DISCUSSION

S. westwoodi asiatica is known only from the above locality. No other information regarding its biology is known, nor have any additional records surfaced since its original collection. Since the original collection was in November and some North American *Stenamma* have been recently shown to only be conspicuously present above ground during the winter months (DuBois and Davis, 1998), this species should be searched for in November.

I tentatively could place this species in the *westwoodii* group (near *S.debile*) based upon the superficial similarities mentioned in the above description. Given the type locality and that of *S. ucrainicum* (=*S. debile* in this revision), these two species could be closely related (or synonymous). It is also possible that *S. sogdianum* and this species are related (or synonymous). Without specimens, I choose to leave this taxon as *incertae sedis*. Palpal formula is unknown (but presumed to be the same as all other *Stenamma* examined during this study).

MATERIAL EXAMINED

None. Type specimen could not be located (G. Dlussky and A. Antropov, pers. comm.). Specimens should have been among ZMUM collection (which was searched by above individuals). No material

examined fit the above description.

Stenamma berendti (Mayr)

Aphaenogaster berendti Mayr, 1868: 82, figs. 78, 79. Male — Balt Amber [not examined].

Stenamma berendti; Wheeler, 1914: 53. Male — Baltic Amber [n examined].

Since no specimens could be located, the following translation Mayr's (1868) description (diagnosis in Latin and description in Ge man) is presented, followed by a discussion of Wheeler's (1914) descri tion of a second specimen and a brief analysis.

MALE

"Body length 2.2 mm. Nearly naked, fine rugae; first segment of funiculus thickened, following segment one third longer; metanotum elongate, [propodeum] with two bumps; petiole pedunculate, very long, lacking distinct node; wing infuscate. "

"In Berendt collection, 1 piece."

"Male. Clear red brown, almost black. Only with solitary fine setae and extremely fine irregular rugae. The paltry stalk [scape] barely reached the first ocellus. The first funicular segment is thick, as long as the cylindrical second segment, the third segment is shorter than the second. The following segments gradually increase in length and thickness. Behind the elongated metanotum are two knobs. The petiole is almost cylindrical only a little depressed in front near the thorax and lacks a distinct node. The postpetiole is conical in outline. The male of this species is closest to *Aphaenogaster testaceo-pilosa* Luc. although this one's node is more swollen. The forewing appears to have only one abnormality, the cross vein which separates the cubital vein from the interior cubital cell. Other than the single cubital cell, which is the only mistake [!], this species clearly belongs to *Aphaenogaster*. Also, the forewing has a cross vein branching from the cubital vein behind the union of the pterostigma which approaches cross vein one. The partition of the cubital vein is not normally with one cubital cell. This abnormality would make proper determination difficult for the unskilled due to the size of this specimen. This male also has converging lines on the mesonotum [notauli?] which is peculiar as all *Aphaenogaster* lack this."

"This male is not placed near *Aphaenogaster sommerfelti*

because the body size is much smaller in proportion." (Mayr, 1868: 82; translation by this author).

Wheeler (1914: 53) described a second specimen which he located in the Geological Institute of Koenigsberg collection (no number). This second specimen measured 2.5 mm in total body length. Wheeler placed this species in *Stenamma* due to the single cubital cell which he indicated was characteristic of *Stenamma* (as opposed to the two cubital cells of *Aphaenogaster*). Wheeler also indicated that Mayr described the Mayrian Furrows (notauli) as lacking and that they were present in the specimen he examined. Based on my translation of Mayr's original description, I believe Mayr indicated the presence of notauli on the first specimen. His original description is repeated below (untranslated):

"...Eigenthümlich ist auch, dass dieses Männchen die convergirenden Linien am Mesonotum eigendrückt hat, ..." (Mayr, 1868).

Wheeler also indicated the compound eyes are too small in Mayr's original Fig.. Unfortunately, Wheeler did not include another Fig. for comparison. Both authors describe similar colors for the specimens (Mayr — clear reddish brown, almost black [piceous]; Wheeler — black [piceous]). On Wheeler's specimen, the legs and gaster were brown. Mayr indicated the wings to be smoky gray brown with a black tinge; Wheeler indicated the wings were pale brown with concolorous veins. These colors agree with those observed for modern *Stenamma* males with the exception of Mayr's infuscate term.

Mayr's figure indicated the head to be flattened (reminiscent of certain *Aphaenogaster* males, but not as pronounced). Additionally, the propodeal spines were reduced to a bump which is much more prominent than in any extant *Stenamma* species examined. The petiolar node profile does not conform with those found in modern species either. However, the genitalia appear to be fully retractile (and appear to be retracted in Mayr's Fig.) as in modern *Stenamma*.

With total lengths of 2.2 and 2.5 mm, these males are quite small for *Stenamma*. Most males examined fell within the range of 3.2 to 4.2 mm with an average of 3.8 mm.

Given the above differences in body size, shape, and coloration, I do not believe this species is closely related to any modern group of *Stenamma*. Some of the characters depicted by this species are presumed to be primitive states and were used to clarify relationships among other species. It is difficult to assign a more specific relationship with known *Stenamma* without examining specimens. It is also possible that these specimens represent males of one of the smaller and lesser known genera within the Stenammimi. Palpal formulas were not

recorded by either Wheeler nor Mayr and this would have helped clari placement of these specimens within this tribe.

MATERIAL EXAMINED.

None. Neither type specimen nor Wheeler's specimen could l located in spite of numerous queries of most European museums (thos listed among museums earlier).

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APPENDIX

METHODS AND MATERIALS

All measurements were taken manually using a Wild M5A dissecting microscope with calibrated ocular micrometer. These measurements were stored in a Paradox (version 3.5) database and analyzed using Quattro Pro (version 4.0) and Minitab (version 9.0). A full database of all measurements is available upon request from the author. Not all measurements are discussed elsewhere in the text. They are provided herein as additional information regarding the range of structural size in Palaearctic and Oriental *Stenamma*. Selected statistics (in the following tables) provide a summary of known population variation for these species.

It is probable that not all measurements follow a normal distribution. In many instances, the known population is too small to accurately depict any distribution. Therefore, the median value was selected for inclusion as an alternate measure of central tendency; it may be more meaningful to describe small sample sizes (particularly if the samples do not follow a normal distribution).

Latitude and longitude of all specimens examined was also recorded in the Paradox database. This information was then exported as data points which were used to create the distribution maps using Geodat (version 2.0).

Drawings were made using the camera lucida attachment to the Wild M5A dissecting microscope. All SEM photographs by the author were created using an Amray Scanning Electron Microscope (model 1800). Specimens were coated with a gold-palladium mixture (approximate thickness of 200 Angstroms) and photographed at 15 KVA.

APPENDIX TABLE 1

Stenamma westwoodii measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	12	40.30%	48.53%	44.00%	2.32%	0.669%	44.03
AL	12	1.01	1.22	1.11	0.060	0.017	1.09
CI	11	80.91%	89.42%	84.75%	2.543%	0.767%	84.21
EL	11	0.06	0.10	0.09	0.011	0.003	0.08
HL	11	0.77	0.92	0.85	0.046	0.014	0.87
HW	11	0.66	0.79	0.72	0.041	0.013	0.72
OI	11	7.27%	12.50%	10.15%	1.436%	0.433%	10.00
PH	12	0.20	0.25	0.22	0.016	0.005	0.21
PL	12	0.35	0.50	0.42	0.042	0.012	0.42
PRW	12	0.43	0.55	0.49	0.033	0.009	0.49
PW	12	0.15	0.19	0.17	0.015	0.004	0.17
PPH	12	0.21	0.26	0.23	0.016	0.005	0.23
PPL	12	0.21	0.29	0.26	0.024	0.007	0.26
PPW	12	0.20	0.29	0.23	0.028	0.008	0.23
SI	11	85.71%	97.62%	91.79%	3.716%	1.120%	91.67
SL	11	0.60	0.71	0.66	0.034	0.010	0.66
TL	11	3.32	4.03	3.67	0.228	0.069	3.67

Stenamma westwoodii measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Mediar
AI	5	45.45%	50.59%	47.90%	2.09%	0.936%	48.39%
AL	5	1.37	1.50	1.45	0.053	0.024	1.47
CI	5	82.76%	89.66%	87.31%	2.942%	1.316%	88.96%
EL	5	0.21	0.26	0.24	0.018	0.008	0.24
HL	5	0.92	0.93	0.93	0.008	0.004	0.93
HW	5	0.77	0.84	0.81	0.026	0.012	0.82
OI	5	22.61%	28.07%	25.74%	1.975%	0.883%	25.86%
PH	5	0.26	0.29	0.28	0.013	0.006	0.27
PL	5	0.50	0.60	0.54	0.038	0.017	0.55
PRW	5	0.64	0.72	0.69	0.034	0.015	0.69
PW	5	0.19	0.24	0.22	0.018	0.008	0.21
PPH	5	0.29	0.31	0.29	0.007	0.003	0.29
PPL	5	0.29	0.34	0.32	0.021	0.009	0.32
PPW	5	0.27	0.31	0.29	0.014	0.006	0.29
SI	5	84.31%	95.83%	89.74%	4.512%	2.018%	90.20%
SL	5	0.69	0.74	0.72	0.020	0.009	0.72
TL	5	4.44	4.75	4.65	0.127	0.057	4.72

Stenamma westwoodii measurements (continued). Males

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	12	43.53%	52.22%	48.74%	2.93%	0.846%	49.69%
AL	12	1.30	1.51	1.41	0.055	0.016	1.42
CI	12	83.72%	95.35%	90.60%	3.610%	1.042%	90.70%
EL	12	0.26	0.32	0.28	0.019	0.005	0.29
HL	12	0.64	0.74	0.69	0.025	0.007	0.69
HW	12	0.58	0.66	0.62	0.027	0.008	0.63
OI	12	37.21%	46.51%	41.31%	2.810%	0.811%	41.86%
PH	12	0.19	0.24	0.22	0.016	0.005	0.21
PL	12	0.43	0.50	0.46	0.024	0.007	0.47
PRW	12	0.60	0.76	0.69	0.044	0.013	0.69
PW	12	0.17	0.23	0.19	0.016	0.005	0.19
PPH	13	0.19	0.26	0.22	0.016	0.005	0.23
PPL	13	0.26	0.29	0.27	0.012	0.003	0.27
PPW	13	0.23	0.27	0.25	0.016	0.004	0.26
SI	12	39.02%	51.28%	43.23%	3.341%	0.964%	43.04%
SL	12	0.24	0.32	0.27	0.024	0.007	0.27
TL	12	3.91	4.40	4.08	0.144	0.042	4.09

APPENDIX TABLE 2.

Stenamma debile measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	360	38.46%	55.32%	44.78%	2.20%	0.12%	44.68%
AL	360	0.85	1.45	1.09	0.07	0.004	1.08
CI	355	75.00%	93.62%	85.12%	2.60%	0.14%	85.11%
EL	355	0.06	0.21	0.09	0.01	0.001	0.09
HL	355	0.69	0.97	0.83	0.04	0.002	0.84
HW	355	0.56	0.84	0.71	0.04	0.002	0.71
OI	355	4.83%	17.71%	7.35%	1.06%	0.06%	8.00%
PH	359	0.17	0.27	0.22	0.01	0.001	0.23
PL	359	0.32	0.52	0.40	0.04	0.002	0.40
PRW	360	0.39	0.68	0.49	0.03	0.002	0.48
PW	359	0.13	0.21	0.17	0.01	0.001	0.16
PPH	355	0.18	0.29	0.23	0.02	0.001	0.23
PPL	355	0.19	0.32	0.26	0.02	0.001	0.26
PPW	355	0.18	0.29	0.23	0.02	0.001	0.23
SI	355	78.05%	97.83%	88.21%	3.35%	0.18%	88.10%
SL	355	0.52	0.79	0.63	0.04	0.002	0.63
TL	346	2.87	4.59	3.60	0.23	0.012	3.59

Stenamma debile measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	68	44.16%	55.48%	49.48%	2.63%	0.32%	49.43%
AL	68	1.08	1.55	1.35	0.09	0.011	1.37
CI	66	81.13%	94.23%	87.22%	3.12%	0.38%	87.27%
EL	67	0.09	0.26	0.21	0.03	0.003	0.22
HL	67	0.74	0.98	0.90	0.05	0.006	0.90
HW	66	0.68	0.87	0.78	0.04	0.005	0.79
OI	67	8.05%	20.93%	17.21%	1.85%	0.23%	18.00%
PH	68	0.21	0.29	0.26	0.02	0.002	0.26
PL	68	0.35	0.61	0.48	0.05	0.006	0.48
PRW	68	0.50	0.76	0.67	0.05	0.006	0.68
PW	68	0.16	0.23	0.20	0.02	0.002	0.21
PPH	66	0.23	0.32	0.27	0.02	0.002	0.27
PPL	66	0.24	0.37	0.30	0.03	0.004	0.29
PPW	66	0.23	0.32	0.27	0.02	0.002	0.27
SI	64	79.25%	95.92%	85.51%	3.66%	0.46%	85.26%
SL	65	0.60	0.76	0.67	0.03	0.004	0.66
TL	65	3.57	4.93	4.35	0.29	0.036	4.41

Stenamma debile measurements (continued). Males

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	68	43.21%	63.10%	51.19%	4.39%	0.53%	51.78%
AL	68	1.21	1.65	1.42	0.11	0.013	1.42
CI	66	73.81%	97.22%	87.26%	3.53%	0.43%	87.20%
EL	67	0.21	0.30	0.26	0.02	0.002	0.27
HL	67	0.56	0.79	0.68	0.06	0.007	0.68
HW	66	0.50	0.69	0.59	0.05	0.007	0.59
OI	67	17.71%	25.76%	21.98%	1.68%	0.20%	23.00%
PH	68	0.18	0.26	0.22	0.02	0.002	0.22
PL	68	0.39	0.60	0.47	0.04	0.005	0.47
PRW	68	0.56	0.87	0.73	0.08	0.010	0.74
PW	68	0.14	0.23	0.19	0.02	0.002	0.19
PPH	67	0.19	0.28	0.24	0.02	0.003	0.23
PPL	67	0.22	0.34	0.28	0.03	0.003	0.27
PPW	67	0.19	0.32	0.26	0.03	0.004	0.26
SI	66	36.59%	58.06%	44.98%	3.83%	0.47%	44.44%
SL	67	0.21	0.31	0.27	0.02	0.003	0.27
TL	65	3.48	4.63	4.07	0.31	0.038	4.07

APPENDIX TABLE 3.

Stenamma sardoum measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	3	42.03%	47.62%	44.04%	3.11%	1.795%	42.47%
AL	3	1.01	1.18	1.10	0.081	0.047	1.11
CI	3	82.76%	86.54%	84.92%	1.946%	1.124%	85.45%
EL	3	0.08	0.10	0.09	0.009	0.005	0.08
HL	3	0.84	0.93	0.89	0.048	0.028	0.89
HW	3	0.72	0.77	0.75	0.025	0.014	0.76
OI	3	9.09%	10.34%	9.68%	0.630%	0.364%	9.62%
PH	3	0.19	0.24	0.21	0.028	0.016	0.19
PL	3	0.37	0.42	0.39	0.025	0.014	0.39
PRW	3	0.47	0.50	0.48	0.016	0.009	0.48
PW	3	0.16	0.18	0.17	0.009	0.005	0.18
PPH	3	0.19	0.23	0.21	0.016	0.009	0.21
PPL	3	0.23	0.26	0.25	0.19	0.011	0.26
PPW	3	0.19	0.24	0.22	0.025	0.014	0.23
SI	3	89.36%	93.75%	92.15%	2.422%	1.399%	93.33%
SL	3	0.68	0.72	0.69	0.028	0.016	0.68
TL	3	3.51	3.93	3.65	0.237	0.137	3.53

APPENDIX TABLE 4.

Stenamma orousseti measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	11	41.56%	49.23%	45.57%	2.33%	0.703%	45.71%
AL	11	0.87	1.24	1.07	0.096	0.029	1.06
CI	11	79.55%	87.27%	84.07%	2.489%	0.750%	84.91%
EL	11	0.08	0.11	0.09	0.011	0.003	0.09
HL	11	0.71	0.93	0.85	0.062	0.019	0.87
HW	11	0.56	0.77	0.71	0.061	0.018	0.72
OI	11	8.93%	12.07%	10.61%	0.892%	0.269%	10.91%
PH	11	0.19	0.26	0.23	0.022	0.007	0.23
PL	11	0.34	0.50	0.43	0.044	0.013	0.43
PRW	11	0.39	0.52	0.49	0.040	0.012	0.51
PW	11	0.14	0.19	0.17	0.013	0.004	0.17
PPH	11	0.20	0.26	0.23	0.019	0.006	0.24
PPL	11	0.19	0.29	0.25	0.032	0.010	0.24
PPW	11	0.19	0.26	0.23	0.018	0.006	0.23
SI	11	81.25%	98.92%	87.78%	5.604%	1.690%	86.96%
SL	11	0.52	0.74	0.62	0.053	0.016	0.63
TL	11	2.93	4.06	3.67	0.312	0.094	3.72

Stenamma orousseti measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	4	46.67%	50.68%	49.02%	1.952%	0.977%	49.36%
AL	4	1.18	1.45	1.34	0.128	0.064	1.37
CI	4	86.44%	88.68%	87.65%	0.920%	0.460%	87.74%
EL	4	0.19	0.24	0.21	0.023	0.011	0.20
HL	4	0.79	0.95	0.88	0.071	0.036	0.89
HW	4	0.69	0.82	0.77	0.058	0.029	0.78
OI	4	22.64%	25.45%	23.84%	1.346%	0.673%	23.65%
PH	4	0.24	0.29	0.27	0.021	0.010	0.27
PL	4	0.42	0.52	0.48	0.044	0.022	0.50
PRW	4	0.60	0.72	0.66	0.056	0.028	0.65
PW	4	0.18	0.21	0.19	0.013	0.007	0.19
PPH	4	0.26	0.32	0.29	0.027	0.014	0.28
PPL	4	0.21	0.39	0.28	0.075	0.037	0.27
PPW	4	0.26	0.27	0.27	0.009	0.005	0.27
SI	4	82.00%	90.70%	87.04%	3.663%	1.831%	87.73%
SL	4	0.63	0.72	0.67	0.041	0.020	0.66
TL	4	3.78	4.93	4.44	0.495	0.247	4.52

Stenamma orousseti measurements (continued). Males

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	1	N/A	N/A	54.05%	N/A	N/A	54.05%
AL	1	N/A	N/A	1.19	N/A	N/A	1.19
CI	1	N/A	N/A	86.67%	N/A	N/A	86.67%
EL	1	N/A	N/A	0.24	N/A	N/A	0.24
HL	1	N/A	N/A	0.60	N/A	N/A	0.60
HW	1	N/A	N/A	0.52	N/A	N/A	0.52
OI	1	N/A	N/A	40.00%	N/A	N/A	40.00%
PH	1	N/A	N/A	0.21	N/A	N/A	0.21
PL	1	N/A	N/A	0.45	N/A	N/A	0.45
PRW	1	N/A	N/A	0.64	N/A	N/A	0.64
PW	1	N/A	N/A	0.17	N/A	N/A	0.17
PPH	1	N/A	N/A	0.21	N/A	N/A	0.21
PPL	1	N/A	N/A	0.23	N/A	N/A	0.23
PPW	1	N/A	N/A	0.24	N/A	N/A	0.24
SI	1	N/A	N/A	49.23%	N/A	N/A	49.23%
SL	1	N/A	N/A	0.26	N/A	N/A	0.26
TL	1	N/A	N/A	3.47	N/A	N/A	3.47

N/A = Not Applicable.

APPENDIX TABLE 5.

Stenamma kashmirense measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	46	41.54%	48.48%	44.15%	1.586%	0.234%	43.94%
AL	46	0.93	1.08	1.02	0.033	0.005	1.01
CI	46	80.61%	89.80%	84.89%	2.175%	0.321%	85.11%
EL	46	0.08	0.11	0.10	0.009	0.001	0.10
HL	46	0.74	0.81	0.77	0.017	0.003	0.77
HW	46	0.60	0.71	0.66	0.024	0.003	0.64
OI	46	10.20%	15.22%	13.00%	1.161%	0.171%	13.00%
PH	46	0.16	0.21	0.18	0.010	0.002	0.19
PL	46	0.35	0.45	0.41	0.019	0.003	0.41
PRW	46	0.42	0.52	0.45	0.018	0.003	0.45
PW	46	0.14	0.18	0.16	0.008	0.001	0.16
PPH	46	0.17	0.23	0.19	0.010	0.002	0.19
PPL	46	0.23	0.29	0.25	0.011	0.002	0.26
PPW	46	0.18	0.23	0.20	0.011	0.002	0.20
SI	46	80.95%	91.36%	87.03%	2.498%	0.368%	87.34%
SL	46	0.54	0.60	0.57	0.014	0.002	0.57
TL	46	3.22	3.61	3.42	0.091	0.013	3.42

APPENDIX TABLE 6.

Stenamma jeriorum measurements.

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	31	41.04%	46.03%	44.15%	1.255%	0.225%	44.26%
AL	31	0.89	1.09	1.02	0.041	0.007	1.01
CI	31	86.73%	95.65%	89.55%	1.936%	0.348%	89.36%
EL	31	0.08	0.11	0.10	0.008	0.001	0.10
HL	31	0.69	0.82	0.77	0.027	0.005	0.77
HW	31	0.64	0.74	0.68	0.021	0.004	0.68
OI	31	10.64%	14.58%	12.97%	0.866%	0.155%	12.77%
PH	31	0.19	0.22	0.20	0.008	0.001	0.21
PL	31	0.34	0.43	0.38	0.021	0.004	0.39
PRW	31	0.40	0.48	0.45	0.017	0.003	0.45
PW	31	0.15	0.18	0.17	0.007	0.001	0.17
PPH	31	0.18	0.22	0.20	0.010	0.002	0.20
PPL	31	0.21	0.26	0.23	0.015	0.003	0.23
PPW	31	0.19	0.23	0.21	0.009	0.002	0.21
SI	31	77.78%	86.05%	81.82%	2.158%	0.388%	81.71%
SL	31	0.52	0.60	0.56	0.019	0.003	0.56
TL	31	2.98	3.53	3.39	0.111	0.020	3.41

APPENDIX TABLE 7.

Stenamma petiolatum measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	20	37.66%	49.18%	43.14%	2.818%	0.630%	43.40
AL	20	0.93	1.42	1.17	0.168	0.037	1.18
CI	20	80.33%	90.20%	85.23%	3.278%	0.733%	85.26
EL	20	0.07	0.10	0.08	0.008	0.002	0.08
HL	20	0.74	1.01	0.88	0.092	0.021	0.86
HW	20	0.64	0.85	0.74	0.061	0.014	0.74
OI	20	7.76%	12.77%	9.84%	1.615%	0.361%	9.82%
PH	20	0.19	0.27	0.23	0.021	0.005	0.23
PL	20	0.34	0.55	0.44	0.088	0.020	0.44
PRW	20	0.42	0.60	0.50	0.057	0.013	0.50
PW	20	0.14	0.19	0.17	0.014	0.003	0.16
PPH	20	0.21	0.27	0.24	0.022	0.005	0.24
PPL	20	0.21	0.27	0.24	0.021	0.005	0.24
PPW	20	0.21	0.26	0.23	0.015	0.003	0.23
SI	20	82.61%	100.00%	92.25%	5.938%	1.328%	92.46
SL	20	0.56	0.81	0.69	0.091	0.020	0.68
TL	20	3.19	4.52	3.85	0.489	0.109	3.86

Stenamma petiolatum measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	3	50.60%	55.00%	52.36%	2.326%	1.343%	51.49
AL	3	1.29	1.63	1.42	0.183	0.106	1.34
CI	3	82.35%	91.07%	88.06%	4.941%	2.853%	90.74
EL	3	0.23	0.24	0.24	0.009	0.005	0.24
HL	3	0.87	1.09	0.96	0.122	0.070	0.90
HW	3	0.79	0.90	0.84	0.058	0.034	0.82
OI	3	20.59%	27.78%	25.05%	3.896%	2.249%	26.79
PH	3	0.24	0.26	0.25	0.009	0.005	0.26
PL	3	0.45	0.63	0.53	0.092	0.053	0.50
PRW	3	0.68	0.84	0.74	0.085	0.049	0.71
PW	3	0.19	0.23	0.21	0.019	0.011	0.23
PPH	3	0.24	0.29	0.26	0.025	0.014	0.26
PPL	3	0.26	0.32	0.28	0.034	0.019	0.27
PPW	3	0.27	0.31	0.29	0.016	0.009	0.29
SI	3	82.35%	108.93%	91.65%	14.977%	8.647%	83.67
SL	3	0.66	0.98	0.77	0.181	0.105	0.68
TL	3	4.27	5.23	4.60	0.544	0.314	4.31

APPENDIX TABLE 8.

Stenamma msilanum measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	7	41.33%	47.62%	43.77%	2.222%	0.840%	43.42%
AL	7	1.01	1.24	1.18	0.078	0.029	1.21
CI	7	76.67%	87.72%	83.79%	3.885%	1.468%	85.19%
EL	7	0.06	0.10	0.08	0.013	0.005	0.08
HL	7	0.87	0.97	0.90	0.031	0.012	0.90
HW	7	0.72	0.81	0.76	0.028	0.011	0.74
OI	7	6.67%	10.71%	8.93%	1.549%	0.585%	9.09%
PH	7	0.21	0.24	0.23	0.013	0.005	0.23
PL	7	0.42	0.50	0.46	0.031	0.012	0.47
PRW	7	0.48	0.53	0.52	0.021	0.008	0.53
PW	7	0.14	0.19	0.17	0.018	0.007	0.16
PPH	7	0.19	0.24	0.22	0.017	0.007	0.23
PPL	7	0.23	0.32	0.27	0.032	0.012	0.27
PPW	7	0.18	0.26	0.21	0.026	0.010	0.21
SI	6	89.58%	115.22%	96.28%	9.566%	3.905%	93.61%
SL	6	0.69	0.85	0.73	0.061	0.025	0.72
TL	7	3.67	4.12	3.94	0.158	0.060	3.96

Stenamma msilanum measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	2	43.91%	53.61%	48.76%	6.858%	4.850%	48.76%
AL	2	1.43	1.56	1.50	0.093	0.066	1.50
CI	2	82.76%	88.89%	85.82%	4.335%	3.065%	85.82%
EL	2	0.23	0.26	0.24	0.023	0.016	0.24
HL	2	0.93	1.01	0.97	0.057	0.040	0.97
HW	2	0.77	0.90	0.84	0.091	0.064	0.84
OI	2	24.14%	25.40%	24.77%	0.890%	0.629%	24.77%
PH	2	0.27	0.31	0.29	0.023	0.016	0.29
PL	2	0.55	0.56	0.56	0.011	0.008	0.56
PRW	2	0.63	0.84	0.73	0.148	0.105	0.73
PW	2	0.19	0.21	0.20	0.011	0.008	0.20
PPH	2	0.27	0.29	0.28	0.011	0.008	0.28
PPL	2	0.32	0.42	0.37	0.068	0.048	0.37
PPW	2	0.29	0.29	0.29	0.000	0.000	0.29
SI	2	89.29%	91.67%	90.48%	1.684%	1.190%	90.48%
SL	2	0.71	0.81	0.76	0.068	0.048	0.76
TL	2	4.80	5.12	4.96	0.228	0.161	4.96

APPENDIX TABLE 9.

Stenamma striatulum measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	28	40.91%	47.62%	45.02%	1.995%	0.377%	45.08%
AL	28	0.89	1.16	1.01	0.070	0.013	1.01
CI	28	80.85%	90.57%	86.35%	2.515%	0.475%	86.36%
EL	28	0.06	0.11	0.09	0.012	0.002	0.10
HL	28	0.69	0.89	0.79	0.054	0.010	0.77
HW	28	0.60	0.77	0.68	0.051	0.010	0.68
OI	28	9.09%	14.58%	11.78%	1.572%	0.297%	12.37%
PH	28	0.19	0.26	0.22	0.017	0.003	0.23
PL	28	0.34	0.45	0.37	0.029	0.005	0.37
PRW	28	0.39	0.52	0.46	0.039	0.007	0.44
PW	28	0.14	0.18	0.16	0.011	0.002	0.16
PPH	28	0.19	0.26	0.23	0.018	0.003	0.23
PPL	28	0.18	0.27	0.23	0.030	0.006	0.23
PPW	28	0.19	0.26	0.22	0.018	0.003	0.23
SI	28	82.98%	97.37%	89.91%	3.830%	0.724%	90.36%
SL	28	0.55	0.66	0.61	0.029	0.005	0.61
TL	28	2.95	3.75	3.37	0.230	0.044	3.34

Stenamma striatulum measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	9	46.75%	52.78%	50.48%	2.094%	0.698%	51.19%
AL	9	1.13	1.35	1.21	0.071	0.024	1.18
CI	9	85.71%	92.00%	88.37%	2.376%	0.792%	88.24%
EL	9	0.17	0.23	0.19	0.016	0.005	0.19
HL	9	0.77	0.92	0.81	0.044	0.015	0.81
HW	9	0.68	0.82	0.71	0.045	0.015	0.71
OI	9	21.00%	25.00%	23.55%	1.349%	0.450%	24.00%
PH	9	0.23	0.27	0.25	0.015	0.005	0.25
PL	9	0.39	0.50	0.43	0.036	0.012	0.42
PRW	9	0.57	0.69	0.61	0.036	0.012	0.61
PW	9	0.17	0.23	0.19	0.015	0.005	0.19
PPH	8	0.24	0.29	0.26	0.014	0.005	0.26
PPL	8	0.24	0.32	0.27	0.030	0.011	0.26
PPW	8	0.26	0.31	0.27	0.019	0.007	0.26
SI	9	84.44%	90.91%	87.68%	2.350%	0.783%	88.24%
SL	9	0.60	0.71	0.63	0.033	0.011	0.61
TL	8	3.77	4.46	3.94	0.224	0.079	3.86

***Stenamma striatulum* measurements (continued). Males**

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	3	52.78%	56.52%	54.79%	1.888%	1.090%	55.07%
AL	3	1.11	1.16	1.13	0.028	0.016	1.11
CI	3	80.56%	85.71%	82.74%	2.669%	1.541%	81.94%
EL	3	0.23	0.24	0.24	0.009	0.005	0.24
HL	3	0.56	0.58	0.57	0.009	0.005	0.58
HW	3	0.47	0.48	0.47	0.008	0.005	0.47
OI	3	38.89%	42.86%	41.14%	2.036%	1.176%	41.67%
PH	3	0.20	0.21	0.21	0.005	0.003	0.21
PL	3	0.35	0.35	0.35	0.000	0.000	0.35
PRW	3	0.61	0.63	0.62	0.009	0.005	0.61
PW	3	0.16	0.18	0.17	0.009	0.005	0.16
PPH	3	0.20	0.21	0.20	0.005	0.003	0.20
PPL	3	0.19	0.23	0.21	0.016	0.009	0.21
PPW	3	0.19	0.23	0.21	0.016	0.009	0.21
SI	3	33.90%	41.38%	37.31%	3.782%	2.184%	36.67%
SL	3	0.16	0.19	0.18	0.016	0.009	0.18
TL	3	3.24	3.36	3.30	0.065	0.038	3.28

APPENDIX TABLE 10.

***Stenamma lippulum* measurements. Workers**

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	88	39.71%	47.69%	44.76%	1.685%	0.180%	44.78%
AL	88	1.00	1.27	1.16	0.064	0.007	1.18
CI	85	79.25%	90.74%	85.57%	2.520%	0.273%	85.71%
EL	84	0.08	0.13	0.10	0.014	0.001	0.10
HL	85	0.81	0.95	0.87	0.038	0.004	0.87
HW	85	0.66	0.81	0.75	0.034	0.004	0.76
OI	84	9.09%	15.09%	11.56%	1.404%	0.153%	11.22%
PH	88	0.19	0.29	0.23	0.017	0.002	0.24
PL	88	0.34	0.48	0.40	0.031	0.003	0.40
PRW	88	0.43	0.60	0.52	0.032	0.003	0.52
PW	88	0.14	0.21	0.18	0.014	0.001	0.18
PPH	88	0.21	0.31	0.25	0.018	0.002	0.24
PPL	88	0.24	0.34	0.29	0.025	0.003	0.29
PPW	88	0.19	0.27	0.24	0.017	0.002	0.24
SI	85	80.00%	97.83%	86.99%	2.912%	0.316%	86.67%
SL	85	0.60	0.72	0.65	0.027	0.003	0.64
TL	85	3.33	4.22	3.79	0.172	0.019	3.82

Stenamma lippulum measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	3	48.78%	55.81%	51.87%	3.593%	2.075%	51.02%
AL	3	1.32	1.58	1.43	0.134	0.077	1.38
CI	3	86.44%	88.33%	87.69%	1.080%	0.624%	88.29%
EL	3	0.23	0.26	0.24	0.016	0.009	0.24
HL	3	0.89	0.97	0.94	0.038	0.022	0.95
HW	3	0.79	0.85	0.82	0.032	0.019	0.82
OI	3	25.23%	26.67%	25.77%	0.781%	0.451%	25.42%
PH	3	0.24	0.32	0.28	0.041	0.023	0.29
PL	3	0.50	0.52	0.50	0.009	0.005	0.50
PRW	3	0.64	0.81	0.74	0.085	0.049	0.77
PW	3	0.19	0.26	0.23	0.032	0.019	0.23
PPH	3	0.26	0.35	0.30	0.049	0.028	0.29
PPL	3	0.31	0.35	0.33	0.025	0.014	0.34
PPW	3	0.26	0.32	0.29	0.032	0.019	0.29
SI	3	84.91%	88.24%	86.29%	1.737%	1.003%	85.71%
SL	3	0.68	0.72	0.71	0.028	0.016	0.72
TL	3	4.31	4.99	4.63	0.343	0.198	4.60

APPENDIX TABLE 11.

Stenamma georgii measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	18	40.30%	47.14%	43.71%	1.857%	0.438%	43.56%
AL	18	1.03	1.26	1.13	0.061	0.014	1.13
CI	18	81.82%	90.57%	85.48%	2.565%	0.604%	84.73%
EL	18	0.06	0.11	0.09	0.011	0.003	0.10
HL	18	0.81	0.93	0.86	0.035	0.008	0.85
HW	18	0.68	0.79	0.73	0.035	0.008	0.72
OI	18	8.00%	13.21%	10.46%	1.362%	0.321%	10.91%
PH	18	0.21	0.24	0.22	0.013	0.003	0.21
PL	18	0.35	0.43	0.40	0.025	0.006	0.40
PRW	18	0.43	0.53	0.49	0.026	0.006	0.50
PW	18	0.14	0.21	0.16	0.017	0.004	0.16
PPH	17	0.21	0.24	0.23	0.013	0.003	0.23
PPL	17	0.23	0.39	0.28	0.037	0.009	0.27
PPW	17	0.21	0.26	0.23	0.013	0.003	0.24
SI	18	83.33%	93.02%	89.07%	2.668%	0.629%	89.25%
SL	18	0.61	0.69	0.65	0.025	0.006	0.65
TL	17	3.48	3.96	3.68	0.163	0.040	3.64

Stenamma georgii measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	1	N/A	N/A	47.83%	N/A	N/A	47.83%
AL	1	N/A	N/A	1.48	N/A	N/A	1.48
CI	1	N/A	N/A	88.33%	N/A	N/A	88.33%
EL	1	N/A	N/A	0.26	N/A	N/A	0.26
HL	1	N/A	N/A	0.97	N/A	N/A	0.97
HW	1	N/A	N/A	0.85	N/A	N/A	0.85
OI	1	N/A	N/A	26.67%	N/A	N/A	26.67%
PH	1	N/A	N/A	0.31	N/A	N/A	0.31
PL	1	N/A	N/A	0.55	N/A	N/A	0.55
PRW	1	N/A	N/A	0.71	N/A	N/A	0.71
PW	1	N/A	N/A	0.23	N/A	N/A	0.23
PPH	1	N/A	N/A	0.29	N/A	N/A	0.29
PPL	1	N/A	N/A	0.35	N/A	N/A	0.35
PPW	1	N/A	N/A	0.27	N/A	N/A	0.27
SI	1	N/A	N/A	81.13%	N/A	N/A	81.13%
SL	1	N/A	N/A	0.69	N/A	N/A	0.69
TL	1	N/A	N/A	4.75	N/A	N/A	4.75

N/A - Not applicable

APPENDIX TABLE 12.

Stenamma hissarianum measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	18	41.79%	47.62%	44.55%	1.938%	0.457%	44.89%
AL	18	0.97	1.13	1.03	0.046	0.011	1.01
CI	18	80.39%	87.76%	84.63%	1.952%	0.460%	84.86%
EL	18	0.09	0.11	0.10	0.009	0.002	0.10
HL	18	0.74	0.87	0.80	0.032	0.008	0.80
HW	18	0.63	0.74	0.67	0.027	0.006	0.67
OI	18	11.46%	14.58%	12.97%	0.865%	0.204%	12.86%
PH	17	0.19	0.23	0.21	0.011	0.003	0.21
PL	18	0.31	0.40	0.36	0.029	0.007	0.35
PRW	18	0.42	0.48	0.46	0.021	0.005	0.45
PW	18	0.14	0.18	0.16	0.010	0.002	0.16
PPH	18	0.19	0.23	0.21	0.009	0.002	0.21
PPL	18	0.23	0.27	0.24	0.014	0.003	0.24
PPW	18	0.19	0.24	0.22	0.011	0.003	0.22
SI	18	85.00%	97.67%	90.41%	3.569%	0.841%	89.44%
SL	18	0.55	0.68	0.61	0.038	0.009	0.61
TL	18	3.20	3.70	3.44	0.144	0.034	3.45

Stenamma hissarianum measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	2	49.38%	56.72%	53.05%	5.186%	3.667%	53.05
AL	2	1.08	1.30	1.19	0.159	0.113	1.19
CI	2	88.24%	88.46%	88.35%	0.160%	0.113%	88.35
EL	2	0.24	0.24	0.24	0.000	0.000	0.24
HL	2	0.82	0.84	0.83	0.011	0.008	0.83
HW	2	0.72	0.74	0.73	0.011	0.008	0.73
OI	2	28.85%	29.41%	29.13%	0.400%	0.283%	29.13
PH	2	0.26	0.27	0.27	0.011	0.008	0.27
PL	2	0.43	0.45	0.44	0.011	0.008	0.44
PRW	2	0.61	0.64	0.63	0.023	0.016	0.63
PW	2	0.18	0.24	0.21	0.046	0.032	0.21
PPH	2	0.24	0.27	0.26	0.023	0.016	0.26
PPL	2	0.26	0.27	0.27	0.011	0.008	0.27
PPW	2	0.26	0.29	0.27	0.023	0.016	0.27
SI	2	84.44%	89.13%	86.79%	3.313%	2.343%	86.79
SL	2	0.61	0.66	0.64	0.034	0.024	0.64
TL	2	3.83	4.27	4.05	0.307	0.217	4.05

Stenamma hissarianum measurements (continued). Males

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	1	N/A	N/A	45.68%	N/A	N/A	45.68
AL	1	N/A	N/A	1.30	N/A	N/A	1.30
CI	1	N/A	N/A	87.50%	N/A	N/A	87.50
EL	1	N/A	N/A	0.29	N/A	N/A	0.29
HL	1	N/A	N/A	0.64	N/A	N/A	0.64
HW	1	N/A	N/A	0.56	N/A	N/A	0.56
OI	1	N/A	N/A	45.00%	N/A	N/A	45.00
PH	1	N/A	N/A	0.21	N/A	N/A	0.21
PL	1	N/A	N/A	0.43	N/A	N/A	0.43
PRW	1	N/A	N/A	0.60	N/A	N/A	0.60
PW	1	N/A	N/A	0.16	N/A	N/A	0.16
PPH	1	N/A	N/A	0.23	N/A	N/A	0.23
PPL	1	N/A	N/A	0.24	N/A	N/A	0.24
PPW	1	N/A	N/A	0.24	N/A	N/A	0.24
SI	1	N/A	N/A	51.43%	N/A	N/A	51.43
SL	1	N/A	N/A	0.29	N/A	N/A	0.29
TL	1	N/A	N/A	3.75	N/A	N/A	3.75

N/A = Not Applicable.

APPENDIX TABLE 13.

Stenamma picetojuglandeti measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	3	42.42%	46.77%	44.71%	2.183%	1.260%	44.93%
AL	3	1.00	1.11	1.06	0.057	0.033	1.06
CI	3	83.02%	88.46%	85.46%	2.764%	1.596%	84.91%
EL	3	0.10	0.11	0.10	0.009	0.005	0.10
HL	3	0.84	0.85	0.85	0.009	0.005	0.85
HW	3	0.71	0.74	0.72	0.016	0.009	0.72
OI	3	11.32%	13.46%	12.03%	1.236%	0.714%	11.32%
PH	3	0.21	0.23	0.21	0.009	0.005	0.21
PL	3	0.37	0.39	0.38	0.009	0.005	0.37
PRW	3	0.45	0.50	0.47	0.025	0.014	0.47
PW	3	0.16	0.18	0.17	0.009	0.005	0.16
PPH	3	0.23	0.23	0.23	0.000	0.000	0.23
PPL	3	0.24	0.27	0.26	0.016	0.009	0.26
PPW	3	0.23	0.24	0.23	0.009	0.005	0.23
SI	3	82.61%	88.64%	85.23%	3.090%	1.784%	84.44%
SL	3	0.61	0.63	0.62	0.009	0.005	0.61
TL	3	3.53	3.70	3.64	0.102	0.059	3.70

Stenamma picetojuglandeti measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	6	46.99%	51.28%	49.20%	1.682%	0.687%	49.10%
AL	6	1.26	1.34	1.30	0.036	0.015	1.30
CI	6	85.19%	87.27%	86.28%	1.026%	0.419%	86.38%
EL	6	0.21	0.24	0.23	0.017	0.007	0.24
HL	6	0.87	0.90	0.88	0.013	0.005	0.88
HW	6	0.74	0.77	0.76	0.016	0.006	0.76
OI	6	24.07%	27.78%	26.21%	1.684%	0.687%	27.03%
PH	6	0.23	0.26	0.24	0.013	0.005	0.23
PL	6	0.40	0.47	0.44	0.024	0.010	0.44
PRW	6	0.61	0.66	0.64	0.017	0.007	0.64
PW	6	0.19	0.21	0.20	0.008	0.003	0.19
PPH	6	0.23	0.26	0.25	0.013	0.005	0.26
PPL	6	0.24	0.27	0.26	0.013	0.005	0.27
PPW	6	0.24	0.27	0.26	0.016	0.006	0.27
SI	6	82.61%	86.96%	84.81%	1.578%	0.644%	85.26%
SL	6	0.61	0.66	0.64	0.018	0.007	0.64
TL	6	4.15	4.40	4.25	0.098	0.040	4.23

Stenamma picetojuglandeti measurements (continued). Males

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	6	47.44%	48.72%	47.93%	0.485%	0.198%	47.86%
AL	6	1.26	1.35	1.29	0.039	0.016	1.29
CI	6	86.49%	94.29%	89.61%	2.962%	1.209%	89.19%
EL	6	0.24	0.27	0.27	0.013	0.005	0.27
HL	6	0.56	0.61	0.59	0.017	0.007	0.60
HW	6	0.52	0.53	0.53	0.007	0.003	0.53
OI	6	40.54%	48.57%	45.04%	2.885%	1.178%	45.34%
PH	5	0.21	0.21	0.21	0.000	0.000	0.21
PL	5	0.37	0.43	0.39	0.026	0.012	0.39
PRW	6	0.60	0.64	0.62	0.017	0.007	0.62
PW	5	0.16	0.19	0.18	0.011	0.005	0.18
PPH	6	0.21	0.23	0.22	0.007	0.003	0.23
PPL	6	0.21	0.29	0.25	0.026	0.011	0.24
PPW	6	0.24	0.26	0.25	0.009	0.004	0.25
SI	6	45.45%	48.48%	46.70%	1.487%	0.607%	46.16%
SL	6	0.24	0.26	0.25	0.008	0.003	0.24
TL	5	3.48	3.85	3.63	0.135	0.060	3.61

APPENDIX TABLE 14.

Stenamma sogdianum measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	21	42.42%	50.00%	45.08%	1.921%	0.419%	45.00%
AL	21	0.93	1.06	0.98	0.036	0.008	0.98
CI	21	82.61%	89.13%	85.25%	1.792%	0.391%	85.42%
EL	21	0.08	0.11	0.10	0.006	0.001	0.10
HL	21	0.72	0.79	0.76	0.015	0.003	0.76
HW	21	0.61	0.68	0.65	0.016	0.003	0.64
OI	21	10.87%	14.89%	12.54%	0.744%	0.162%	12.50%
PH	21	0.16	0.20	0.19	0.010	0.002	0.19
PL	21	0.31	0.40	0.35	0.022	0.005	0.35
PRW	21	0.42	0.47	0.44	0.014	0.003	0.43
PW	21	0.13	0.14	0.14	0.008	0.002	0.14
PPH	21	0.16	0.19	0.18	0.009	0.002	0.19
PPL	21	0.21	0.26	0.23	0.015	0.003	0.23
PPW	21	0.18	0.19	0.18	0.008	0.002	0.18
SI	21	85.37%	95.12%	90.53%	2.243%	0.489%	90.24%
SL	21	0.56	0.63	0.58	0.017	0.004	0.58
TL	21	3.27	3.59	3.41	0.086	0.019	3.40

APPENDIX TABLE 15.

Stenamma owstoni measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	15	41.54%	45.57%	43.68%	1.198%	0.309%	43.84%
AL	15	0.97	1.35	1.20	0.107	0.028	1.24
CI	14	84.00%	94.92%	88.75%	3.295%	0.881%	88.61%
EL	14	0.11	0.18	0.15	0.020	0.005	0.16
HL	14	0.74	1.01	0.91	0.097	0.026	0.96
HW	14	0.66	0.90	0.81	0.096	0.026	0.85
OI	14	14.00%	18.75%	16.74%	1.371%	0.366%	16.67%
PH	15	0.19	0.26	0.22	0.021	0.005	0.21
PL	15	0.37	0.55	0.47	0.055	0.014	0.48
PRW	15	0.43	0.60	0.52	0.052	0.013	0.55
PW	15	0.16	0.21	0.18	0.015	0.004	0.18
PPH	14	0.19	0.27	0.23	0.023	0.006	0.23
PPL	14	0.24	0.40	0.33	0.042	0.011	0.33
PPW	14	0.21	0.29	0.25	0.029	0.008	0.25
SI	14	78.57%	97.62%	88.73%	4.692%	1.254%	88.68%
SL	14	0.58	0.81	0.72	0.067	0.018	0.74
TL	10	3.30	4.65	4.12	0.437	0.138	4.27

Stenamma owstoni measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	3	46.60%	55.67%	51.24%	4.538%	2.620%	51.46%
AL	3	1.56	1.66	1.63	0.056	0.032	1.66
CI	3	86.15%	96.67%	90.11%	5.721%	3.303%	87.50%
EL	3	0.21	0.26	0.24	0.028	0.016	0.26
HL	3	0.97	1.05	1.01	0.043	0.025	1.03
HW	3	0.90	0.93	0.91	0.019	0.011	0.90
OI	3	20.00%	26.67%	23.89%	3.469%	2.003%	25.00%
PH	3	0.27	0.29	0.28	0.009	0.005	0.29
PL	3	0.60	0.66	0.62	0.037	0.021	0.60
PRW	3	0.77	0.87	0.83	0.052	0.030	0.85
PW	3	0.21	0.24	0.22	0.019	0.011	0.21
PPH	3	0.28	0.31	0.29	0.012	0.007	0.29
PPL	3	0.40	0.50	0.45	0.048	0.028	0.45
PPW	3	0.29	0.32	0.31	0.016	0.009	0.31
SI	3	84.48%	98.21%	91.26%	6.868%	3.965%	91.07%
SL	3	0.79	0.89	0.83	0.049	0.028	0.82
TL	3	5.33	5.36	5.34	0.019	0.011	5.33

APPENDIX TABLE 16.

Stenamma nipponense measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	26	40.63%	46.03%	44.10%	1.395%	0.274%	44.29
AL	26	1.01	1.37	1.15	0.073	0.014	1.13
CI	26	80.36%	93.02%	86.95%	3.201%	0.628%	86.67
EL	26	0.05	0.10	0.08	0.010	0.002	0.08
HL	26	0.69	0.98	0.84	0.060	0.012	0.85
HW	26	0.64	0.82	0.73	0.036	0.007	0.72
OI	26	6.00%	11.76%	9.14%	1.334%	0.262%	9.43%
PH	26	0.19	0.24	0.21	0.015	0.003	0.21
PL	26	0.39	0.58	0.46	0.048	0.009	0.43
PRW	26	0.42	0.60	0.51	0.033	0.006	0.50
PW	26	0.14	0.19	0.17	0.012	0.002	0.16
PPH	26	0.18	0.24	0.21	0.016	0.003	0.21
PPL	26	0.23	0.35	0.28	0.032	0.006	0.27
PPW	26	0.16	0.24	0.21	0.019	0.004	0.21
SI	26	84.44%	106.98%	91.01%	5.789%	1.135%	89.13
SL	26	0.60	0.84	0.67	0.056	0.011	0.65
TL	20	3.25	4.59	3.80	0.311	0.070	3.78

Stenamma nipponense measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	4	50.00%	51.72%	50.72%	0.724%	0.362%	50.58
AL	4	1.30	1.50	1.40	0.079	0.040	1.39
CI	4	83.93%	91.07%	87.12%	3.015%	1.508%	86.73
EL	4	0.21	0.24	0.22	0.015	0.008	0.22
HL	4	0.90	0.92	0.91	0.008	0.004	0.90
HW	4	0.76	0.82	0.79	0.026	0.013	0.79
OI	4	22.81%	26.79%	24.45%	1.824%	0.912%	24.11
PH	4	0.23	0.26	0.24	0.013	0.007	0.24
PL	4	0.45	0.56	0.51	0.046	0.023	0.51
PRW	4	0.66	0.76	0.71	0.042	0.021	0.71
PW	4	0.18	0.21	0.19	0.013	0.007	0.19
PPH	4	0.24	0.26	0.25	0.009	0.005	0.25
PPL	4	0.29	0.35	0.33	0.033	0.017	0.33
PPW	4	0.26	0.27	0.27	0.008	0.004	0.27
SI	4	84.31%	91.84%	88.85%	3.543%	1.772%	89.62
SL	4	0.69	0.72	0.70	0.016	0.008	0.69
TL	4	4.38	4.93	4.60	0.232	0.116	4.56

***Stenamma nipponense* measurements (continued). Males**

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	3	49.41%	56.16%	53.76%	3.771%	2.177%	55.70%
AL	3	1.18	1.37	1.27	0.097	0.056	1.27
CI	3	79.49%	85.37%	82.45%	2.940%	1.697%	82.50%
EL	3	0.21	0.26	0.24	0.025	0.014	0.24
HL	3	0.63	0.66	0.64	0.016	0.009	0.64
HW	3	0.50	0.56	0.53	0.032	0.019	0.53
OI	3	31.71%	41.03%	36.74%	4.705%	2.716%	37.50%
PH	3	0.19	0.24	0.21	0.025	0.014	0.21
PL	3	0.35	0.48	0.41	0.065	0.038	0.35
PRW	3	0.66	0.71	0.68	0.025	0.014	0.68
PW	3	0.16	0.18	0.17	0.009	0.005	0.18
PPH	3	0.21	0.23	0.22	0.009	0.005	0.23
PPL	3	0.19	0.32	0.25	0.065	0.038	0.24
PPW	3	0.19	0.24	0.21	0.025	0.014	0.21
SI	3	42.42%	51.61%	45.63%	5.185%	2.993%	42.86%
SL	3	0.23	0.26	0.24	0.016	0.009	0.24
TL	3	3.59	4.03	3.75	0.238	0.138	3.64

APPENDIX TABLE 17.

***Stenamma kurilense* measurements. Workers**

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	2	42.42%	46.88%	44.65%	3.147%	2.225%	44.65%
AL	2	1.03	1.06	1.05	0.023	0.016	1.05
CI	2	82.35%	88.00%	85.15%	3.993%	2.824%	85.18%
EL	2	0.11	0.11	0.11	0.000	0.000	0.11
HL	2	0.81	0.82	0.81	0.011	0.008	0.81
HW	2	0.68	0.71	0.69	0.023	0.016	0.69
OI	2	13.73%	14.00%	13.86%	0.194%	0.137%	13.86%
PH	2	0.24	0.24	0.24	0.000	0.000	0.24
PL	2	0.37	0.43	0.40	0.046	0.032	0.40
PRW	2	0.45	0.48	0.47	0.023	0.016	0.47
PW	2	0.21	0.23	0.22	0.011	0.008	0.22
PPH	2	0.23	0.23	0.23	0.000	0.000	0.23
PPL	2	0.26	0.27	0.27	0.011	0.008	0.27
PPW	2	0.26	0.29	0.27	0.023	0.016	0.27
SI	2	84.09%	90.48%	87.28%	4.515%	3.193%	87.28%
SL	2	0.60	0.61	0.60	0.011	0.008	0.60
TL	2	3.45	3.61	3.53	0.114	0.081	3.53

APPENDIX TABLE 18.

Stenamma ussuriense measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Media
AI	17	40.28%	47.76%	44.12%	2.002%	0.486%	44.29%
AL	17	0.98	1.18	1.10	0.059	0.014	1.11
CI	17	82.22%	92.16%	86.08%	3.021%	0.733%	85.42%
EL	17	0.08	0.12	0.10	0.011	0.003	0.10
HL	17	0.72	0.87	0.82	0.039	0.010	0.83
HW	17	0.60	0.77	0.71	0.040	0.010	0.71
OI	17	10.42%	13.89%	12.59%	1.059%	0.257%	12.96%
PH	17	0.19	0.22	0.20	0.010	0.002	0.20
PL	17	0.35	0.47	0.42	0.032	0.008	0.42
PRW	17	0.42	0.52	0.48	0.029	0.007	0.48
PW	17	0.14	0.20	0.17	0.013	0.003	0.17
PPH	17	0.18	0.23	0.20	0.012	0.003	0.21
PPL	17	0.24	0.30	0.26	0.018	0.004	0.26
PPW	17	0.19	0.24	0.22	0.017	0.004	0.23
SI	17	80.85%	91.89%	86.55%	3.343%	0.811%	86.36%
SL	17	0.55	0.66	0.61	0.027	0.007	0.61
TL	16	3.30	3.86	3.62	0.191	0.048	3.63

Stenamma ussuriense measurements (continued). Gynes

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	4	46.07%	48.84%	47.56%	1.439%	0.720%	47.67%
AL	4	1.29	1.43	1.38	0.065	0.032	1.40
CI	4	83.48%	95.37%	88.44%	5.185%	2.592%	87.45%
EL	4	0.23	0.24	0.23	0.008	0.004	0.23
HL	4	0.87	0.93	0.90	0.023	0.012	0.90
HW	4	0.77	0.83	0.79	0.027	0.013	0.78
OI	4	25.00%	26.09%	25.56%	0.528%	0.264%	25.58%
PH	4	0.24	0.27	0.25	0.011	0.006	0.25
PL	4	0.52	0.55	0.54	0.015	0.008	0.54
PRW	4	0.63	0.68	0.66	0.020	0.010	0.66
PW	4	0.19	0.21	0.20	0.010	0.005	0.19
PPH	4	0.23	0.27	0.25	0.014	0.007	0.26
PPL	4	0.28	0.34	0.31	0.024	0.012	0.31
PPW	4	0.24	0.29	0.26	0.022	0.011	0.26
SI	4	81.55%	84.85%	83.79%	1.506%	0.753%	84.38%
SL	4	0.65	0.68	0.66	0.014	0.007	0.66
TL	4	4.34	4.64	4.50	0.126	0.063	4.51

Stenamma ussuriense measurements (continued). Males

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	2	46.15%	49.33%	47.74%	2.248%	1.590%	47.74%
AL	2	1.21	1.26	1.23	0.034	0.024	1.23
CI	2	78.38%	84.62%	81.50%	4.410%	3.119%	81.50%
EL	2	0.23	0.24	0.24	0.006	0.004	0.24
HL	2	0.60	0.63	0.61	0.023	0.016	0.61
HW	2	0.47	0.53	0.50	0.046	0.032	0.50
OI	2	38.46%	39.19%	38.83%	0.515%	0.364%	38.83%
PH	2	0.19	0.19	0.19	0.006	0.004	0.19
PL	2	0.40	0.42	0.41	0.011	0.008	0.41
PRW	2	0.58	0.60	0.59	0.011	0.008	0.59
PW	2	0.18	0.18	0.18	0.000	0.000	0.18
PPH	2	0.18	0.21	0.19	0.023	0.016	0.19
PPL	2	0.23	0.23	0.23	0.000	0.000	0.23
PPW	2	0.24	0.24	0.24	0.000	0.000	0.24
SI	2	43.10%	45.45%	44.28%	1.662%	1.176%	44.28%
SL	2	0.20	0.24	0.22	0.028	0.020	0.22
TL	2	3.51	3.59	3.55	0.057	0.040	3.55

APPENDIX TABLE 19.

Stenamma bhutanense measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	9	45.16%	50.00%	48.39%	1.612%	0.537%	48.39%
AL	9	0.97	1.01	1.00	0.016	0.005	1.00
CI	9	85.42%	91.67%	87.57%	2.074%	0.691%	87.50%
EL	9	0.11	0.13	0.12	0.008	0.003	0.11
HL	9	0.71	0.79	0.76	0.024	0.008	0.77
HW	9	0.63	0.71	0.67	0.023	0.008	0.66
OI	9	14.58%	17.02%	15.50%	0.998%	0.333%	15.22%
PH	9	0.26	0.29	0.27	0.010	0.003	0.27
PL	9	0.35	0.40	0.38	0.016	0.005	0.39
PRW	9	0.45	0.50	0.48	0.016	0.005	0.48
PW	9	0.18	0.23	0.19	0.014	0.005	0.19
PPH	9	0.23	0.24	0.24	0.007	0.002	0.24
PPL	9	0.18	0.26	0.24	0.024	0.008	0.24
PPW	9	0.24	0.29	0.26	0.016	0.005	0.26
SI	9	75.00%	80.49%	78.33%	2.051%	0.684%	78.05%
SL	9	0.50	0.53	0.52	0.012	0.004	0.53
TL	9	3.32	3.62	3.49	0.088	0.029	3.49

APPENDIX TABLE 20.

Stenamma gurkhalis measurements. Workers

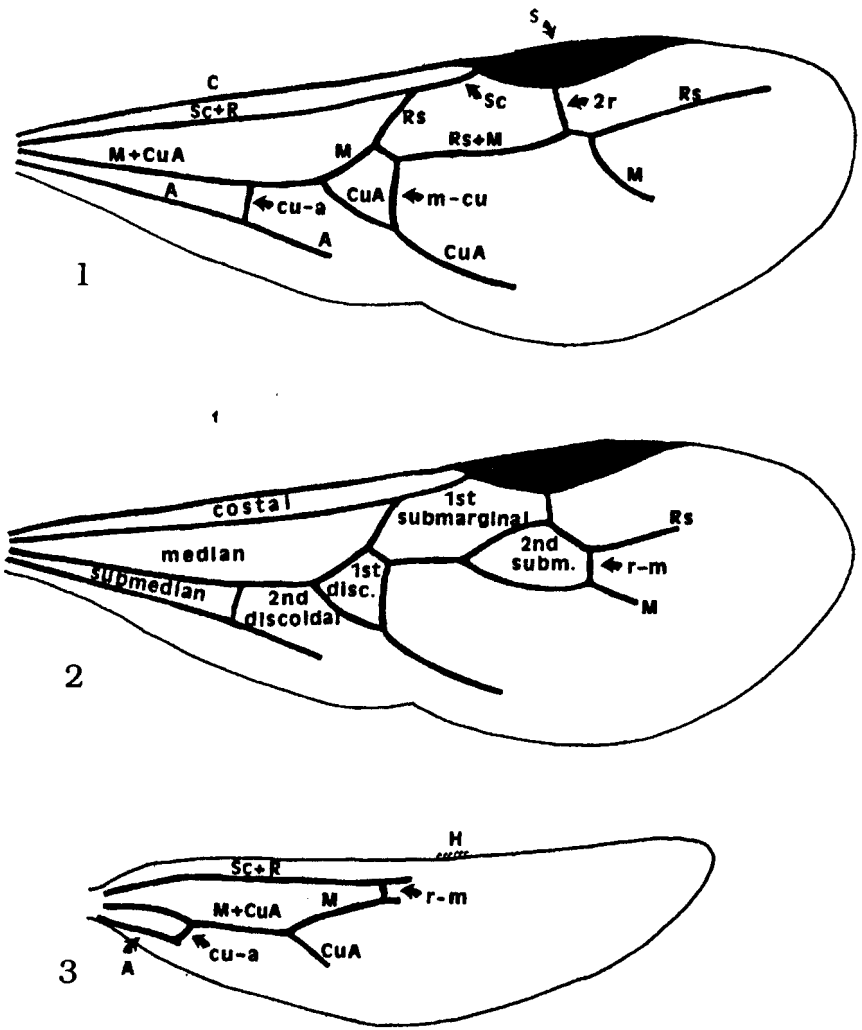
Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	4	42.62%	44.78%	43.80%	0.910%	0.455%	43.91%
AL	4	0.98	1.24	1.11	0.108	0.054	1.11
CI	4	81.25%	84.75%	82.32%	1.631%	0.816%	81.65%
EL	4	0.06	0.10	0.08	0.013	0.007	0.08
HL	4	0.77	0.95	0.87	0.073	0.037	0.88
HW	4	0.63	0.81	0.72	0.073	0.036	0.72
OI	4	8.33%	10.17%	9.21%	0.754%	0.377%	9.18%
PH	4	0.16	0.21	0.19	0.020	0.010	0.19
PL	4	0.37	0.47	0.43	0.043	0.021	0.43
PRW	4	0.42	0.55	0.49	0.053	0.027	0.49
PW	4	0.16	0.19	0.17	0.015	0.008	0.17
PPH	4	0.16	0.21	0.19	0.021	0.010	0.19
PPL	4	0.24	0.34	0.29	0.042	0.021	0.29
PPW	4	0.18	0.24	0.21	0.027	0.014	0.22
SI	4	90.00%	94.87%	92.85%	2.046%	1.023%	93.26%
SL	4	0.60	0.72	0.66	0.053	0.027	0.67
TL	4	2.80	3.77	3.34	0.412	0.206	3.41

APPENDIX TABLE 21.

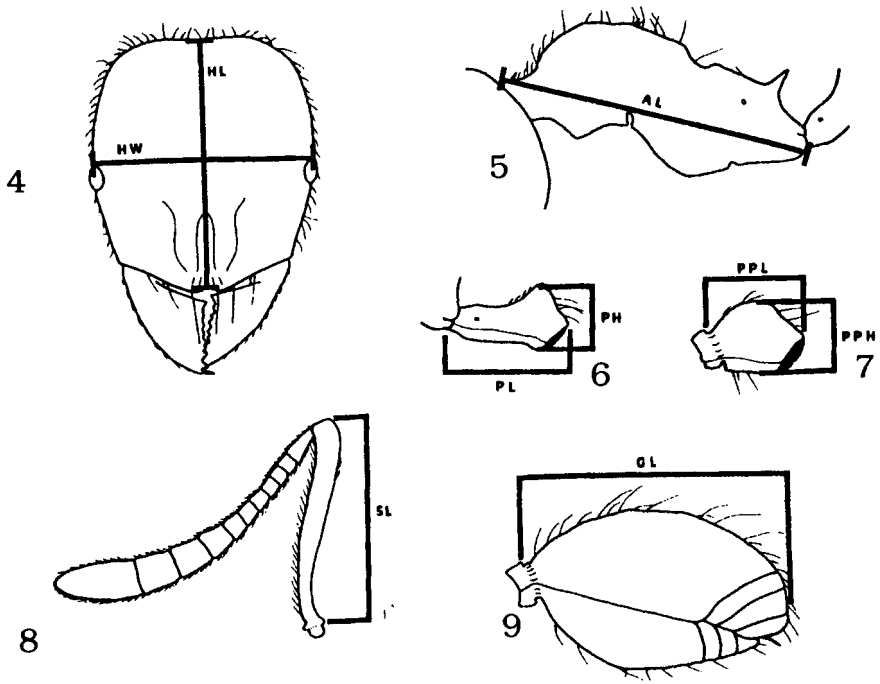
Stenamma orientale measurements. Workers

Measurement	n =	Minimum	Maximum	Mean	Standard Deviation	Standard Error of Mean	Median
AI	7	40.85%	45.90%	43.39%	1.899%	0.718%	43.06%
AL	7	0.98	1.16	0.85	0.062	0.024	1.14
CI	7	81.82%	88.64%	84.26%	2.514%	0.950%	84.09%
EL	7	0.13	0.16	0.14	0.011	0.004	0.14
HL	7	0.71	0.72	0.72	0.009	0.003	0.71
HW	7	0.58	0.63	0.60	0.016	0.006	0.60
OI	7	17.78%	22.73%	19.94%	1.637%	0.619%	20.00%
PH	7	0.21	0.24	0.23	0.013	0.005	0.24
PL	7	0.37	0.43	0.40	0.020	0.007	0.40
PRW	7	0.45	0.52	0.49	0.022	0.008	0.48
PW	7	0.16	0.19	0.18	0.013	0.005	0.18
PPH	7	0.23	0.26	0.24	0.012	0.005	0.24
PPL	7	0.24	0.27	0.25	0.013	0.005	0.24
PPW	7	0.27	0.31	0.29	0.011	0.004	0.29
SI	7	92.31%	97.37%	95.83%	1.989%	0.752%	97.22%
SL	7	0.56	0.60	0.58	0.011	0.004	0.58
TL	7	2.66	3.46	3.27	0.275	0.104	3.33

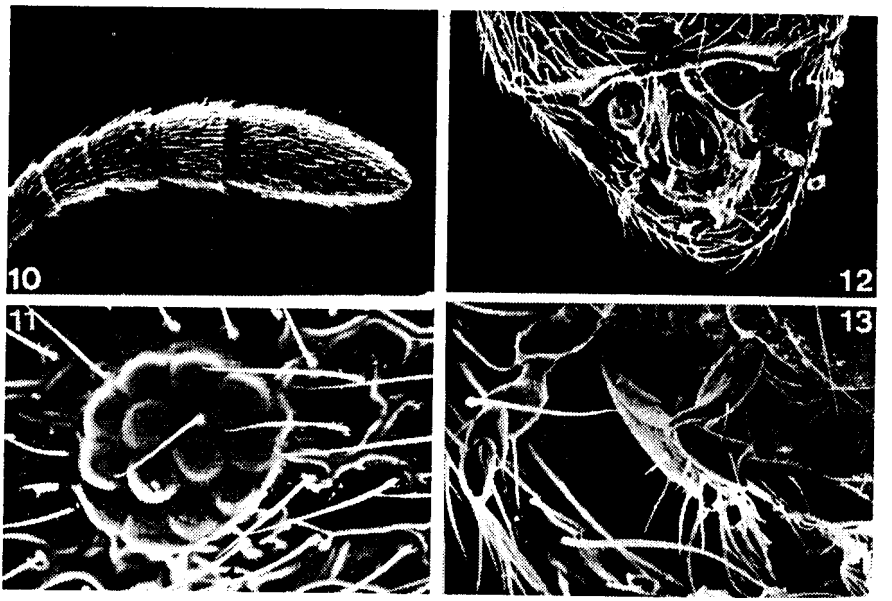
Appendix: Figures



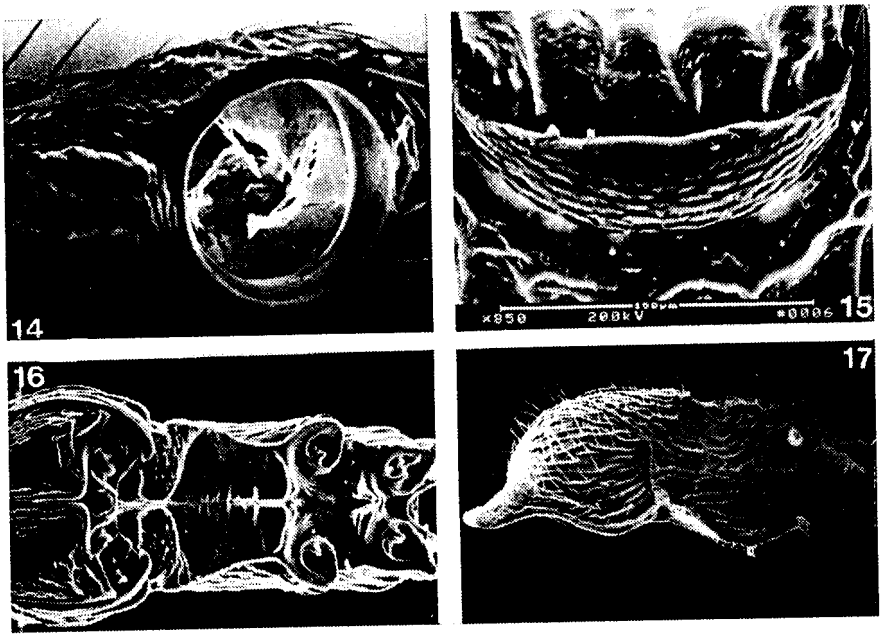
Figs. 1 - 3. Typical wing venation for *Stenamma* species. 1. Veins of forewing. A — Anal, C — Costal, CuA — Cubito-Anal, cu-a — cubital to anal cross vein, M — Median, m-cu — medio - cubital cross vein, R — Radial, 2r — radial cross vein, RS — Radial sector, S - Stigma (pterostigma), Sc — Subcostal. 2. Cells of forewing. 1st disc. — 1st discoidal, 2nd subm. — 2nd submarginal. Veins as in Fig. 1. 3. Veins of hindwing. H — Hamuli. Veins as in Fig. 1. Magnification of these figures is variable.



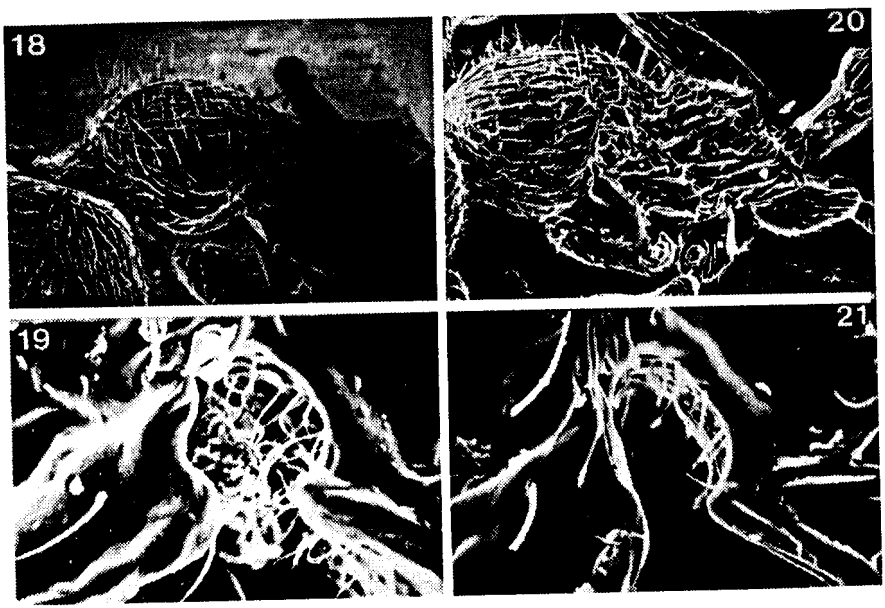
Figs. 4 - 9. Explanation of various body measurements using *Stenamma georgii* worker. 4. HL — Head Length, HW — Head Width. 5. AL — Alitrunk Length. 6. PH — Petiole Height, PL — Petiole Length. 7. PPH — Postpetiole Height, PPL — Postpetiole Length. 8. SL — Scape Length. 9. GL — Gaster Length.

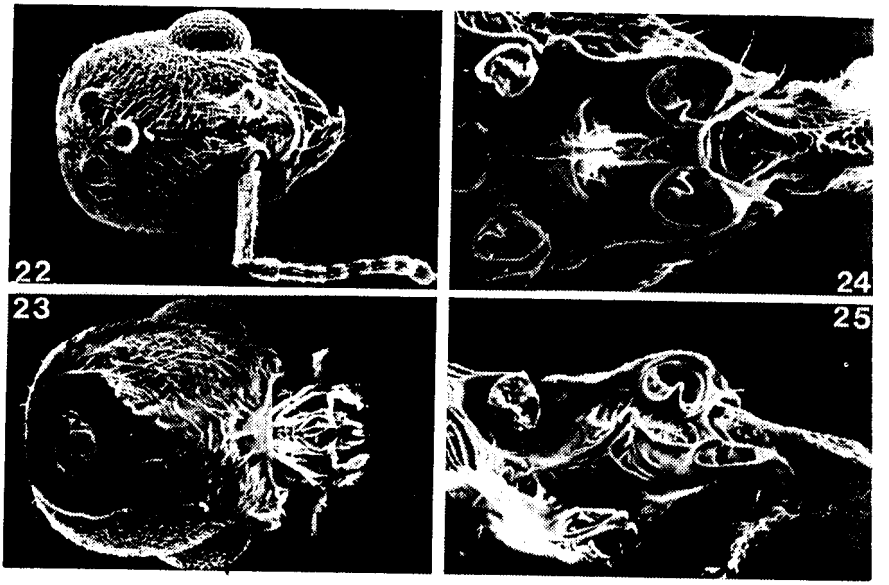


Figs. 10 - 13. *Stenamma debile*, worker morphology. 10. Apical antennal segments depictin indistinct 4-segmented club. 11. Compound eye (note only 4 ommatidia in greatest diameter). 1: Mouthparts viewed from rear (note mandibles, maxillae, labium, and associated palpi). 1: Enlargement of palpi showing 4-segmented maxillary and 3-segmented labial palpi.



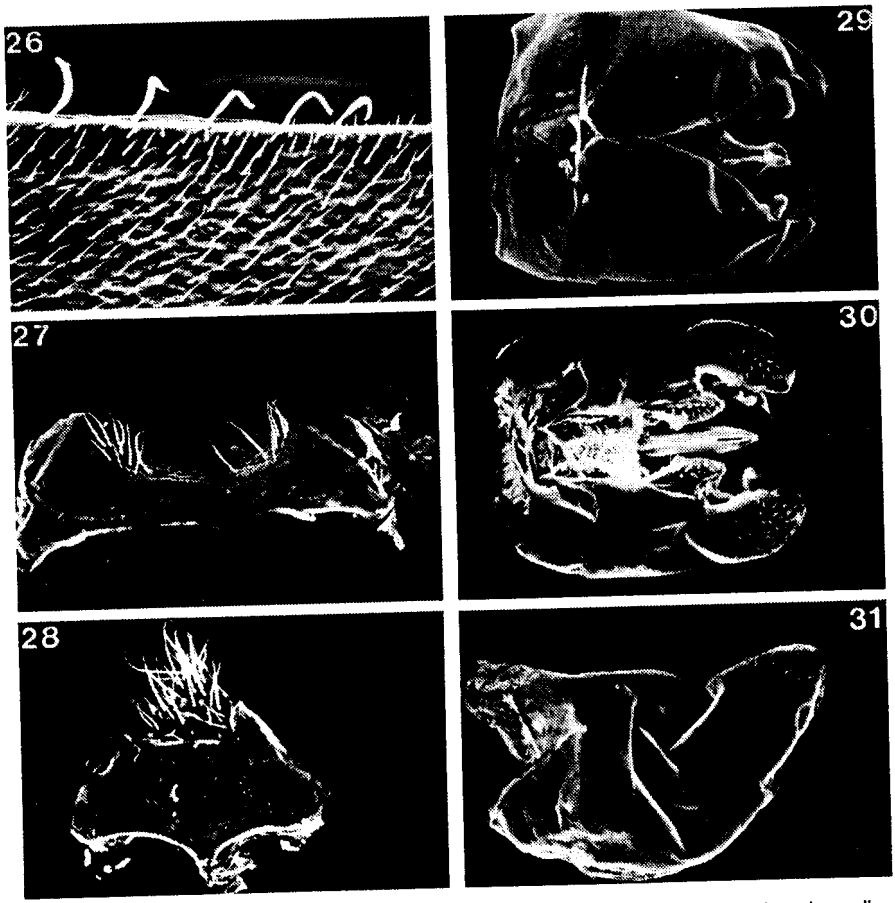
Figs. 14 - 17. *Stenamma debile*, worker morphology. 14. Petiole interior (note ridge which may be scraped across file in Fig. 15). 15. Postpetiole dorsum (note file at base which is inserted into petiole). 16. Alitrunk, ventral view, legs removed (note basisternal process between meso- and meta-coxal inertions). 17. Alitrunk, lateral view, legs removed (note pit at base of procoxal insertion).



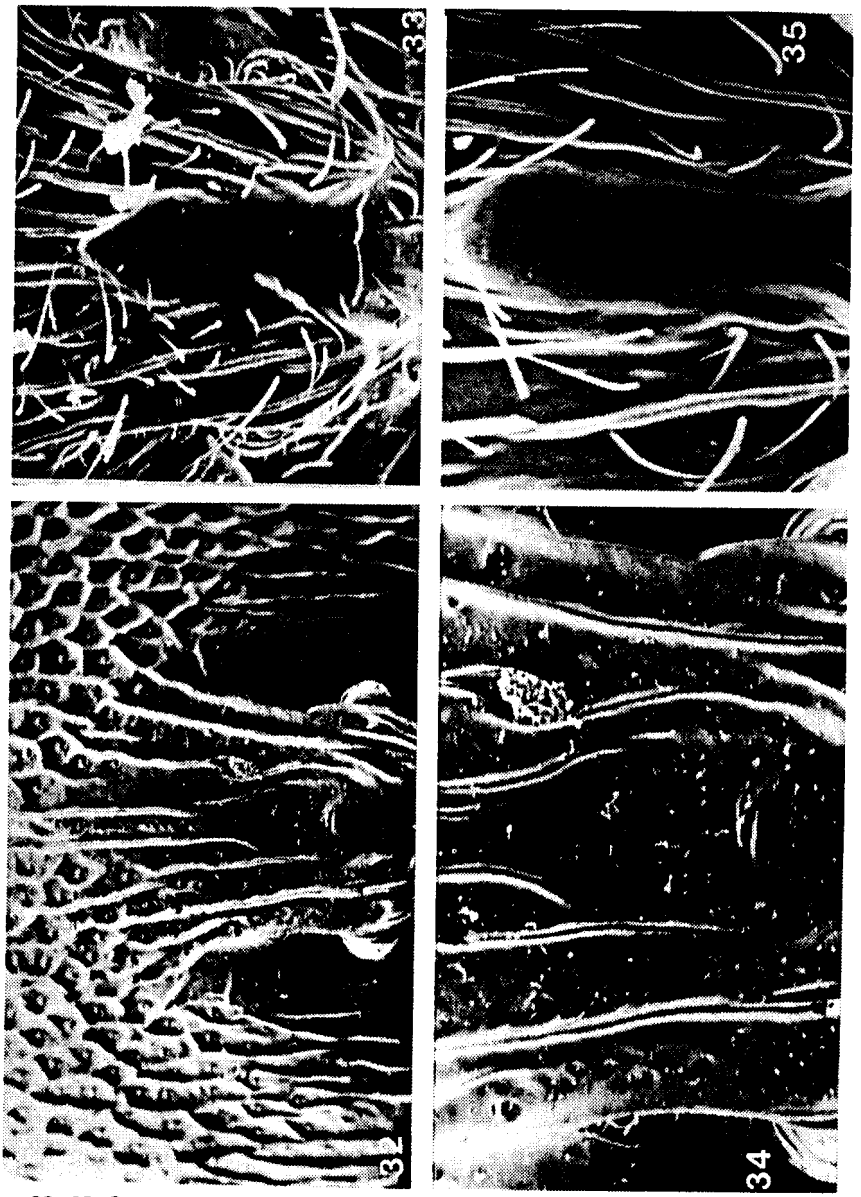


Figs. 22 - 25. *Stenamma diecki*, male morphology. Since males of European and Asian specie are relatively rare, a male of a North American species was dissected to show various structure which were observed in European and Asian species. 22. Head, full face view. 23. Head, viewe from rear (note mouthparts, including palpi). 24. Posterior alitrunk and attached petiole, leg removed (note basisternal process and pegs in metacoxal attachments). 25. Same area as Fi 24 viewed obliquely to depict shape of basisternal process.

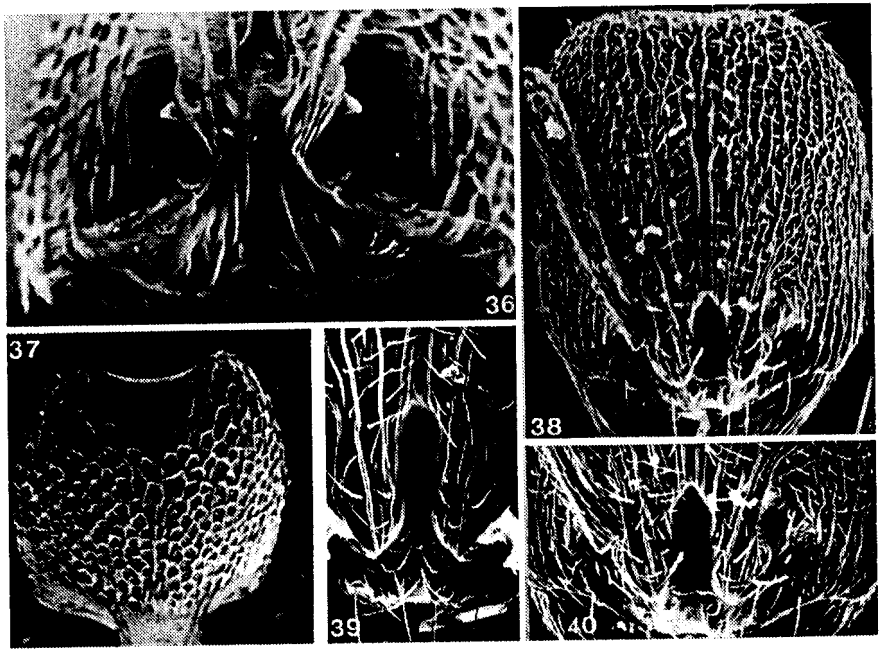
Figs. 18-21. *Stenamma* spp., workers. 18. *S. hissarianum* (note pit at base of procoxae). 19. *S hissarianum* (note pit enlarged to show trapped dirt particles and microsetae lining pit. 20. *S picetojuglandeti* (note pit at base of procoxae). 21. *S. picetojuglandeti* (note pit enlarged to shov microsetae lining pit).



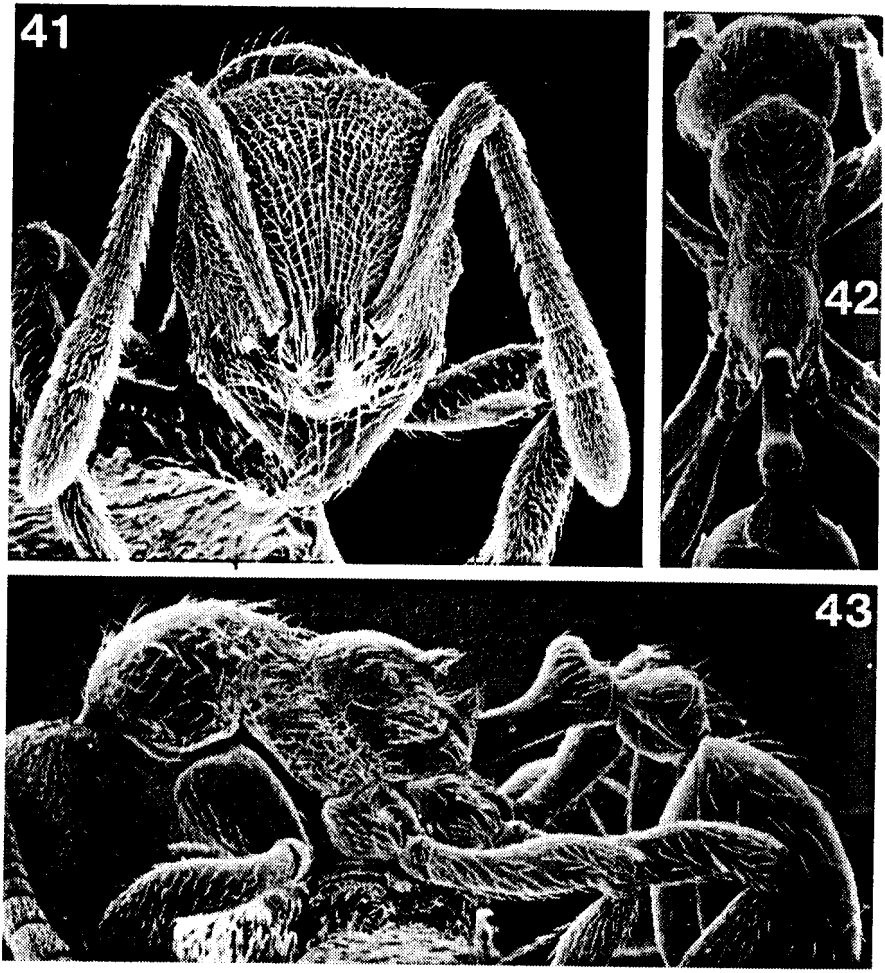
Figs. 26 - 31. *Stenamma diecki*, male morphology. 26. Hind wing magnified to show hamuli and microtrichia. 27. Eighth abdominal tergite. 28. Eighth abdominal sternite. 29. Male genital capsule, dorsal view. 30. Male genital capsule, ventral view. 31. Male genital capsule, lateral view.



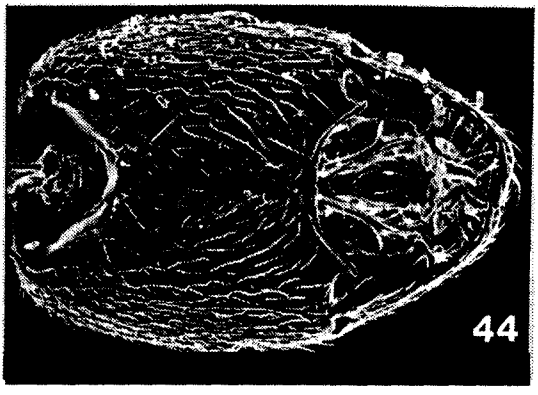
Figs. 32 - 35. *Stenamma* spp., recent and sub-fossil worker head morphology. 32. *S. debile*, head capsule, frontal region enlarged (2,000 year old sub-fossil from England). 33. *S. debile*, head capsule, frontal region enlarged showing area between antennal sockets (recent worker from Czech Republic). 34. *S. debile*, head capsule, frontal region enlarged showing area between antennal sockets (2,000 year old sub-fossil from England). 35. *S. westwoodii*, head capsule frontal region enlarged showing area between antennal sockets (recent worker from England) Note: SEM photographs of sub-fossil worker provided by C. Collingwood.



Figs. 36 - 40. *Stenamma* spp., recent and sub-fossil worker head morphology. 36. *S. debile*, head capsule, clypeal margin and frontal region (2,000 year old sub-fossil from England). 37. *S. debile*, head capsule, occipital vertex showing sculpture (2,000 year old sub-fossil from England). 38. *S. debile*, head capsule, occipital vertex showing sculpture and pilosity (recent worker from Czech Republic). 39. *S. debile*, head capsule, clypeal margin and frontal region (recent worker from Czech Republic). 40. *S. westwoodii*, head capsule, clypeal margin and frontal region (recent worker from England). Note: SEM photographs of sub-fossil worker provided by C. Collingwood.



Figs. 41 - 43. *Stenamma orientale* sp. n., worker. 41. Head, full face view. 42. Alitrunk, petiole, an postpetiole, dorsal view. 43. Alitrunk, petiole, and postpetiole, lateral view. Note: SEM photograph provided by R. Taylor.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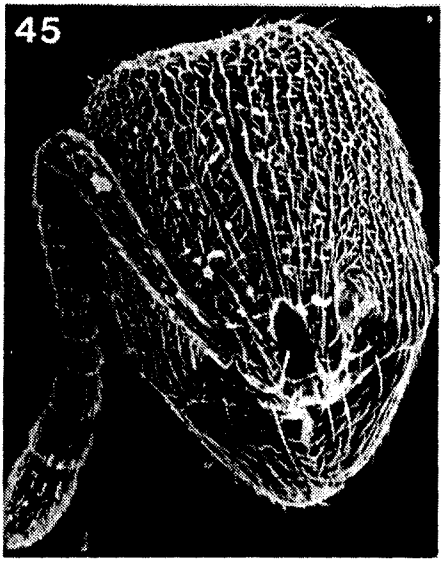
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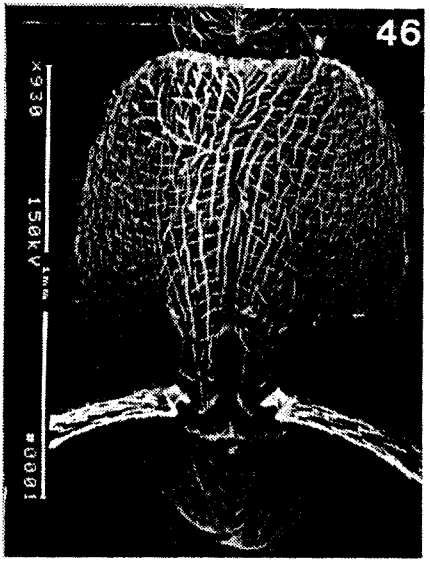
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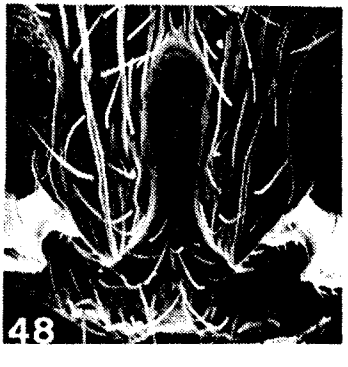
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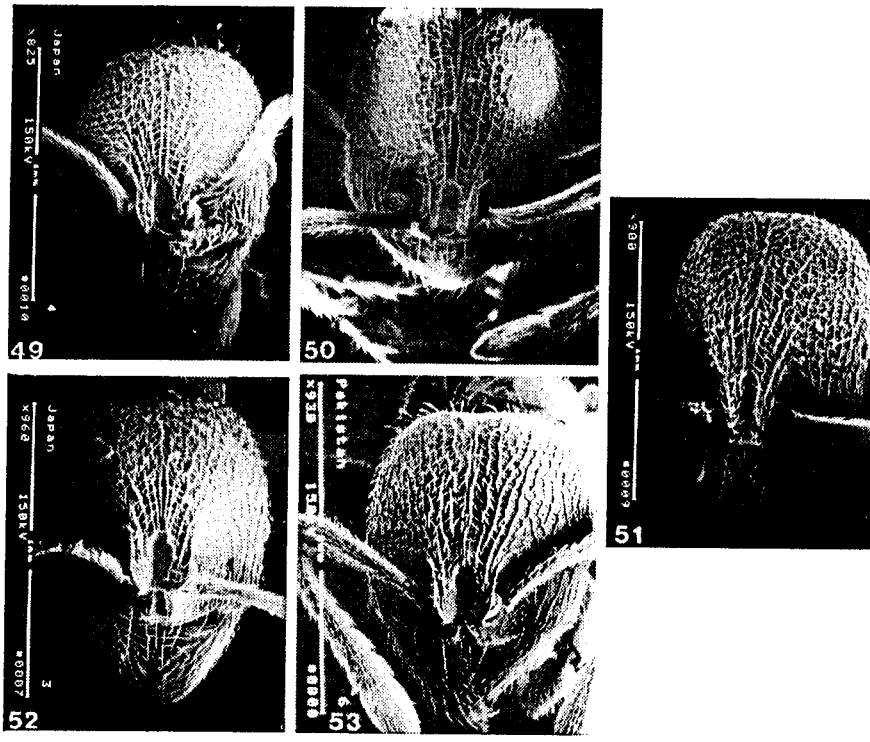
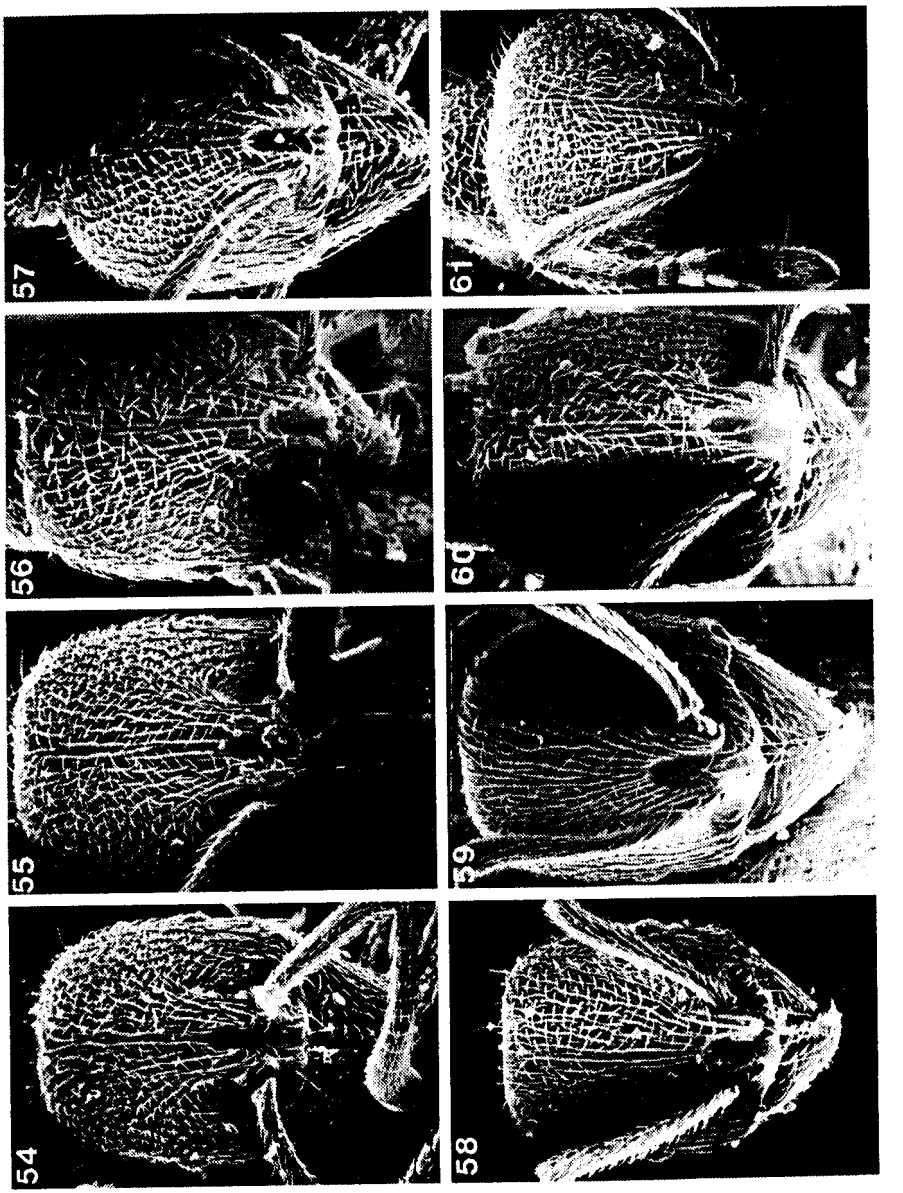
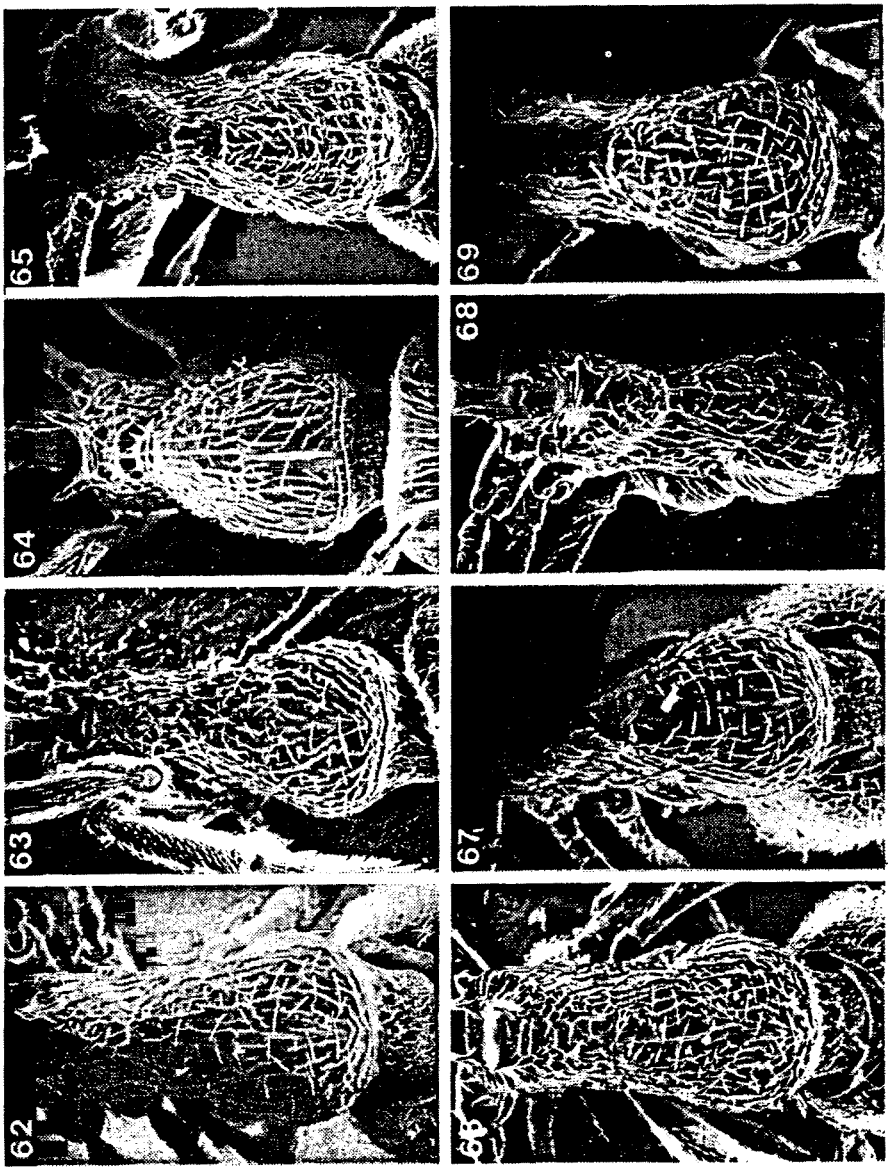


Figs. 49 - 53. *Stenamma* spp., worker heads, full face view. 49. *S. owstoni*. 50. *S. kashmirens*
51. *S. gurkhalis* sp. n. 52. *S. nipponense*. 53. *S. jeriorum* sp. n.

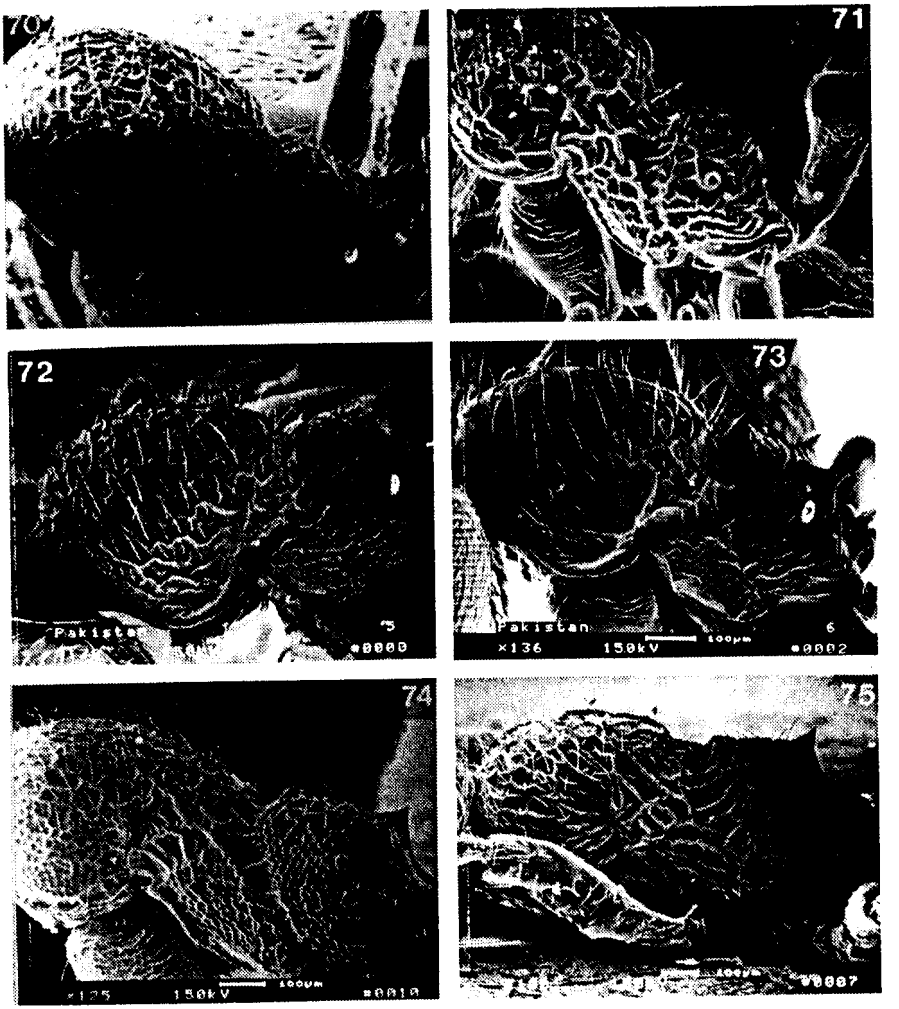
Figs. 44 - 48. *Stenamma debile* vs. *S. westwoodii*, worker head comparisons. 44. *S. debile*, hea
(viewed from rear). 45. *S. debile*, head (full face view). 46. *S. westwoodii*, head (full face view
47. *S. debile*, anterior clypeal margin and frontal area. 48. *S. westwoodii*, anterior clypeal margi
and frontal area.



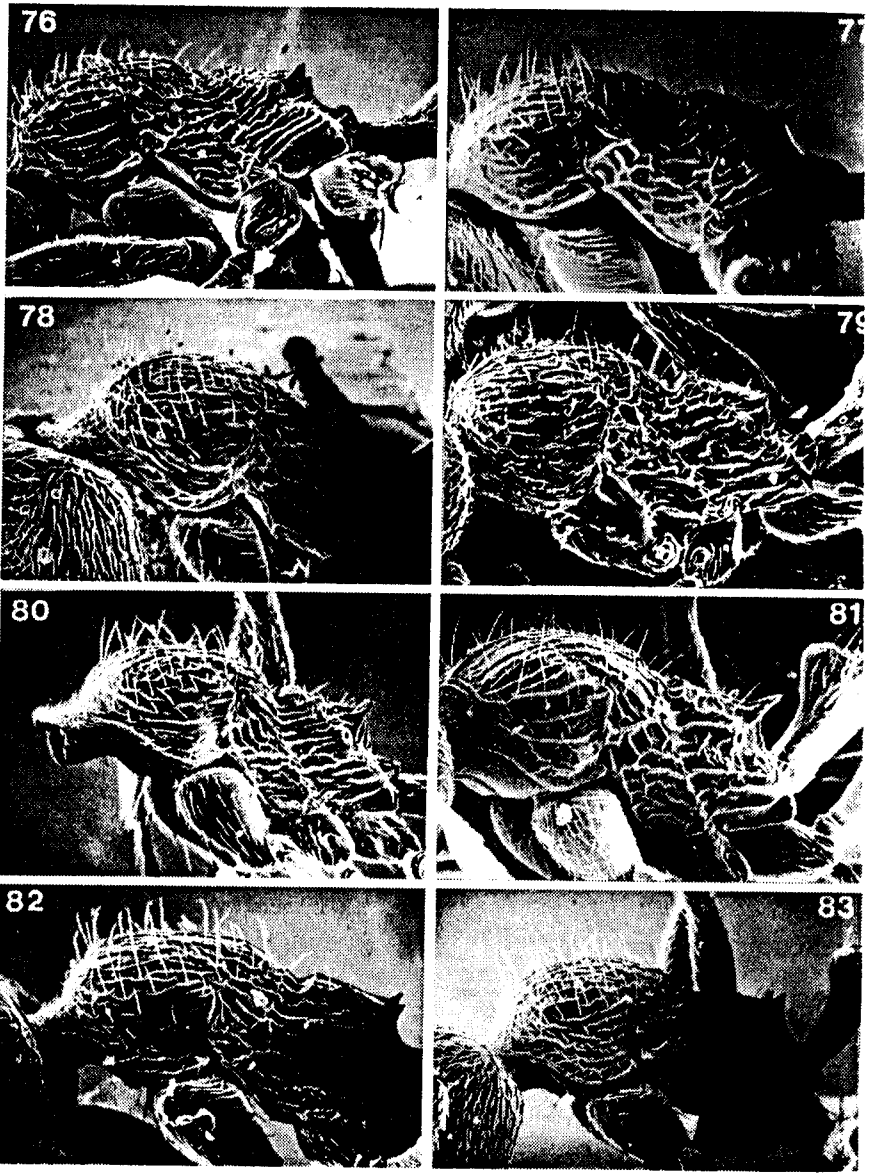
Figs. 54 - 61. *Stenamma* spp., worker heads, full face view. 54. *S. lippulum*. 55. *S. georgii*. 56. *S. hissarianum*. 57. *S. picetojuglandeti*. 58. *S. sogdianum*. 59. *S. striatulum*. 60. *S. debile* (=*S. ucrainicum*). 61. *S. ussuriense*.



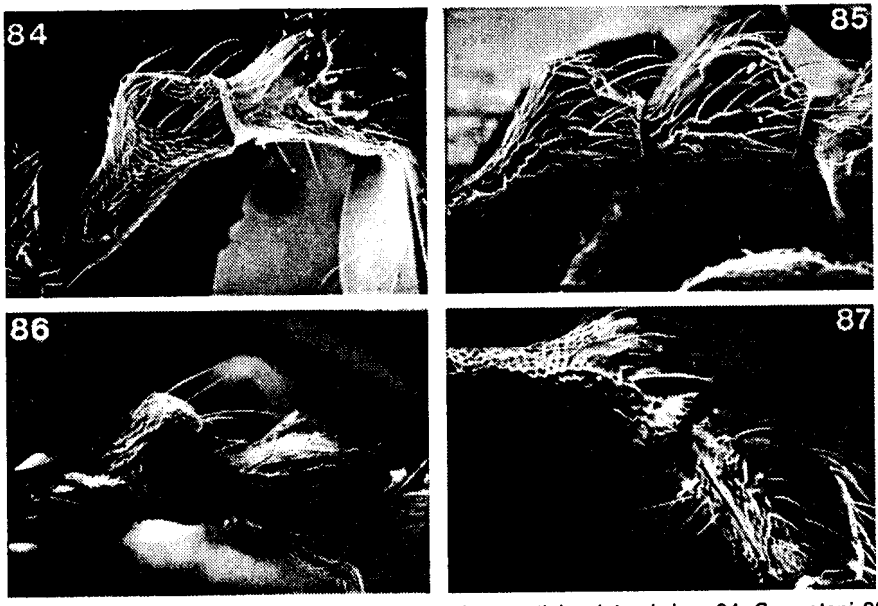
Figs. 62 - 69. *Stenamma* spp., worker alitrunks, dorsal view. 62. *S. georgii*. 63. *S. picetojuglandet* 64. *S. striatulum*. 65. *S. ussuriense*. 66. *S. lippulum*. 67. *S. hissarianum*. 68. *S. sogdianum*. 69 *S. debile* (=*S. ucrainicum*).



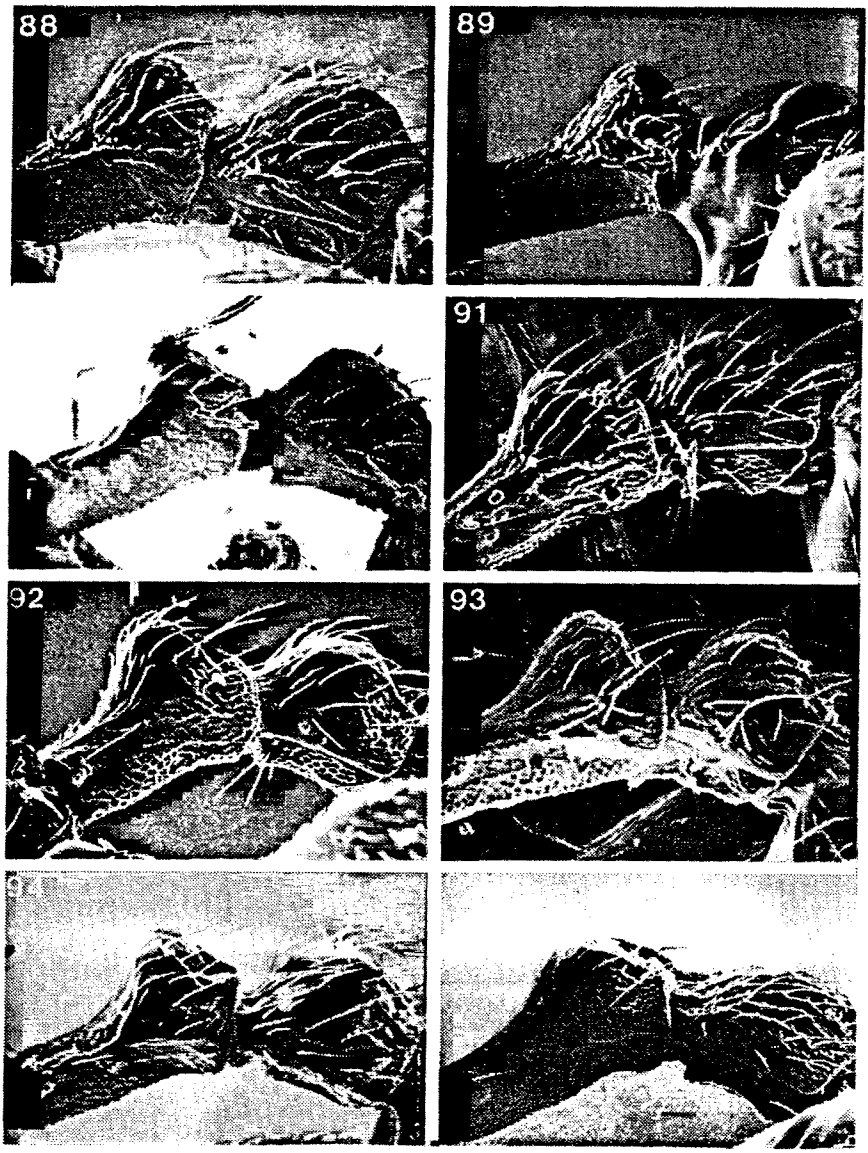
Figs. 70 - 75. *Stenamma* spp., worker alitrunks, lateral view. 70. *S. nipponense*. 71. *S. owstoni*. 72. *S. kashmirense*. 73. *S. jeriorum* sp. n. 74. *S. gurkhalis* sp. n. 75. *S. westwoodii*.



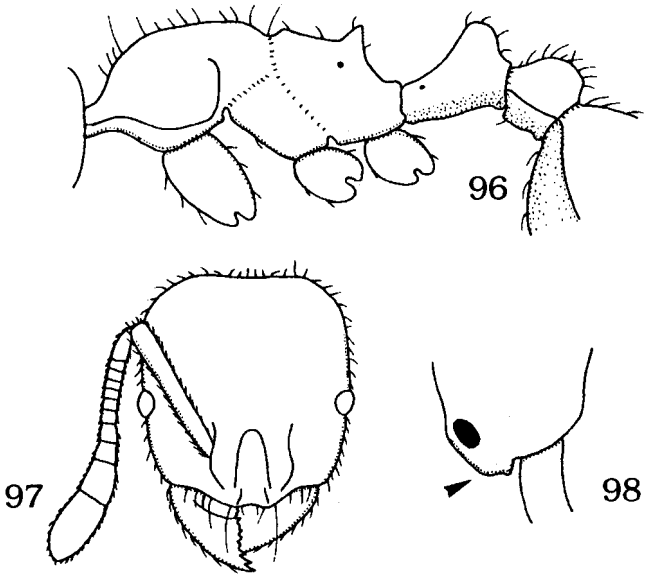
Figs. 76 - 83. *Stenamma* spp., worker alitrunks, lateral view. 76. *S. lippulum*. 77. *S. georgii*. 7
S. hissarianum. 79. *S. picetojuglandeti*. 80. *S. sogdianum*. 81. *S. striatulum*. 82. *S. debile* (=
ucrainicum). 83. *S. ussuriense*.



Figs. 84 - 87. *Stenamma* spp., worker petioles and postpetioles, lateral view. 84. *S. owstoni*. 85. *S. westwoodii*. 86. *S. nipponense*. 87. *S. gurkhalis* sp. n.



Figs. 88 - 95. *Stenamma* spp., worker petioles and postpetioles, lateral view. 88. *S. lippulum.* 8
S. georgii. 90. *S. hissarianum.* 91. *S. picetojuglandeti.* 92. *S. sogdianum.* 93. *S. striatulum.* 94.
debile (=*S. ucrainicum*). 95. *S. ussuriense.*



Figs. 96 - 98. *Stenamma bhutanense*, worker. 96. Alitrunk, lateral view. 97. Head, full face view. 98. Head, lateral view (note clypeal margin).

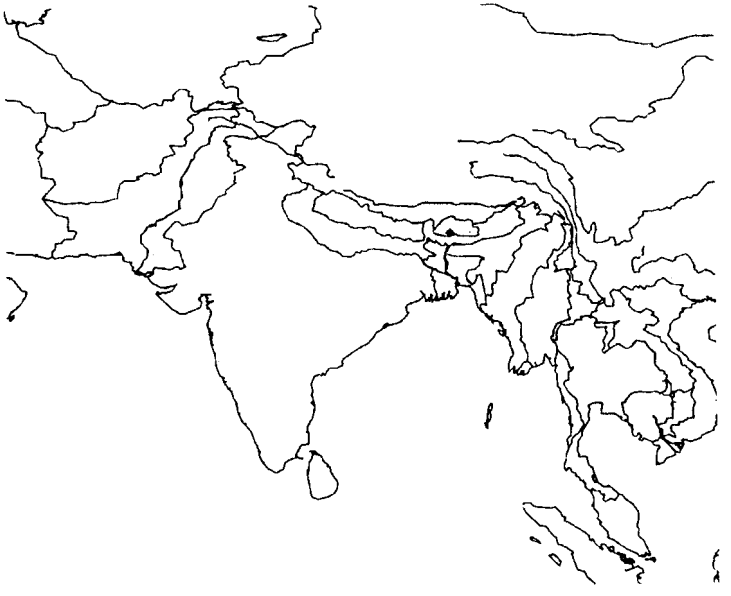
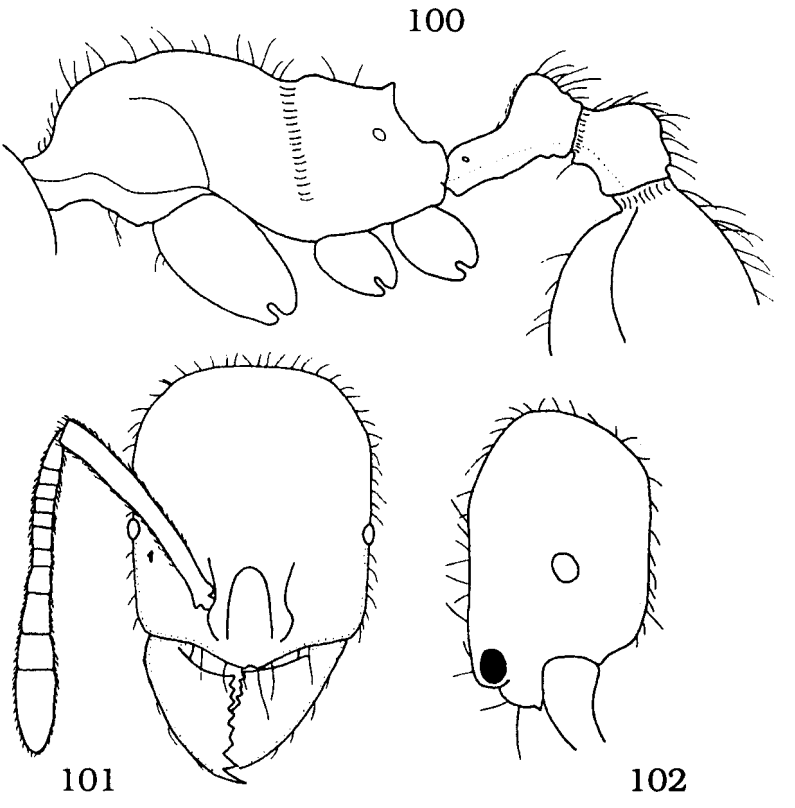
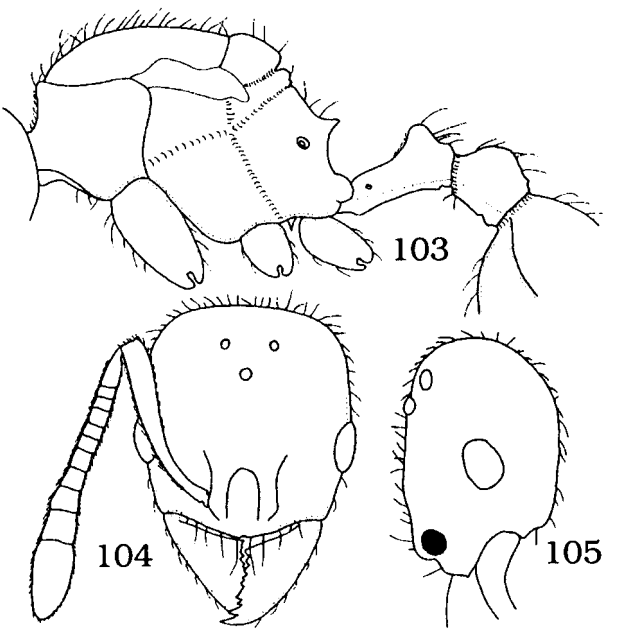


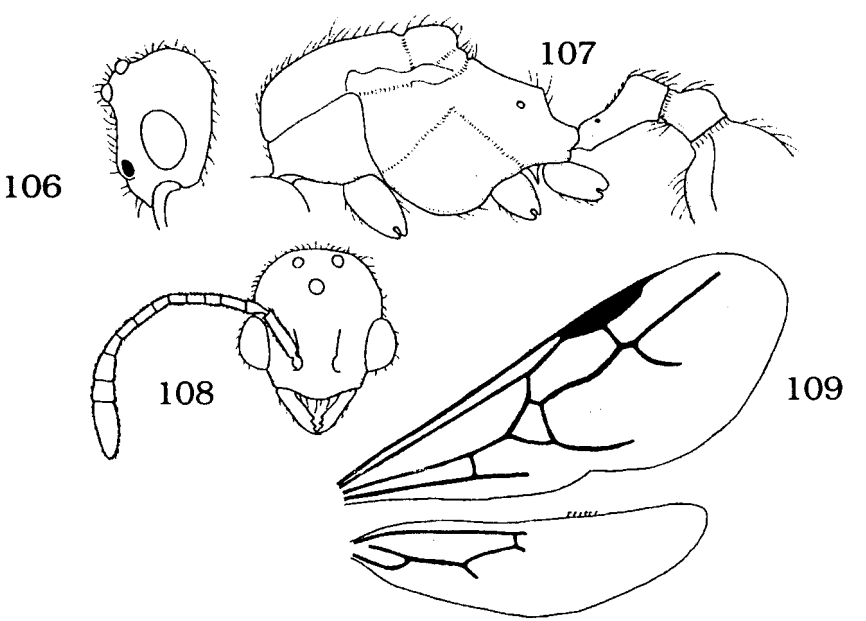
Fig. 99. *Stenamma bhutanense*, known distribution; Bhutan.



Figs. 100 - 102. *Stenamma debile*, worker. 100. Alitrunk, lateral view. 101. Head, full face vie
102. Head, lateral view.



Figs. 103 - 105. *Stenamma debile*, gyne. 103. Alitrunk, lateral view. 104. Head, full face view. 105. Head, lateral view (most pilosity excluded).



Figs. 106 - 109. *Stenamma debile*, male. 106. Head, lateral view. 107. Alitrunk, lateral view. 108. Head, full face view. 109. Wing venation.

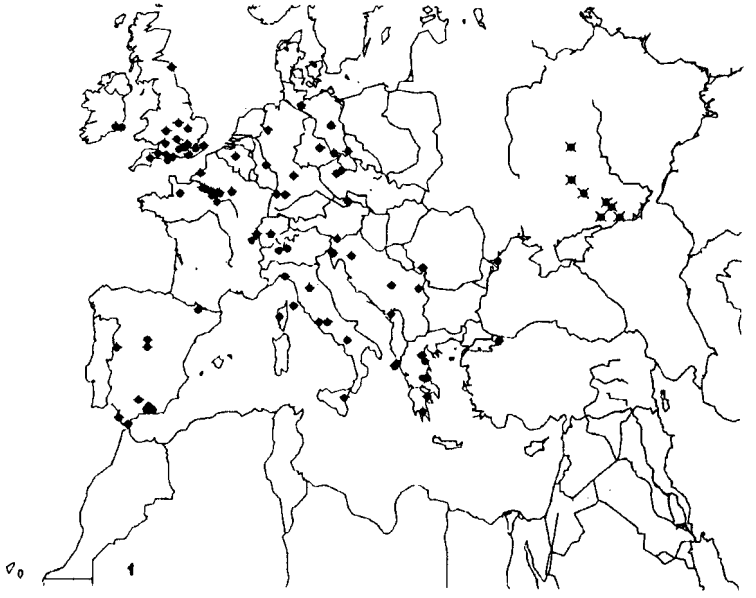
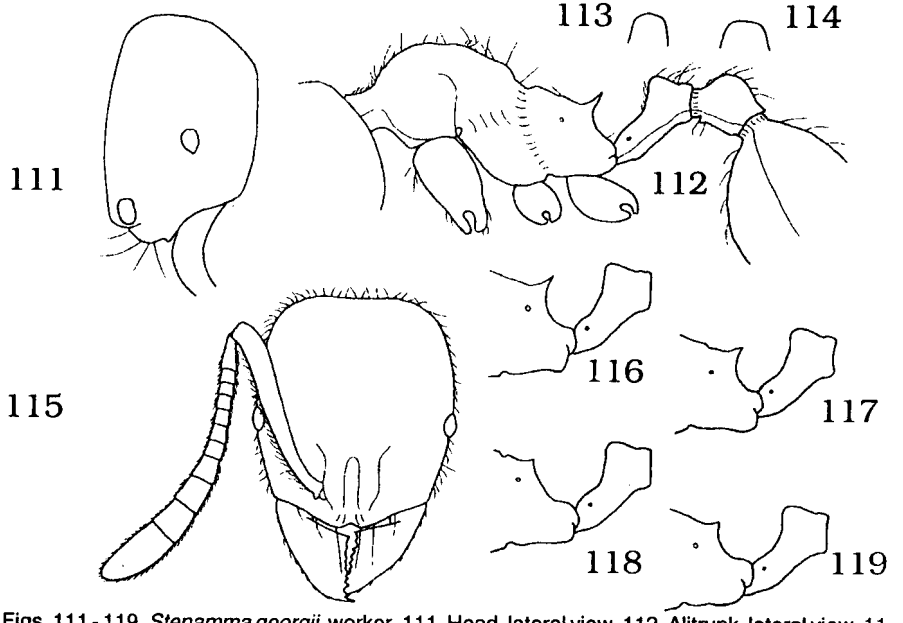
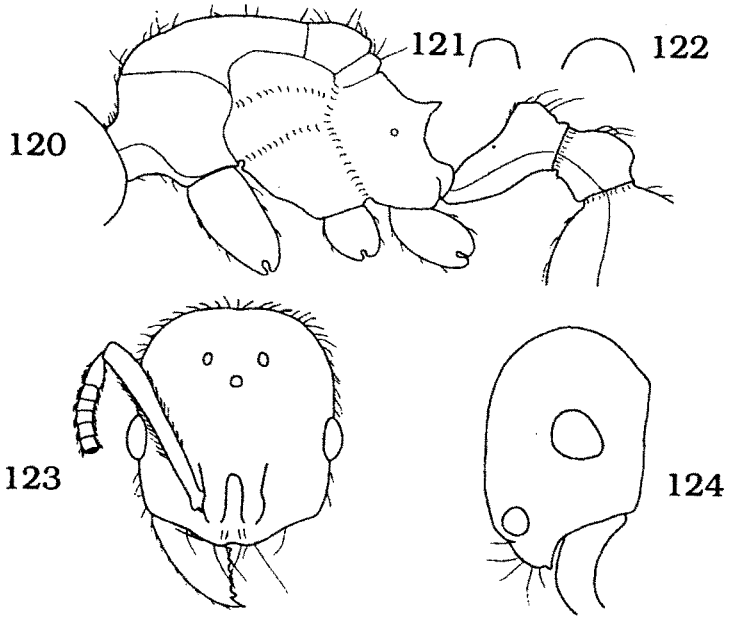


Fig. 110. *Stenamma debile*, known distribution; western and southern Europe.



Figs. 111 - 119. *Stenamma georgii*, worker. 111. Head, lateral view. 112. Alitrunk, lateral view. 11
Petiole, dorsal profile viewed from rear. 114. Postpetiole, dorsal profile viewed from rear. 11
Head, full face view. 116 - 119. Propodeum, lateral view (note different shapes of spines ar
propodeal plates).



Figs. 120 - 124. *Stenamma georgii*, gyne. 120. Alitrunk, lateral view. 121. Petiole, dorsal profile viewed from rear. 122. Postpetiole, dorsal profile viewed from rear. 123. Head, full face view. 124. Head, lateral view (most pilosity excluded).

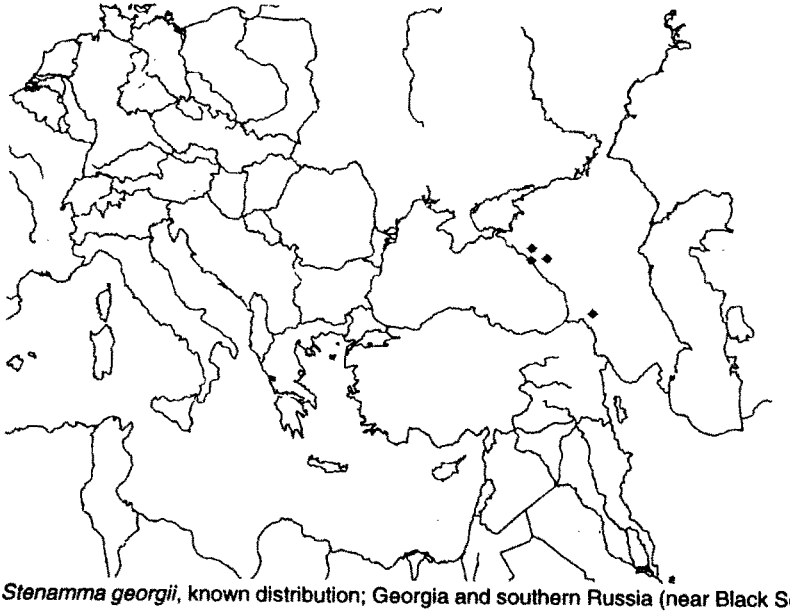
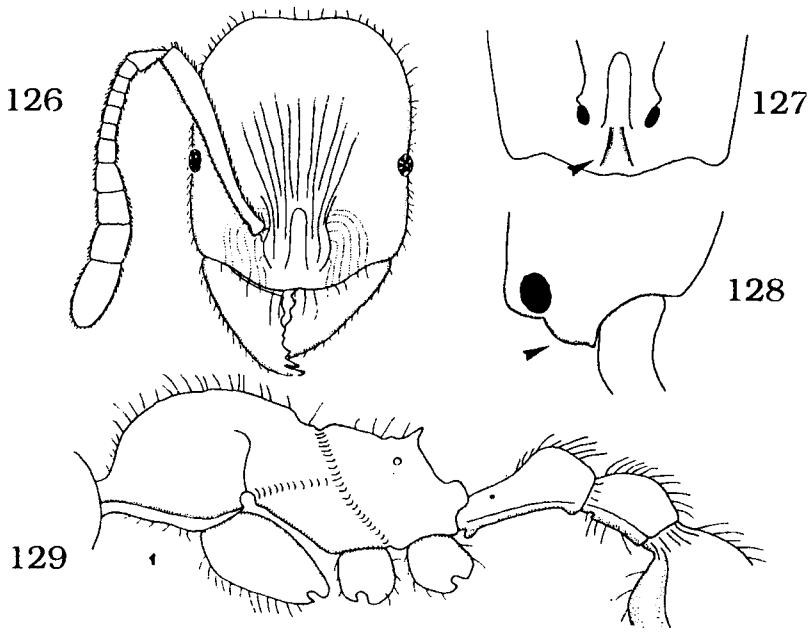


Fig. 125. *Stenamma georgii*, known distribution; Georgia and southern Russia (near Black Sea).



Figs. 126 - 129. *Stenamma gurkhalis* sp. n., worker. 126. Head, full face view. 127. Anterior clyp margin, full face view (note carinae on each side of emargination). 128. Anterior clypeal marg lateral view (pilosity excluded, note margin). 129. Alitrunk, lateral view.

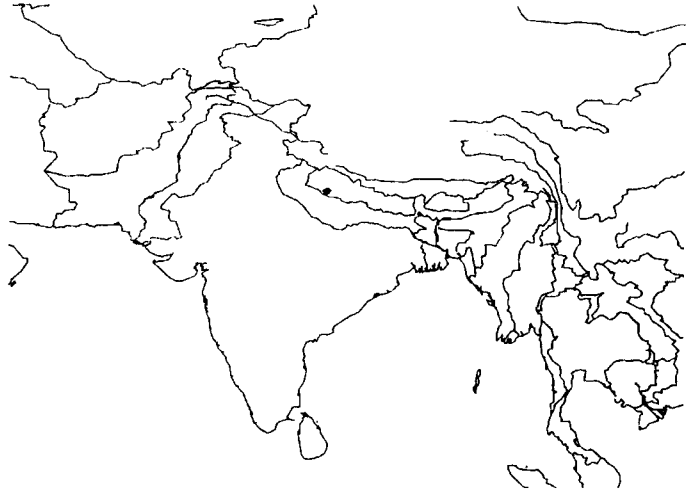
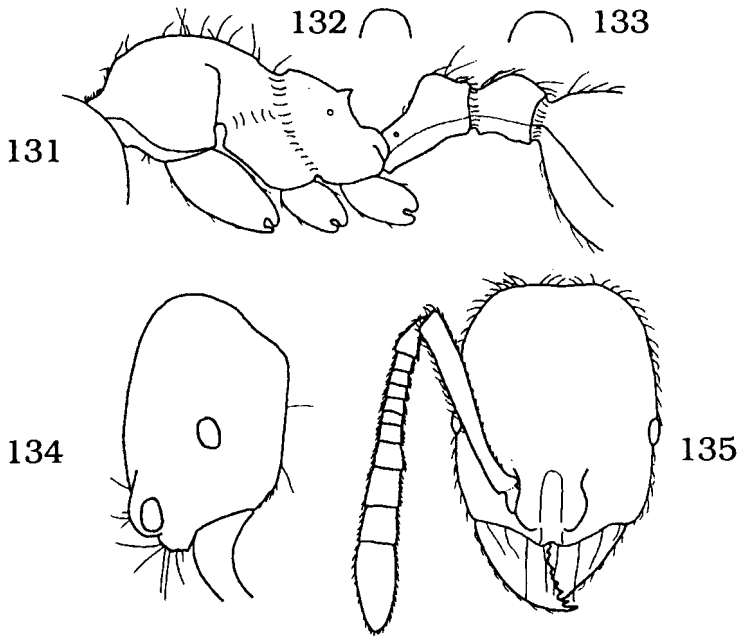
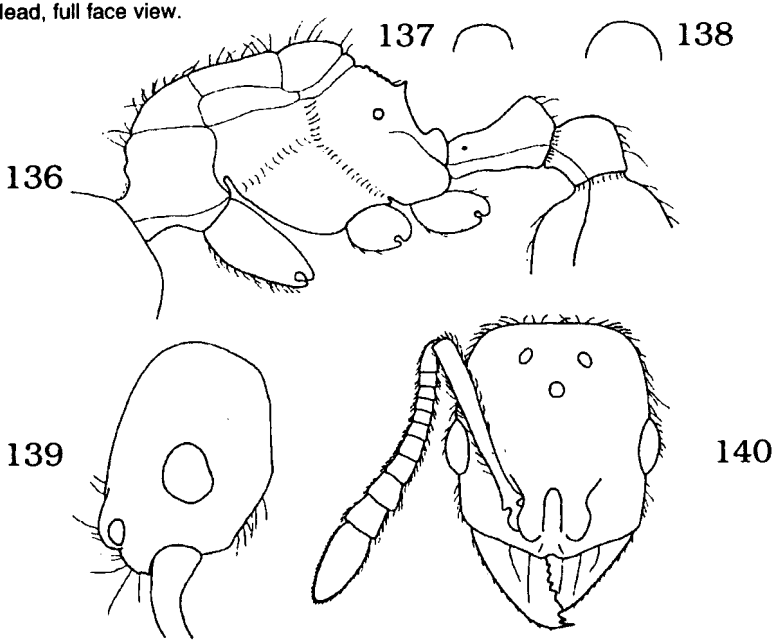


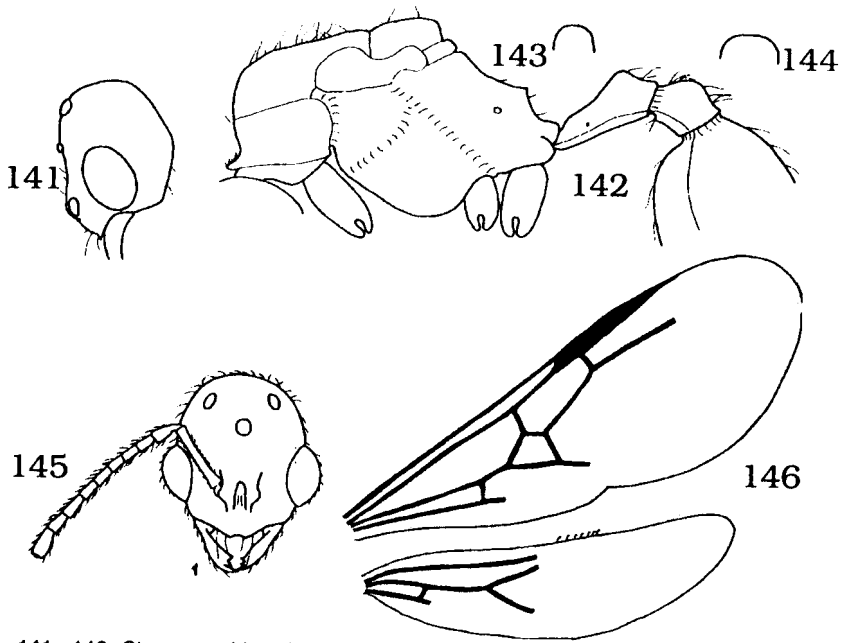
Fig. 130. *Stenamma gurkhalis*, known distribution; Nepal.



Figs. 131 - 135. *Stenamma hissarianum*, worker. 131. Alitrunk, lateral view. 132. Petiole, dorsal profile viewed from rear. 133. Postpetiole, dorsal profile viewed from rear. 134. Head, lateral view. 135. Head, full face view.



Figs. 136 - 140. *Stenamma hissarianum*, gyne. 136. Alitrunk, lateral view. 137. Petiole, dorsal profile viewed from rear. 138. Postpetiole, dorsal profile viewed from rear. 139. Head, lateral view (most pilosity excluded). 140. Head, full face view.



Figs. 141 - 146. *Stenamma hissarianum*, male. 141. Head, lateral view (most pilosity exclude
142. Alitrunk, lateral view. 143. Petiole, dorsal profile viewed from rear. 144. Postpetiole, dor
profile viewed from rear. 145. Head, full face view (apex of funiculus missing). 146. Wing venati

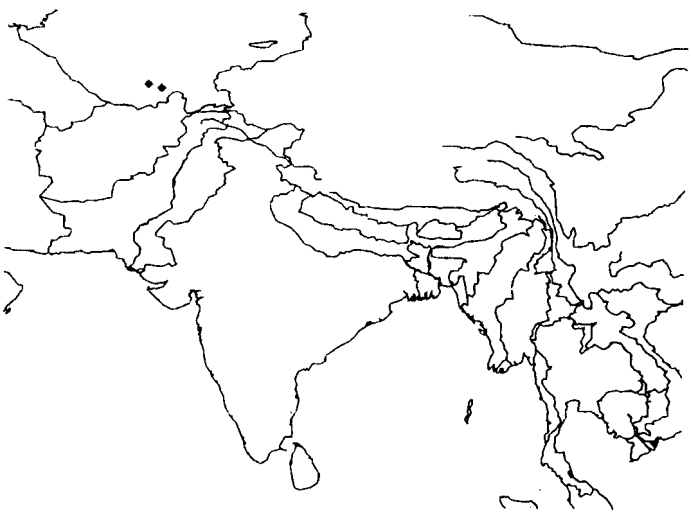
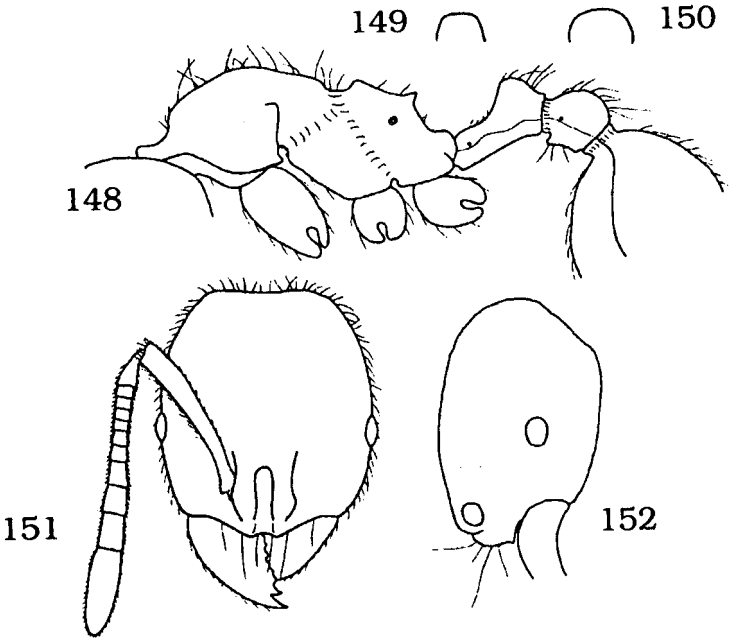


Fig. 147. *Stenamma hissarianum*, known distribution; Tajikstan.



Figs. 148 - 152. *Stenamma jeriorum* sp. n., worker. 148. Alitrunk, lateral view. 149. Petiole, dorsal profile viewed from rear. 150. Postpetiole, dorsal profile viewed from rear. 151. Head, full face view. 152. Head, lateral view.

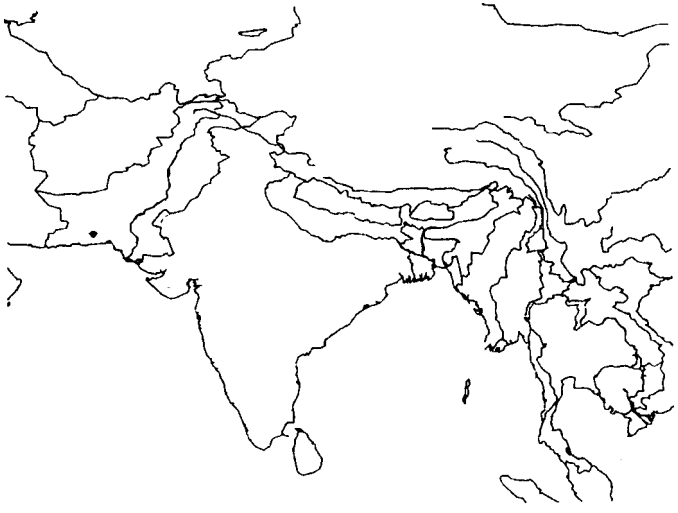
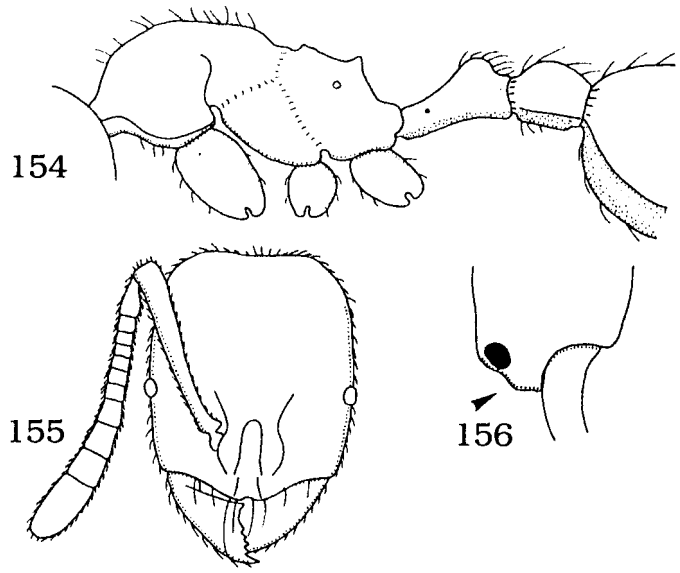
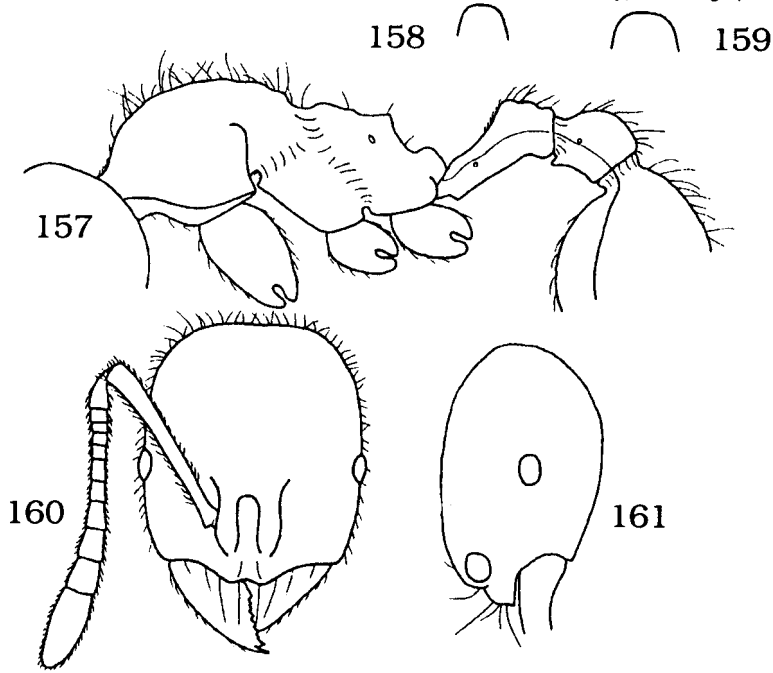


Fig. 153. *Stenamma jeriorum*, known distribution; Pakistan.



Figs. 154 - 156. *Stenamma kashmirense*, worker (from India). 154. Alitrunk, lateral view. 1
Head, full face view. 156. Head, lateral view (pilosity excluded) (note clypeal margin).



Figs. 157 - 161. *Stenamma kashmirense*, worker (from Pakistan). 157. Alitrunk, lateral view. 15
Petiole, dorsal profile viewed from rear. 159. Postpetiole, dorsal profile viewed from rear. 16
Head, full face view. 161. Head, lateral view (most pilosity excluded).

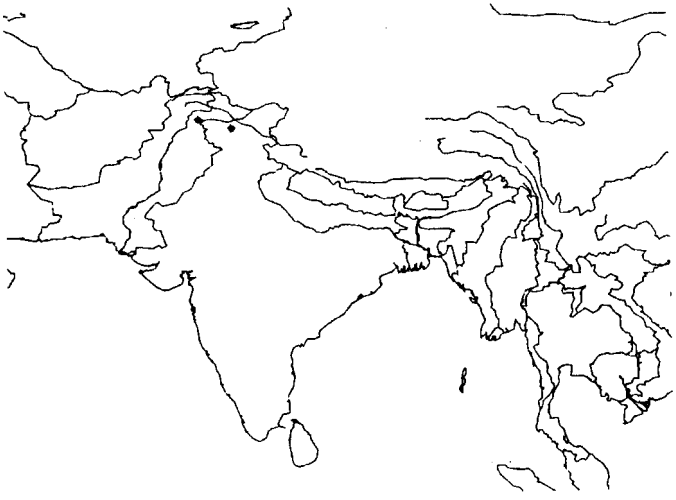
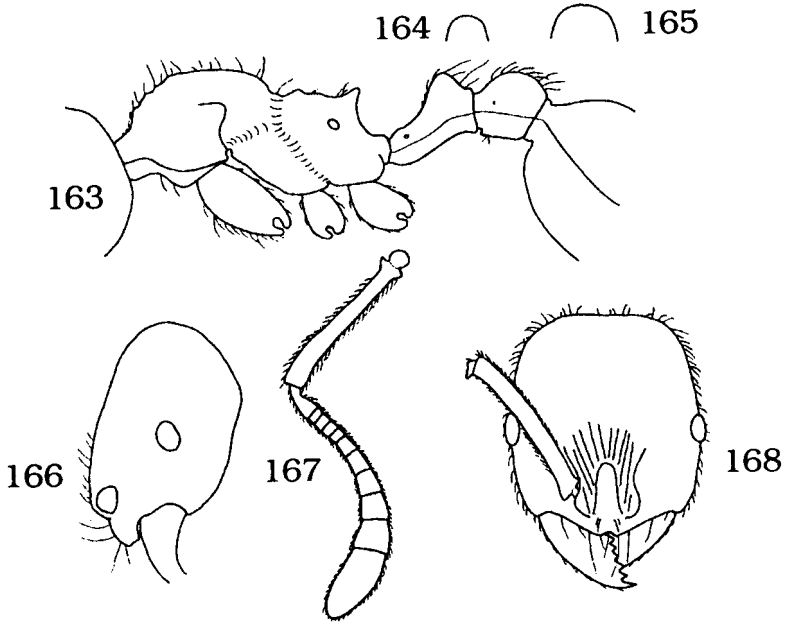
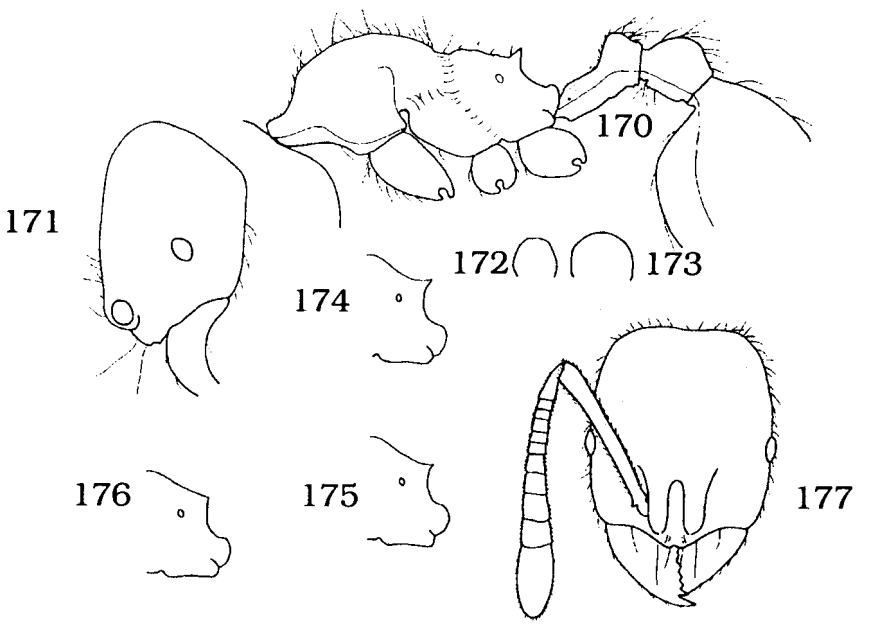


Fig. 162. *Stenamma kashmirense*, known distribution; Kashmir and Pakistan.

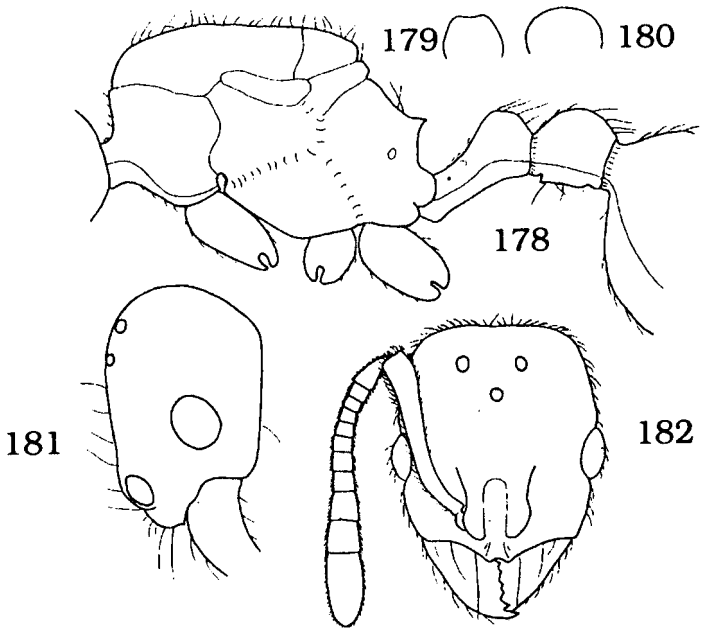


Figs. 163 - 168. *Stenamma kurilense*, worker. 163. Alitrunk, lateral view. 164. Petiole, dorsal profile viewed from rear. 165. Postpetiole, dorsal profile viewed from rear. 166. Head, lateral view (most pilosity excluded). 167. Antenna. 168. Head, full face view (funiculus missing).

Fig. 169. *Stenamma kurilense*, known distribution; Kuril Islands.



Figs. 170 - 177. *Stenamma lippulum*, worker. 170. Alitrunk, lateral view. 171. Head, lateral vie
172. Petiole, dorsal profile viewed from rear. 173. Postpetiole, dorsal profile viewed from rear. 1
- 176. Propodeum, lateral view (note different shapes of spines and propodeal plates). 177. Hea
full face view.



Figs. 178 - 182. *Stenamma lippulum*, gyne. 178. Alitrunk, lateral view. 179. Petiole, dorsal profile viewed from rear. 180. Postpetiole, dorsal profile viewed from rear. 181. Head, lateral view (most pilosity excluded). 182. Head, full face view.

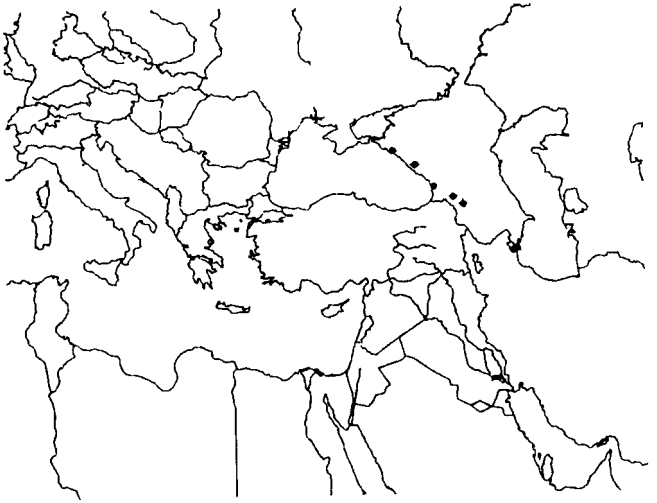
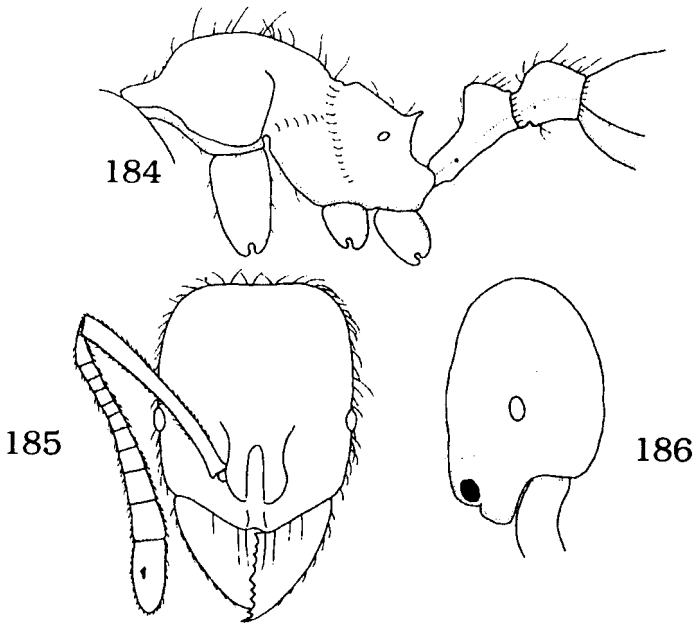
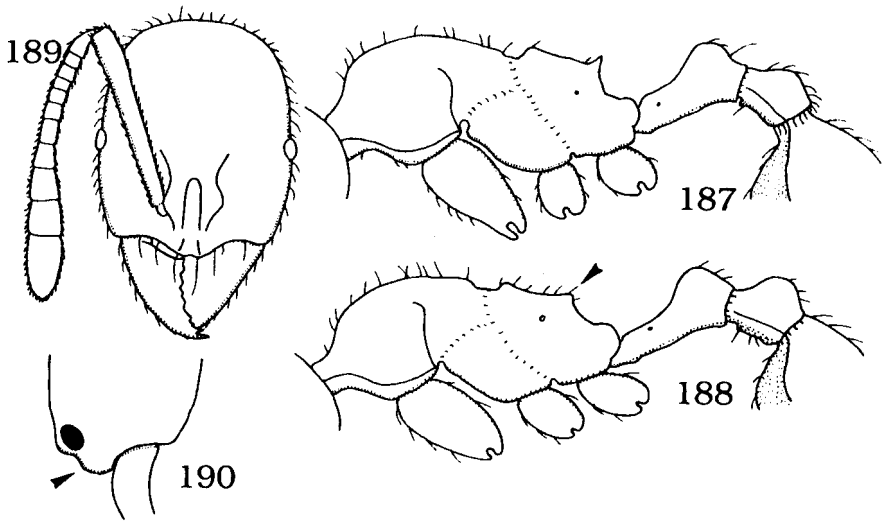


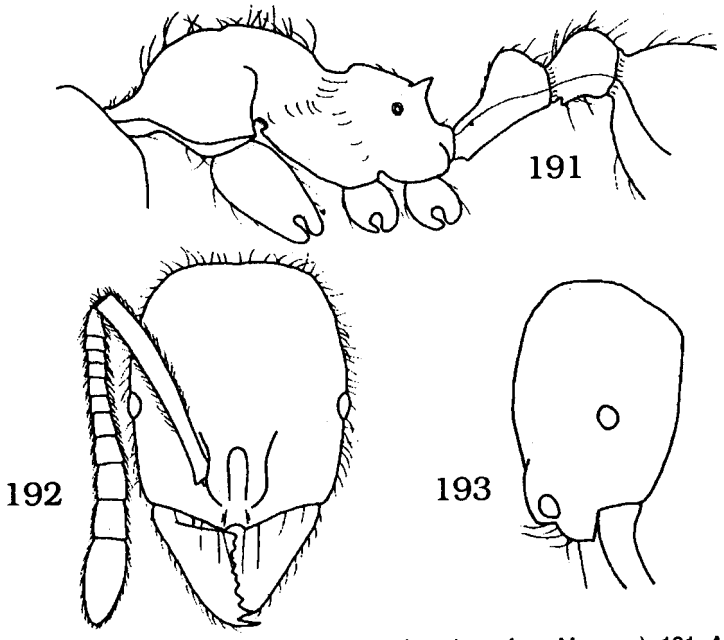
Fig. 183. *Stenamma lippulum*, known distribution; Georgia and southern Russia.



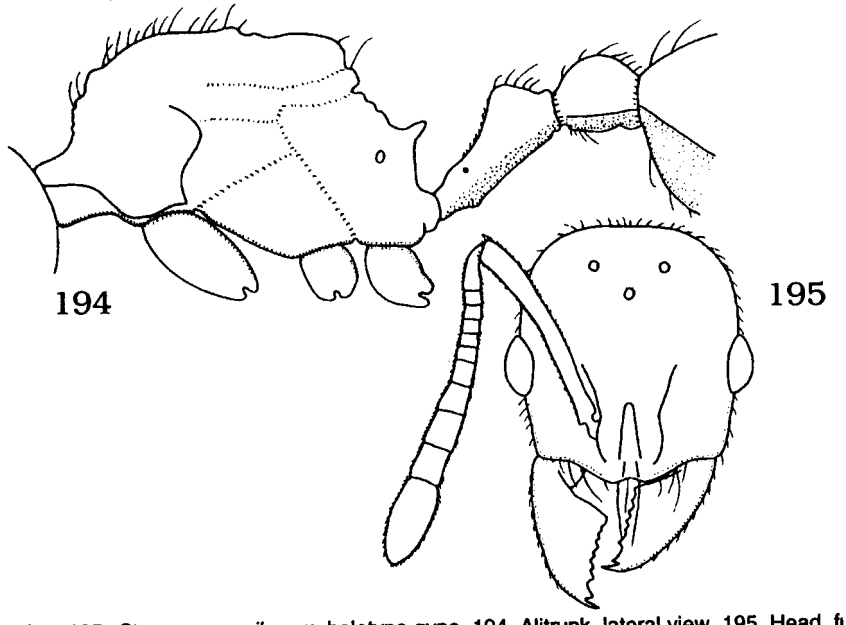
Figs. 184 - 186. *Stenamma hirtulum*, lectotype worker. 184. Alitrunk, lateral view. 185. Head, f face view. 186. Head, lateral view (pilosity excluded).



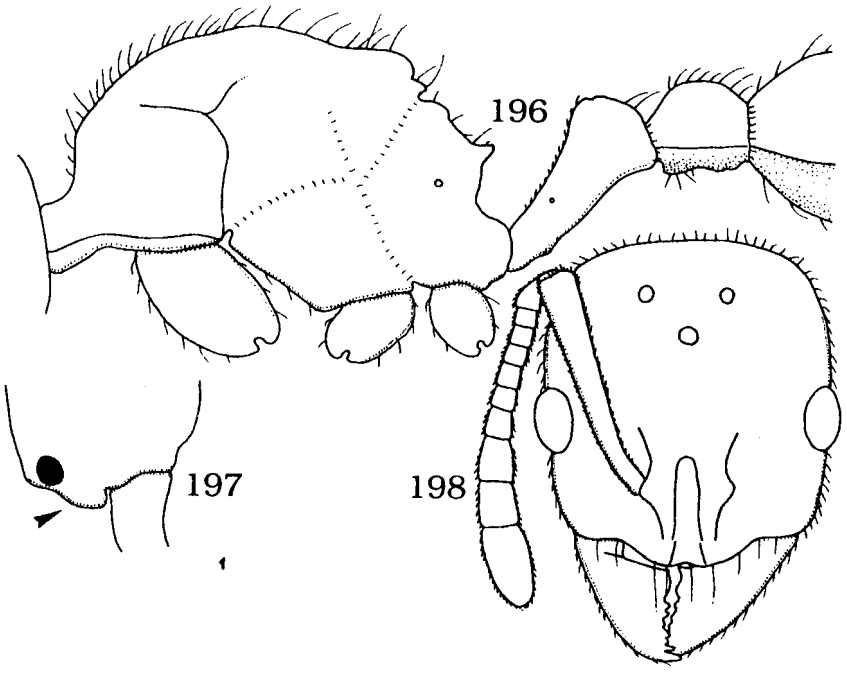
Figs. 187 - 190. *Stenamma msilanum*, worker. 187. Alitrunk, lateral view. 188. Alitrunk, lateral vie (this form was originally described as *S. africanum submuticum*; note reduced propodeal spine 189. Head, full face view. 190. Head, lateral view (pilosity excluded) (note clypeal margin).



Figs. 191 - 193. *Stenamma msilanum*, worker (specimen from Morocco). 191. Alitrunk, lateral view. 192. Head, full face view. 193. Head, lateral view (most pilosity excluded).

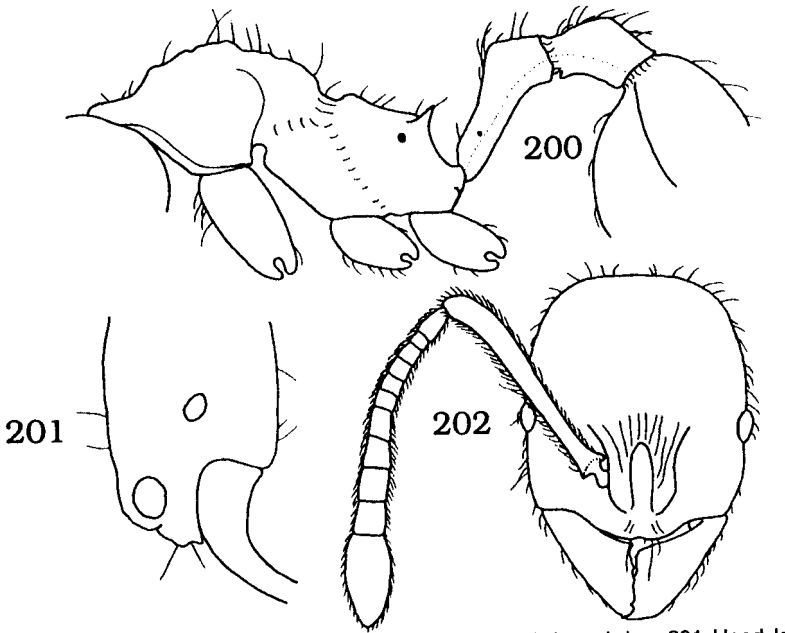


Figs. 194 - 195. *Stenamma msilanum*, holotype gyne. 194. Alitrunk, lateral view. 195. Head, full face view.

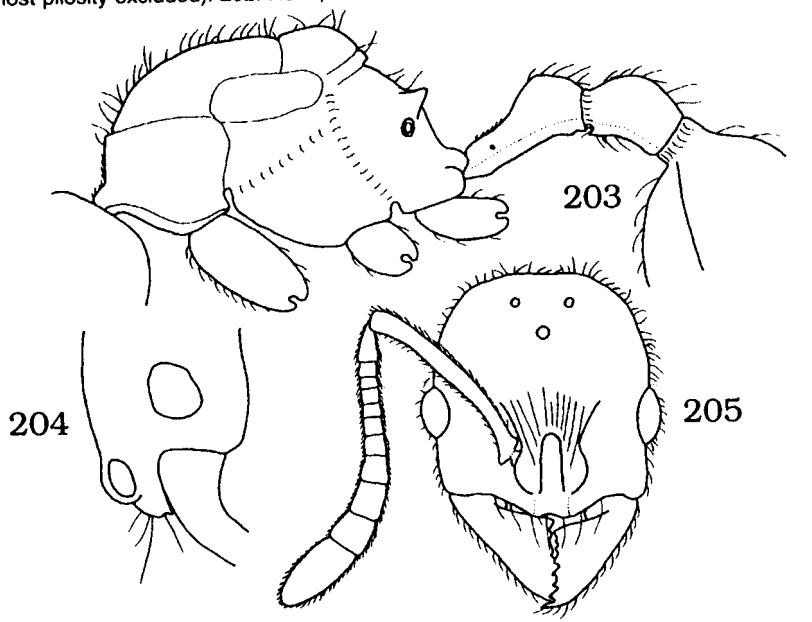


Figs. 196 - 198. *Stenamma msilanum*, gyne. 196. Alitrunk, lateral view. 197. Head, lateral vie (pilosity excluded, note anterior clypeal margin). 198. Head, full face view.

Fig. 199. *Stenamma msilanum*, known distribution; Algeria, Tunisia, and Morocco.



Figs. 200 - 202. *Stenamma nipponense*, worker. 200. Alitrunk, lateral view. 201. Head, lateral view (most pilosity excluded). 202. Head, full face view.



Figs. 203 - 205. *Stenamma nipponense*, gyne. 203. Alitrunk, lateral view. 204. Head, lateral view (most pilosity excluded). 205. Head, full face view.

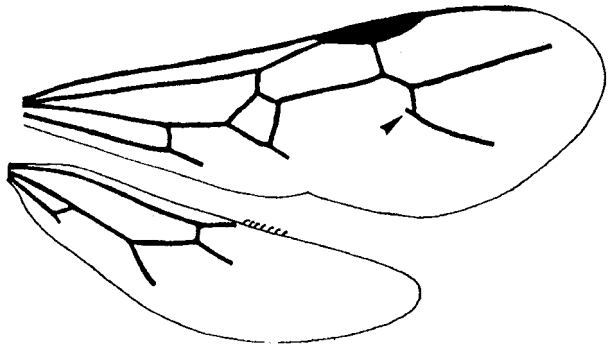
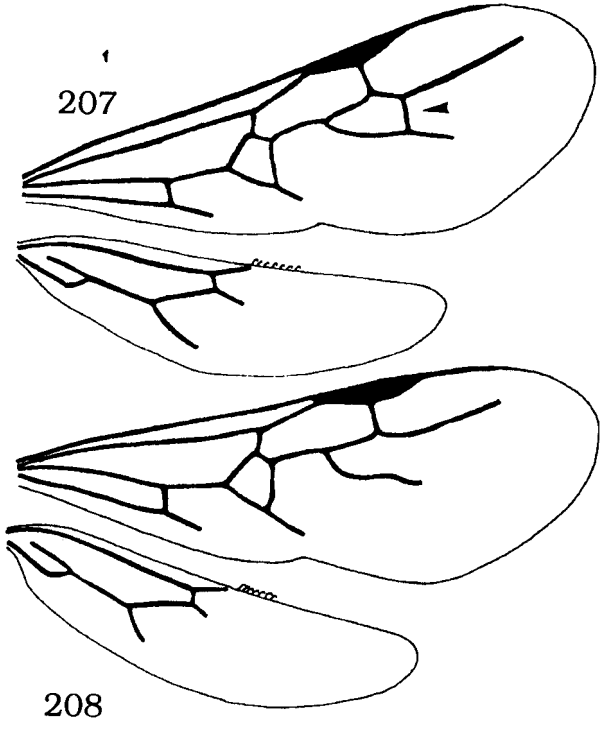


Fig. 206. *Stenamma nipponense*, gyne, wing venation. Note adventitious vein stub on M ve below stigma.



Figs. 207 - 208. *Stenamma nipponense*, male wing venation. 207. Type 1 venation (note additiona cross vein). 208. Type 2 venation (more typical of genus).

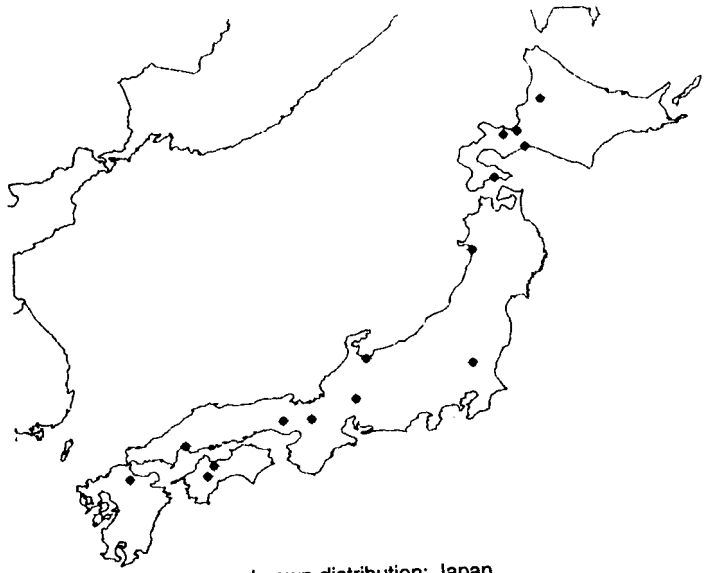
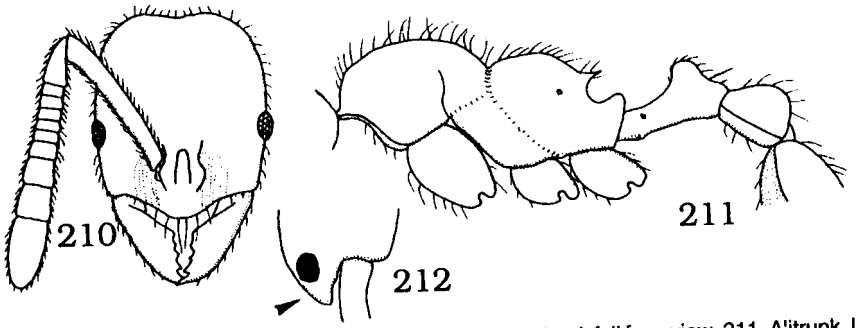


Fig. 209. *Stenamma nipponense*, known distribution; Japan.



Figs. 210 - 212. *Stenamma orientale* sp. n., worker. 210. Head, full face view. 211. Alitrunk, lateral view. 212. Head, lateral view (pilosity excluded, note clypeal margin).

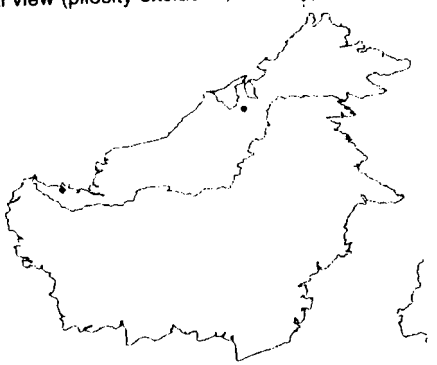
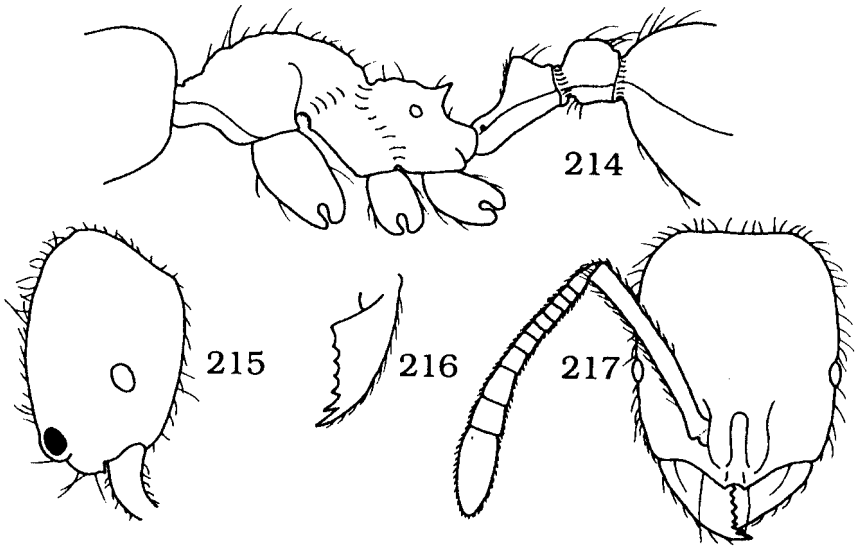
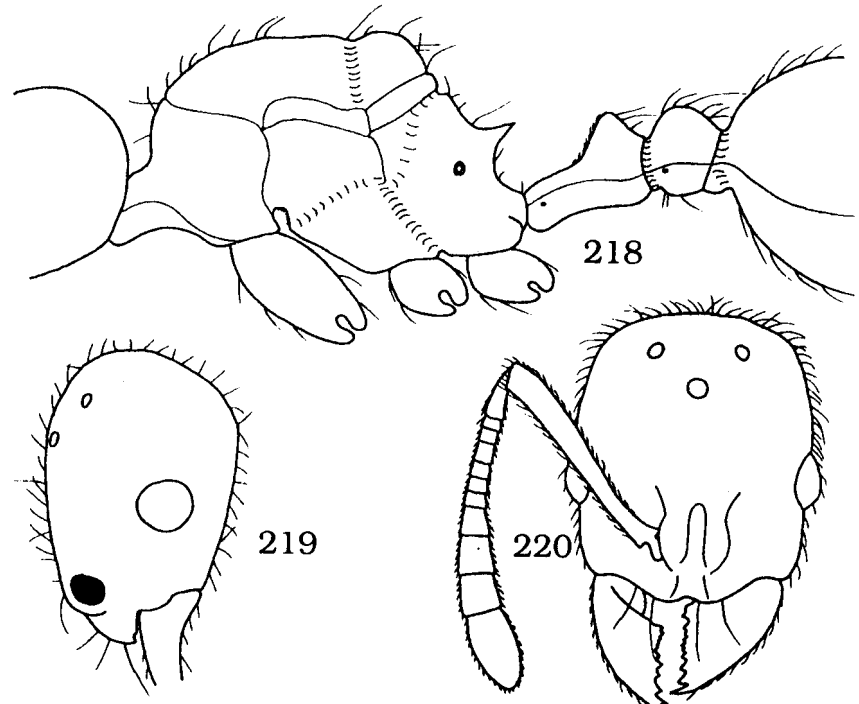


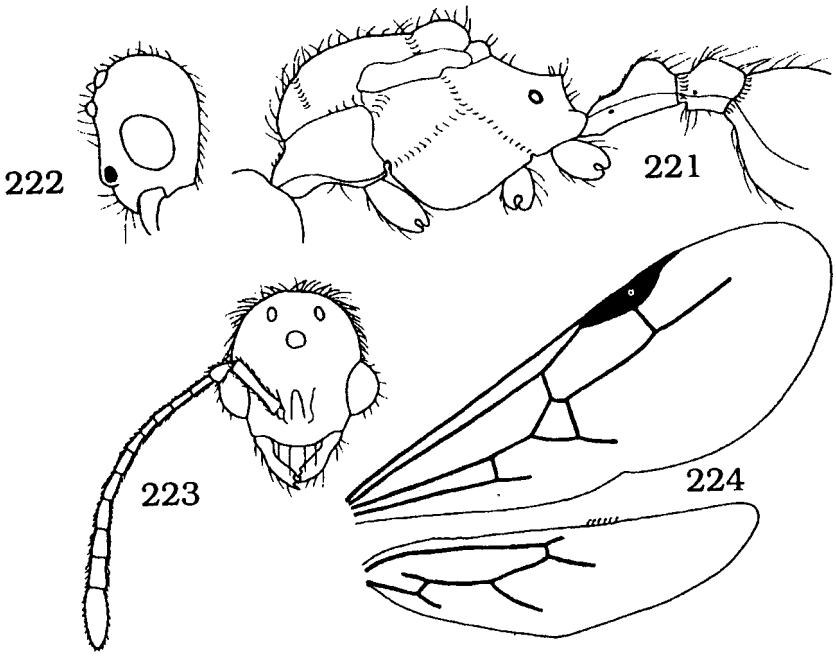
Fig. 213. *Stenamma orientale*, known distribution; Borneo.



Figs. 214 - 217. *Stenamma orousseti*, worker. 214. Alitrunk, lateral view. 215. Head, lateral vie
216. Left mandible. 217. Head, full face view.

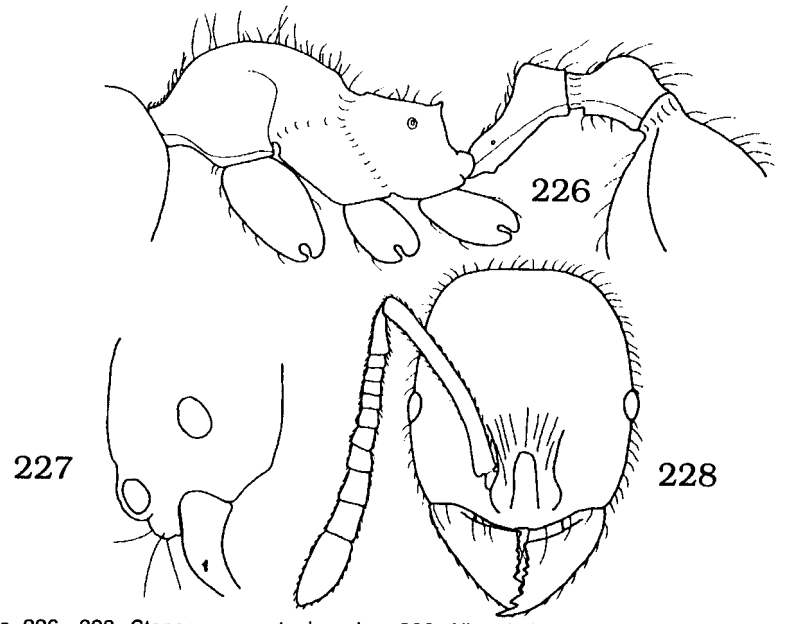


Figs. 218 - 220. *Stenamma orousseti*, gyne. 218. Alitrunk, lateral view. 219. Head, lateral vie
220. Head, full face view.

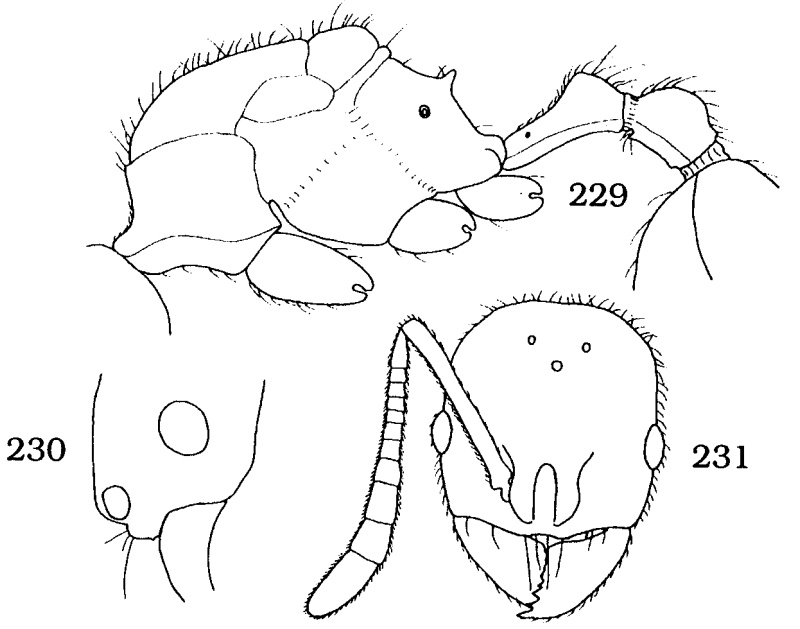


Figs. 221 - 224. *Stenamma orousseti*, male. 221. Alitrunk, lateral view. 222. Head, lateral view. 223. Head, full face view. 224. Wing venation.

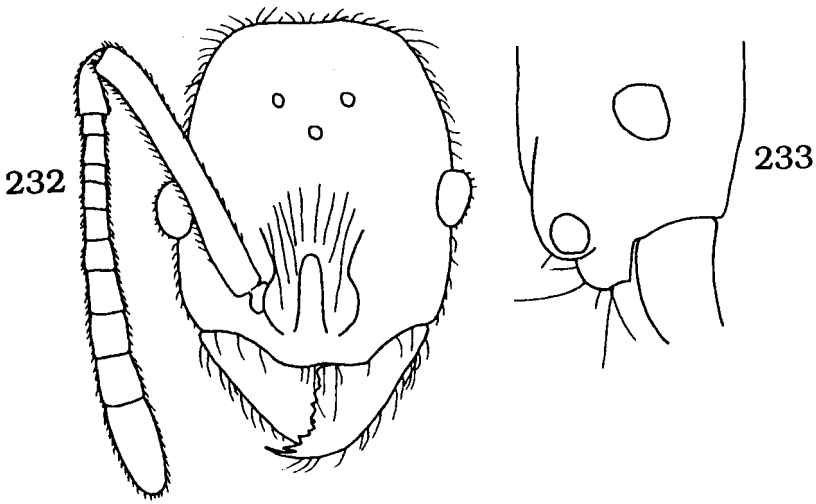
Fig. 225. *Stenamma orousseti*, known distribution; Corsica, Sardinia, southern France.



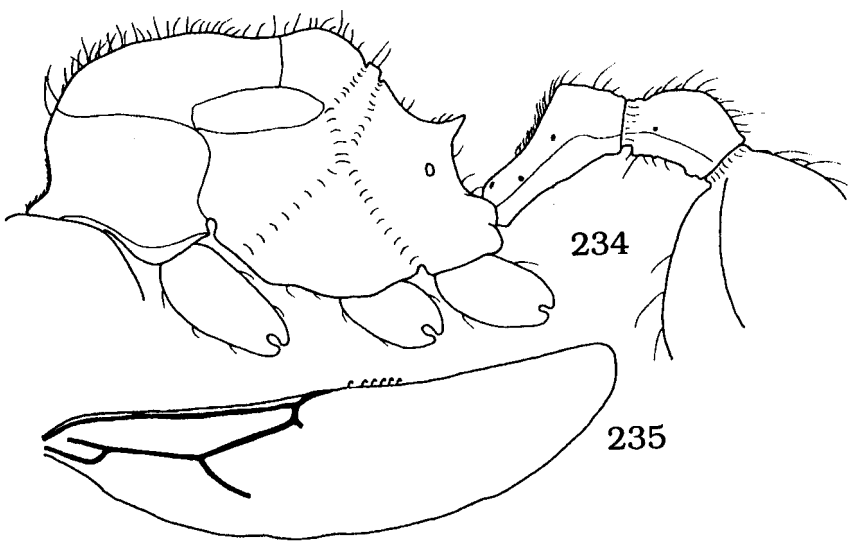
Figs. 226 - 228. *Stenamma owstoni*, worker. 226. Alitrunk, lateral view. 227. Head, lateral vie
(most pilosity excluded). 228. Head, full face view.



Figs. 229 - 231. *Stenamma owstoni*, gyne (from Japan). 229. Alitrunk, lateral view. 230. Hea
lateral view (most pilosity excluded). 231. Head, full face view.



Figs. 232 - 233. *Stenamma owstoni*, gyne (from China). 232. Head, full face view. 233. Head, lateral view (most pilosity excluded).



Figs. 234 - 235. *Stenamma owstoni*, gyne (from China). 234. Alitrunk, lateral view. 235. Hind wing (no fore wing present).

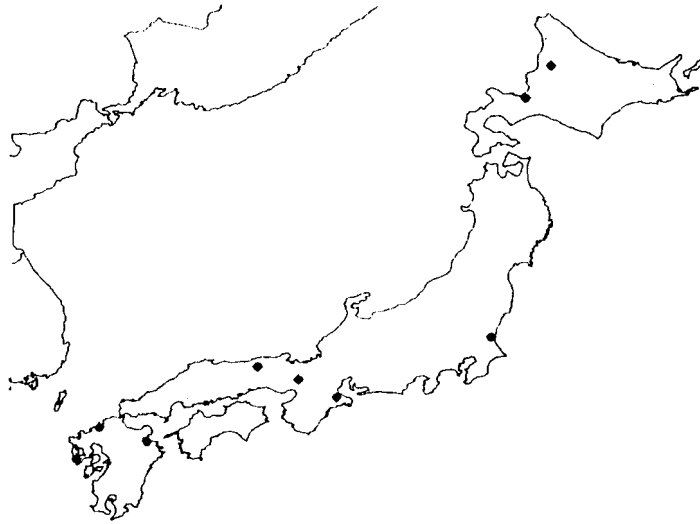
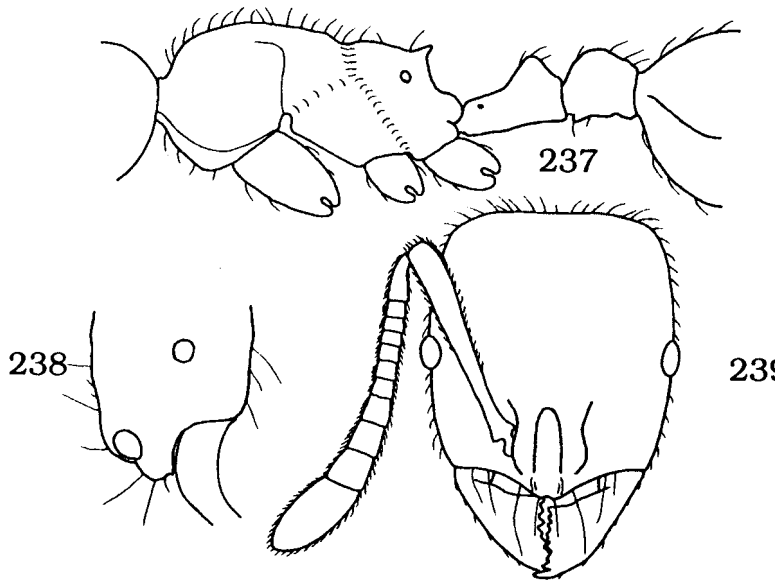
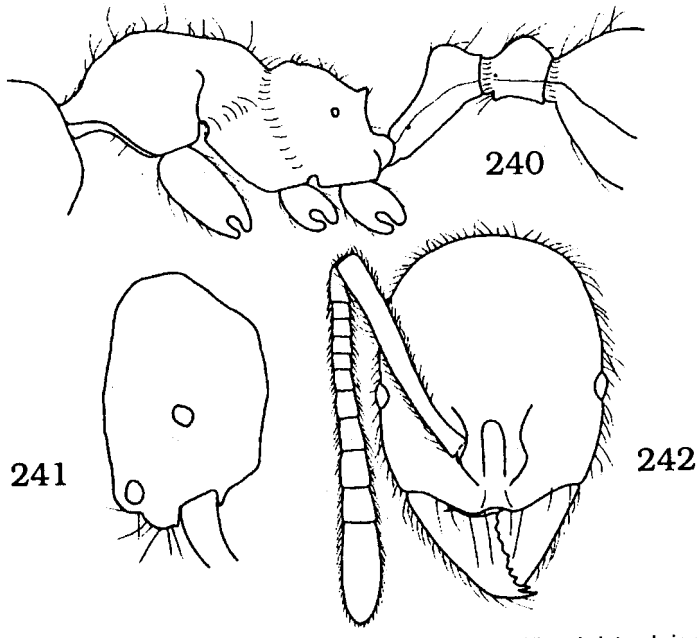


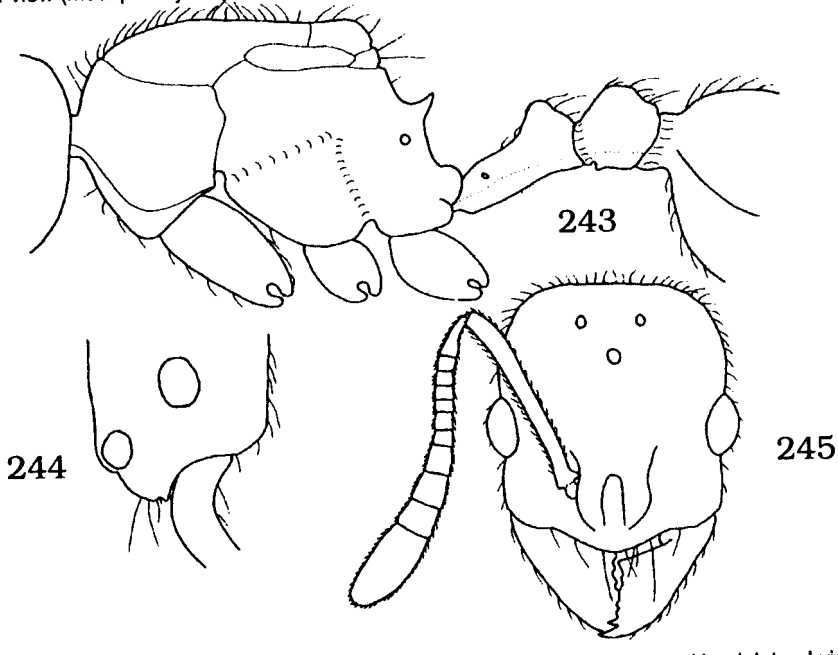
Fig. 236. *Stenamma owstoni*, known distribution (excluding Chinese locality which could not located); Japan.



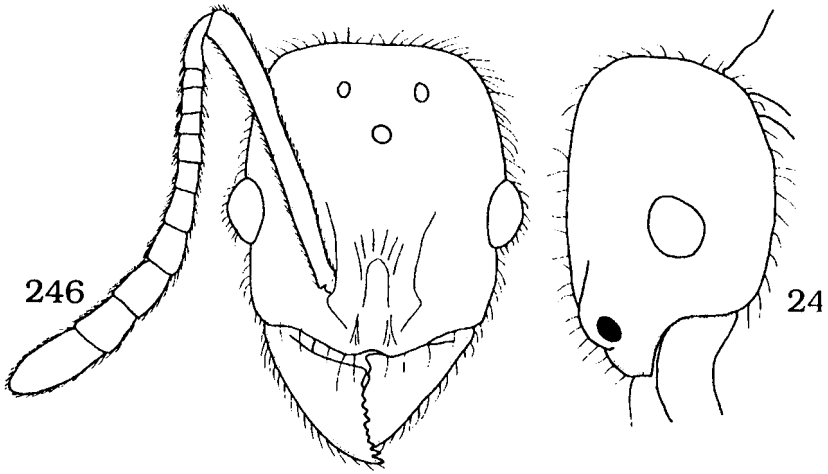
Figs. 237 - 239. *Stenamma petiolatum*, worker (from Italy). 237. Alitrunk, lateral view. 238. Hea lateral view (most pilosity excluded). 239. Head, full face view.



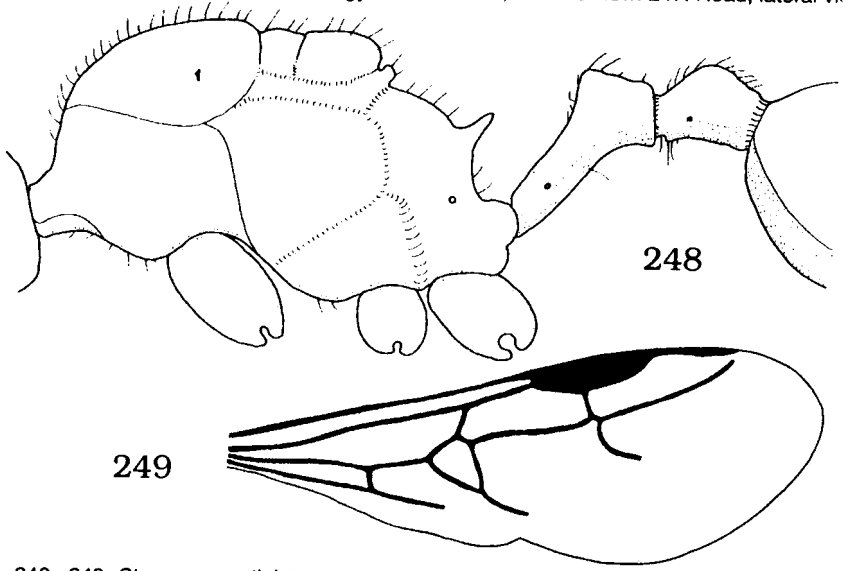
Figs. 240 - 242. *Stenamma petiolatum*, worker (from Spain). 240. Alitrunk, lateral view. 241. Head, lateral view (most pilosity excluded). 242. Head, full face view.



Figs. 243 - 245. *Stenamma petiolatum*, gyne. 243. Alitrunk, lateral view. 244. Head, lateral view (most pilosity excluded). 245. Head, full face view.

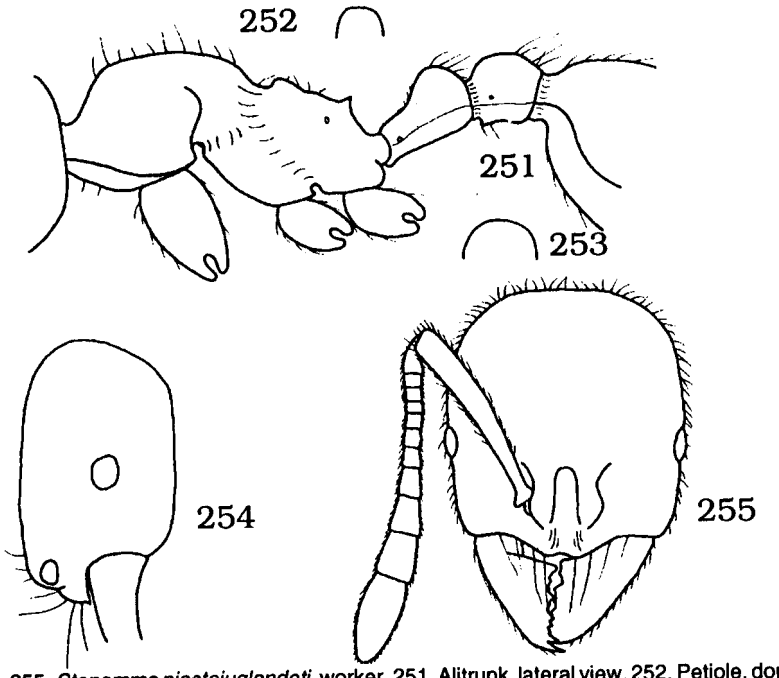


Figs. 246 - 247. *Stenamma petiolatum*, gyne. 246. Head, full face view. 247. Head, lateral vi

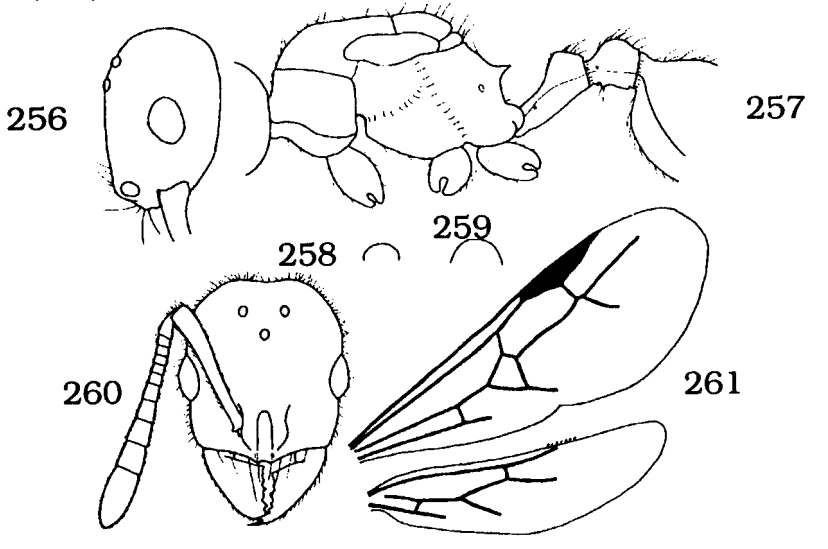


Figs. 248 - 249. *Stenamma petiolatum*, gyne. 248. Alitrunk, lateral view. 249. Fore wing (no hi wing present).

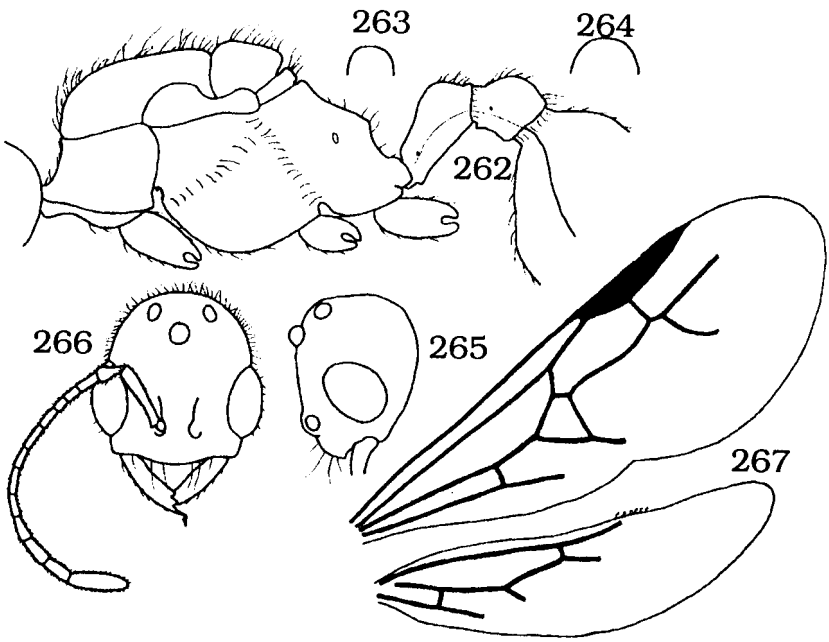
Fig. 250. *Stenamma petiolatum*, known distribution; Italy, Corsica.



Figs. 251 - 255. *Stenamma picetojuglandeti*, worker. 251. Alitrunk, lateral view. 252. Petiole, dorsal profile viewed from rear. 253. Postpetiole, dorsal profile viewed from rear. 254. Head, lateral view (most pilosity excluded). 255. Head, full face view.



Figs. 256 - 261. *Stenamma picetojuglandeti*, gyne. 256. Head, lateral view (most pilosity excluded). 257. Alitrunk, lateral view. 258. Petiole, dorsal profile viewed from rear. 259. Postpetiole, dorsal profile viewed from rear. 260. Head, full face view. 261. Wing venation.



Figs. 262 - 267. *Stenamma picetojuglandeti*, male. 262. Alitrunk, lateral view. 263. Petiole, dor profile viewed from rear. 264. Postpetiole, dorsal profile viewed from rear. 265. Head, lateral vi (most pilosity excluded). 266. Head, full face view. 267. Wing venation.

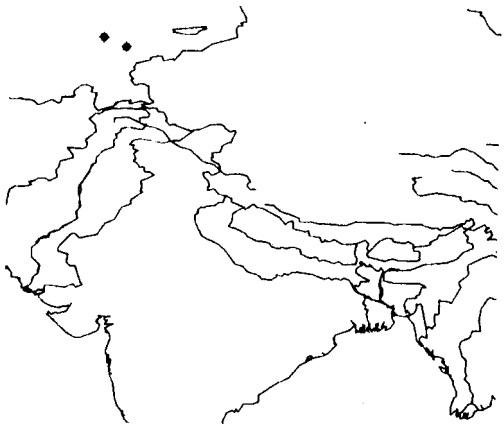
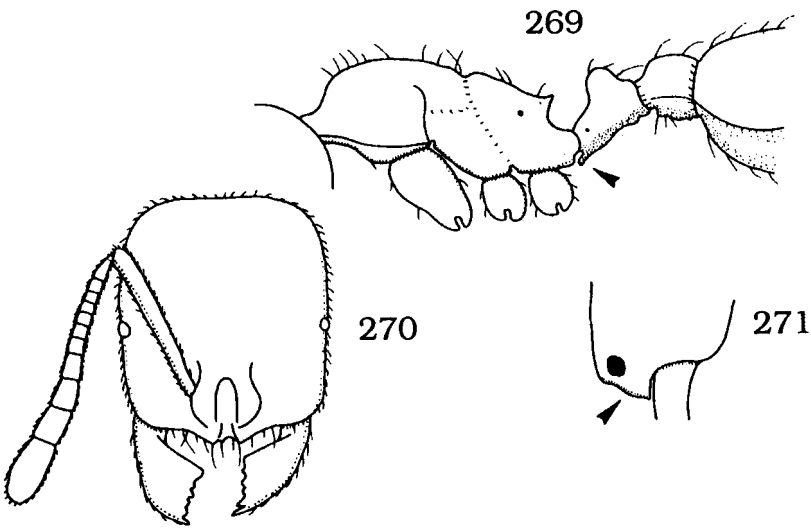
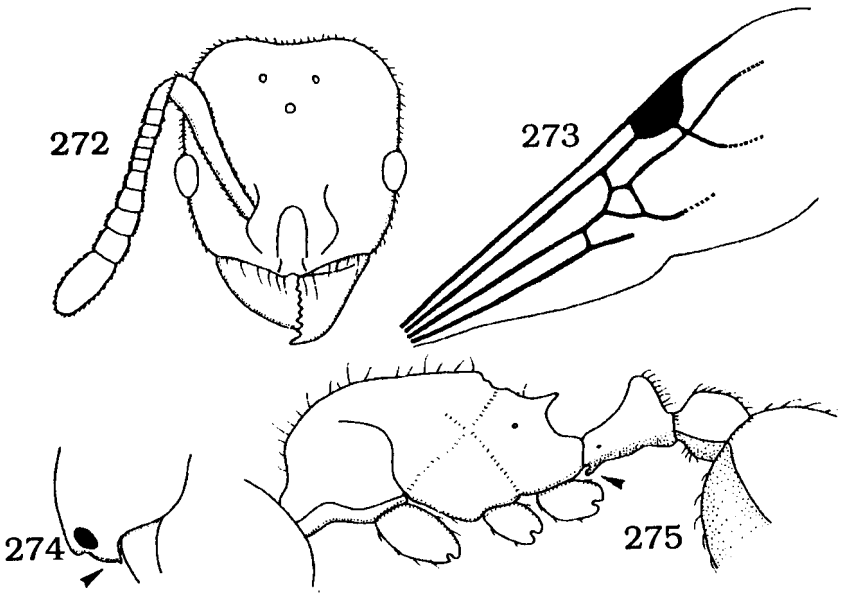


Fig. 268. *Stenamma picetojuglandeti*, known distribution; Kazakstan, Kirghizia.

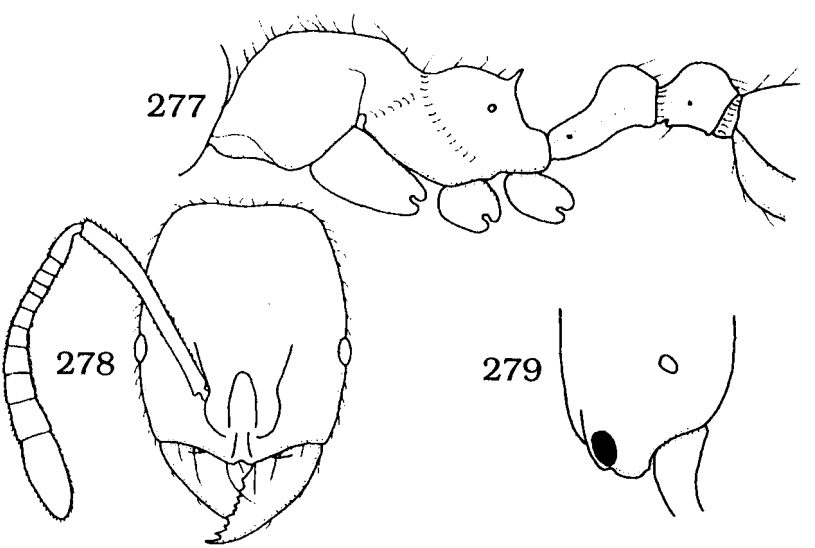


Figs. 269 - 271. *Stenamma punctiventre*, worker. 269. Alitrunk, lateral view (note anterior subpetiolar process). 270. Head, full face view. 271. Head, lateral view (most pilosity excluded, note anterior clypeal margin).

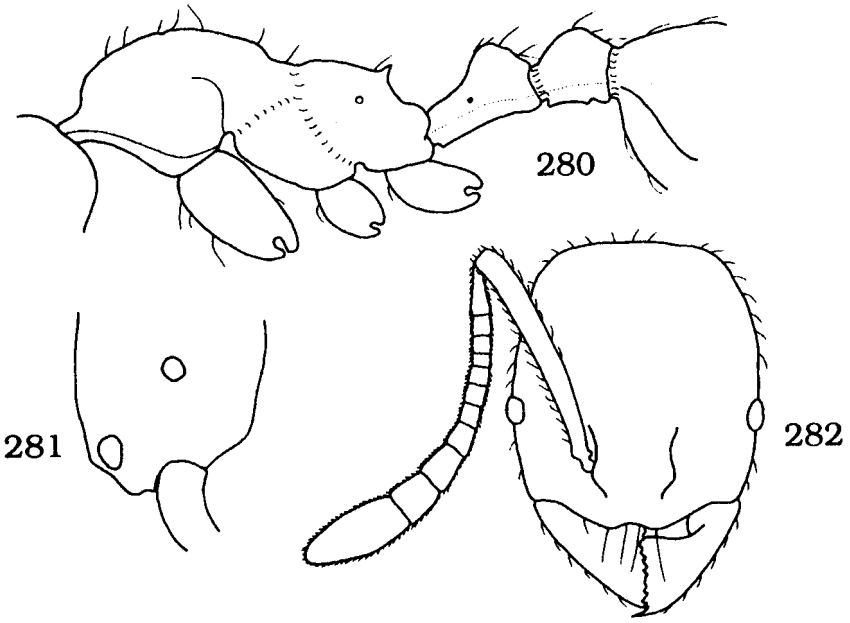


Figs. 272 - 275. *Stenamma punctiventre*, gyne. 272. Head, full face view. 273. Fore wing (hind wing missing). 274. Head, lateral view (pilosity excluded, note anterior clypeal margin). 275. Alitrunk, lateral view (note anterior subpetiolar process).

Fig. 276. *Stenamma punctiventre*, known distribution; Morocco.

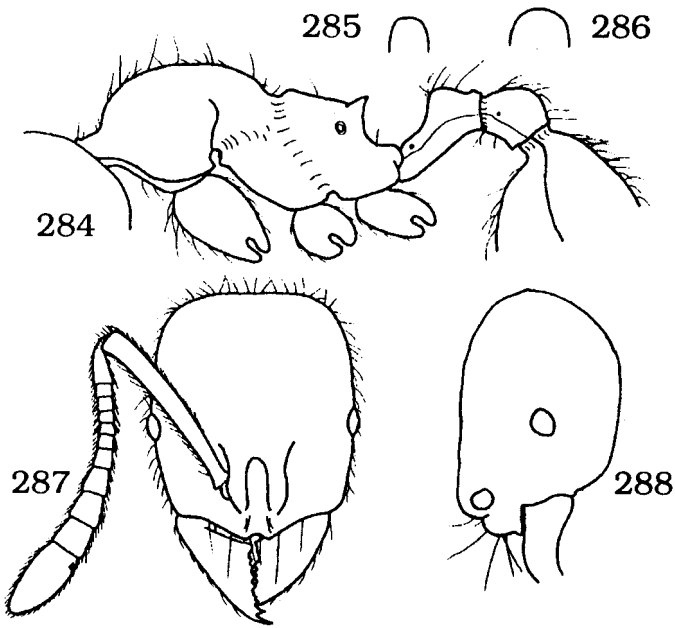


Figs. 277 - 279. *Stenamma sardoum*, worker (from Sardinia). 277. Alitrunk, lateral view. 27
Head, full face view. 279. Head, lateral view (pilosity excluded).



Figs. 280 - 282. *Stenamma sardoum*, worker (from Spain). 280. Alitrunk, lateral view. 281. Head, lateral view (pilosity excluded). 282. Head, full face view.

Fig. 283. *Stenamma sardoum*, known distribution; Spain, Sardinia.



Figs. 284 - 288. *Stenamma sogdianum*, worker. 284. Alitrunk, lateral view. 285. Petiole, dor profile viewed from rear. 286. Postpetiole, dorsal profile viewed from rear. 287. Head, full fa view. 288. Head, lateral view (most pilosity excluded).

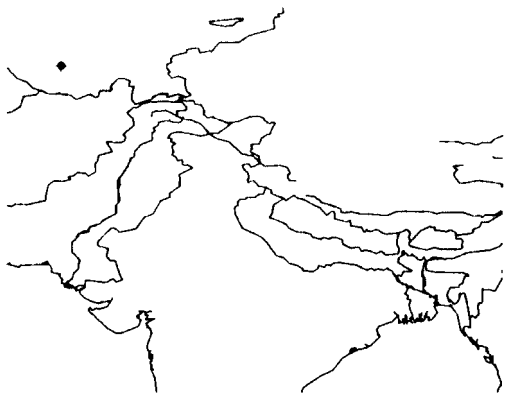
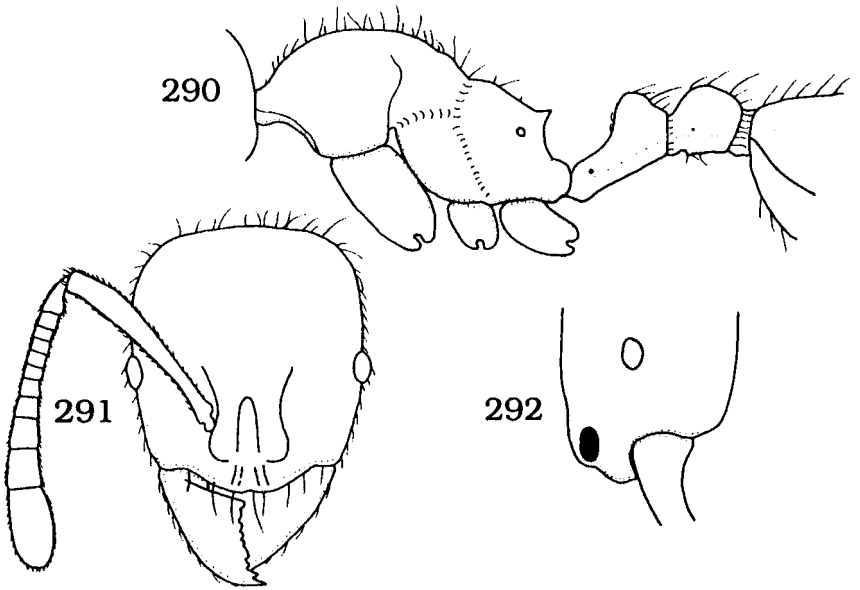
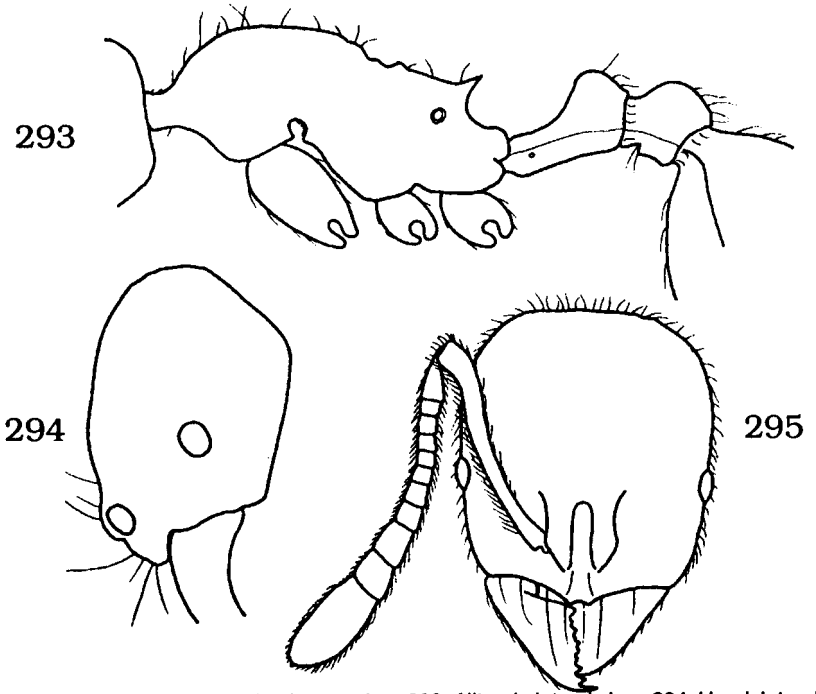


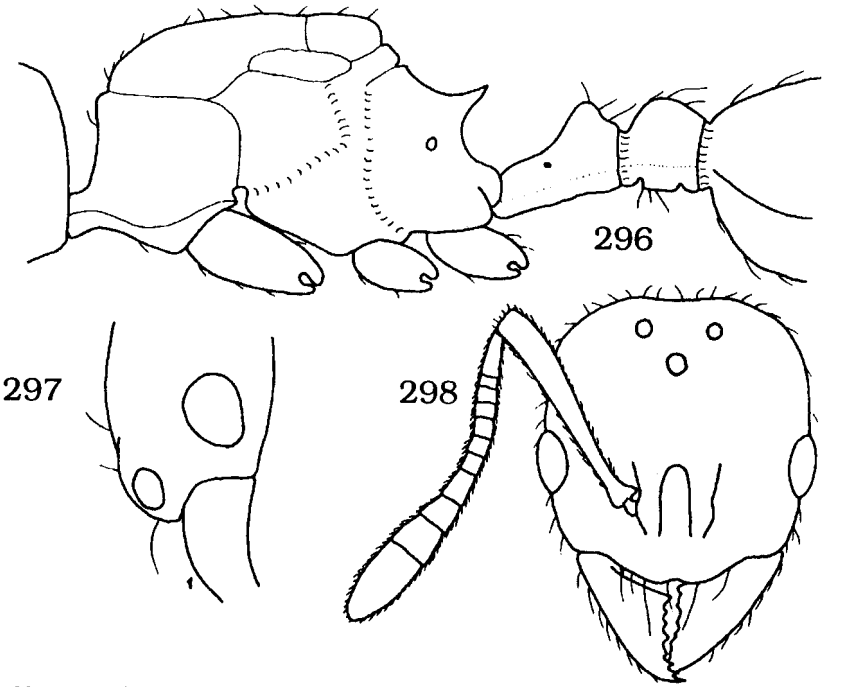
Fig. 289. *Stenamma sogdianum*, known distribution; Uzebekistan.



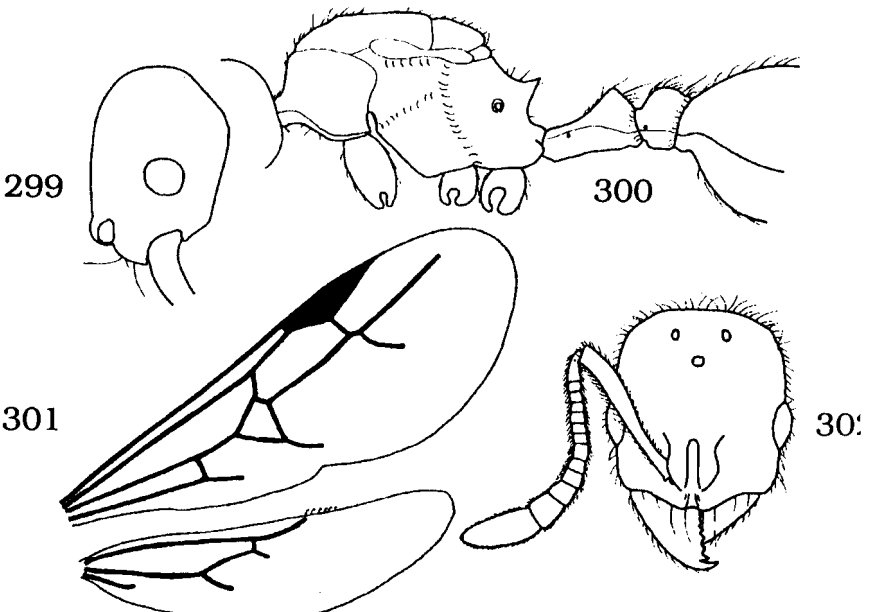
Figs. 290 - 292. *Stenamma striatulum*, worker. 290. Alitrunk, lateral view. 291. Head, full face view. 292. Head, lateral view (pilosity excluded).



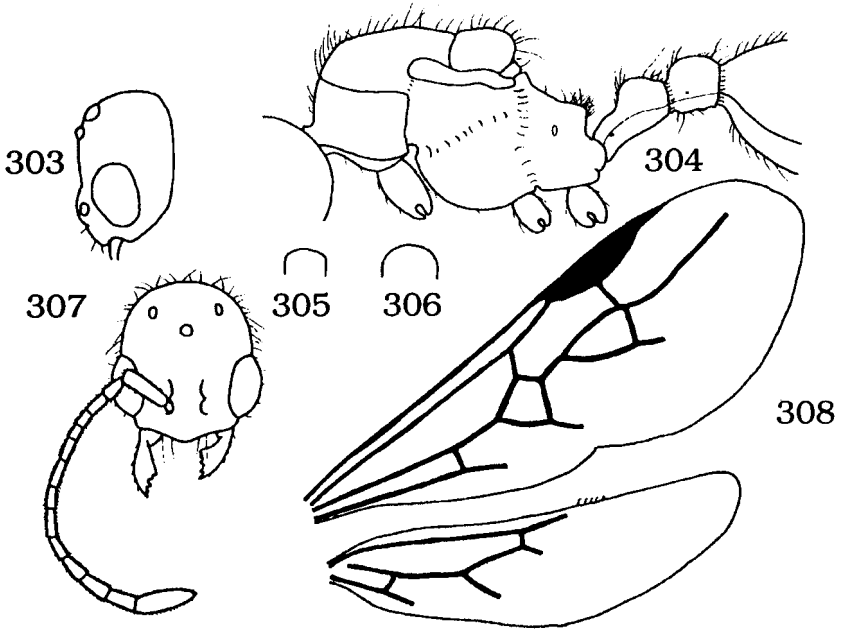
Figs. 293 - 295. *Stenamma striatulum*, worker. 293. Alitrunk, lateral view. 294. Head, lateral view (most pilosity excluded). 295. Head, full face view.



Figs. 296 - 298. *Stenamma striatulum*, gyne. 296. Alitrunk, lateral view. 297. Head, lateral vi
(most pilosity excluded). 298. Head, full face view.



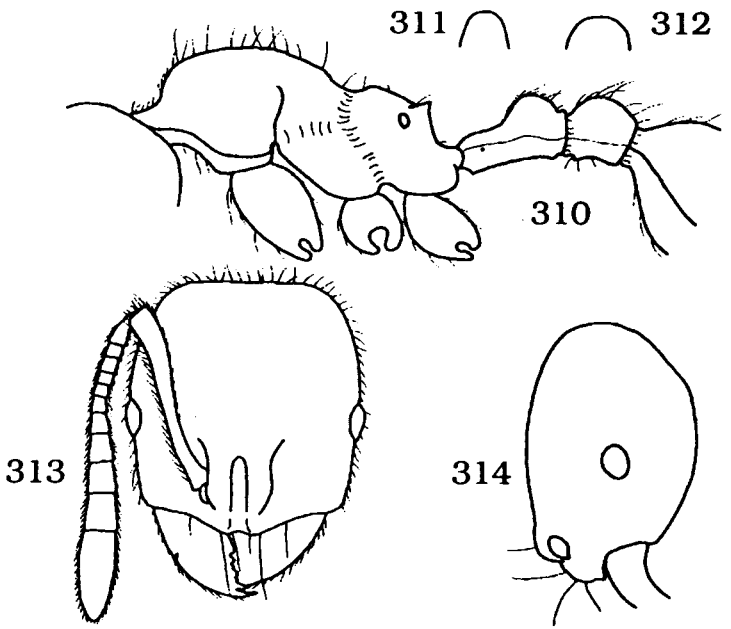
Figs. 299 - 302. *Stenamma striatulum*, gyne (from Spain). 299. Head, lateral view (most pilos
excluded). 300. Alitrunk, lateral view. 301. Wing venation. 302. Head, full face view.



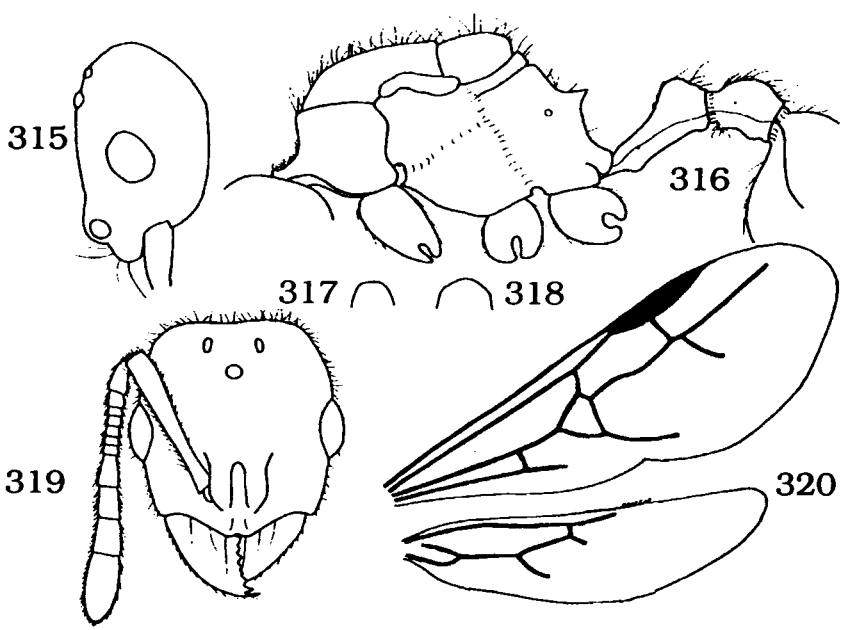
Figs. 303 - 308. *Stenamma striatulum*, male. 303. Head, lateral view (most pilosity excluded). 304. Alitrunk, lateral view. 305. Petiole, dorsal profile viewed from rear. 306. Postpetiole, dorsal profile viewed from rear. 307. Head, full face view. 308. Wing venation.

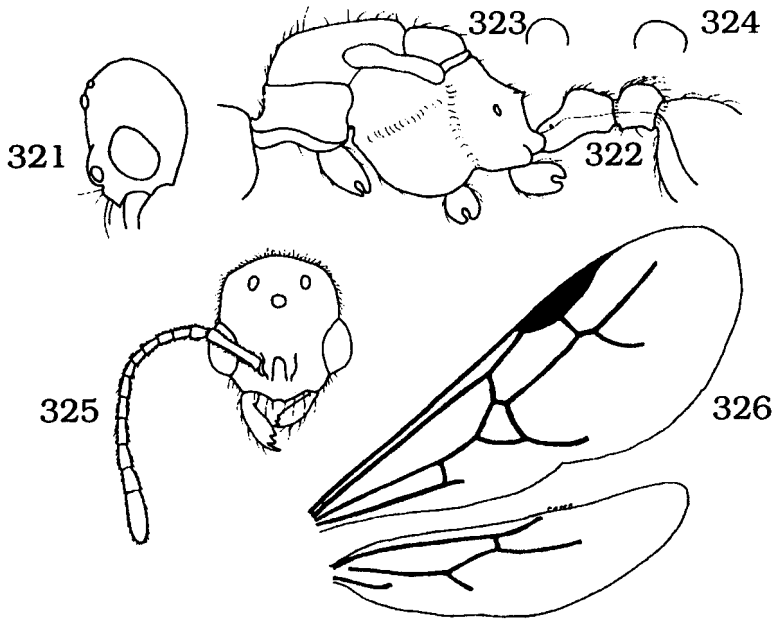
Fig. 309. *Stenamma striatulum*, known distribution; southern and eastern Europe and Turkey.

Figs. 315 - 320. *Stenamma ussuriense*, gyne. 315. Head, lateral view (most pilosity excluded). 316. Alitrunk, lateral view. 317. Petiole, dorsal profile viewed from rear. 318. Postpetiole, dorsal profile viewed from rear. 319. Head, full face view. 320. Wing venation.



Figs. 310 - 314. *Stenamma ussuriense*, worker. 310. Alitrunk, lateral view. 311. Petiole, dor profile viewed from rear. 312. Postpetiole, dorsal profile viewed from rear. 313. Head, full fa view. 314. Head, lateral view (most pilosity excluded).





Figs. 321 - 326. *Stenamma ussuriense*, male. 321. Head, lateral view (most pilosity excluded). 322. Alitrunk, lateral view. 323. Petiole, dorsal profile viewed from rear. 324. Postpetiole, dorsal profile viewed from rear. 325. Head, full face view. 326. Wing venation.

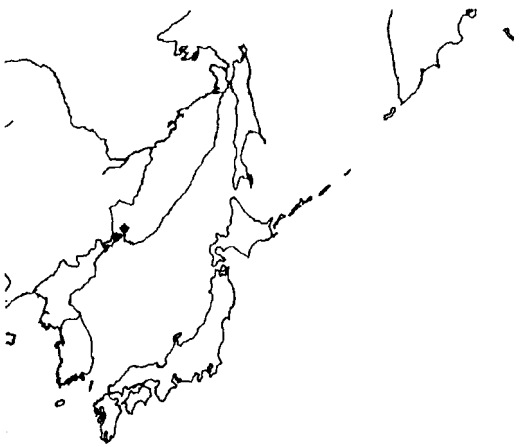
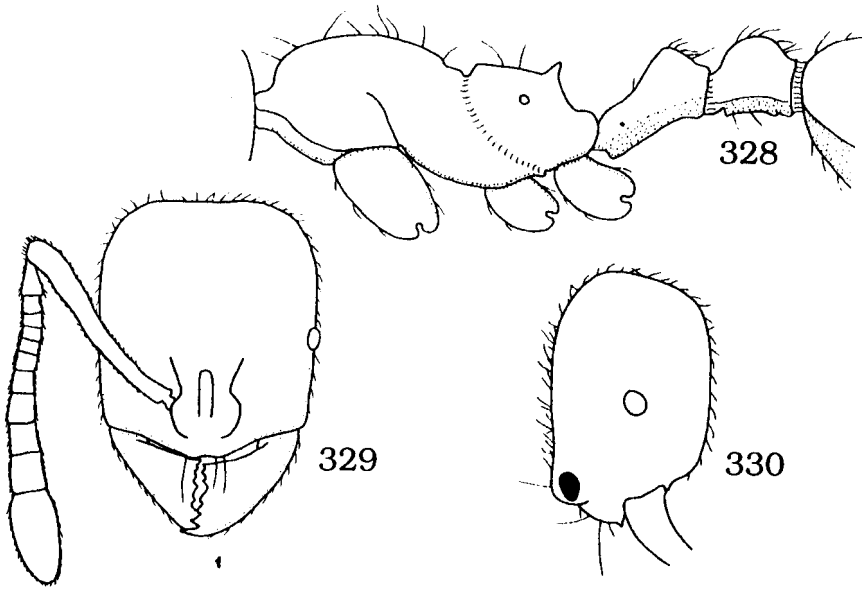
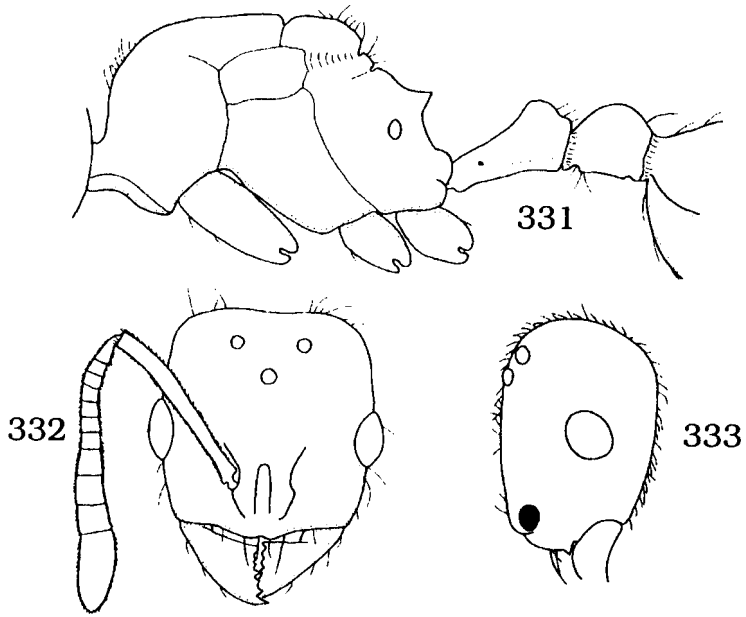


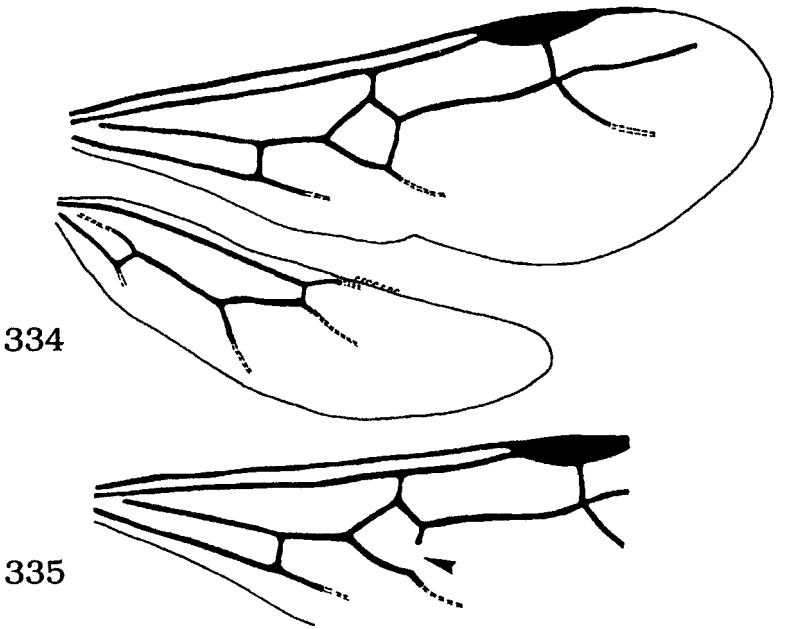
Fig. 327. *Stenamma ussuriense*, known distribution; southeastern Russia.



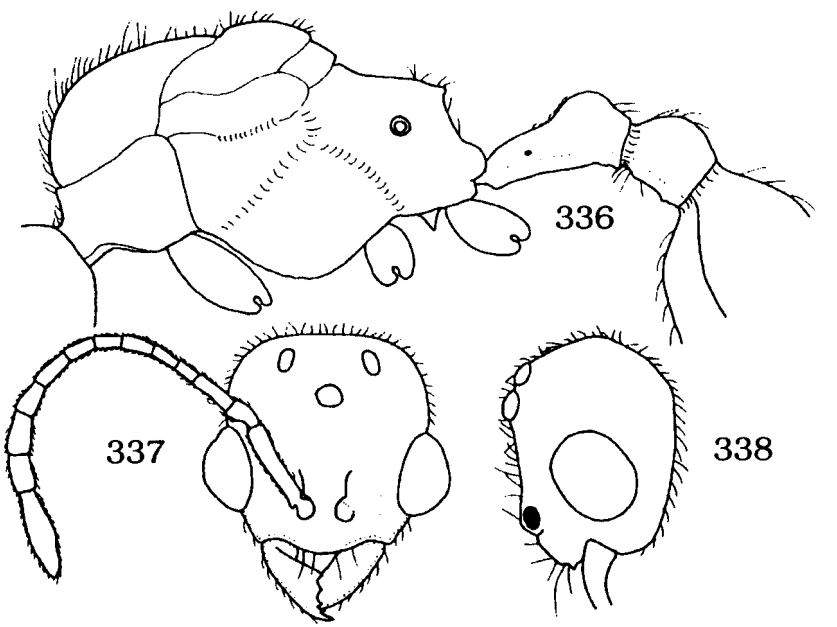
Figs. 328 - 330. *Stenamma westwoodii*, worker. 328. Alitrunk, lateral view. 329. Head, full fa view. 330. Head, lateral view (most pilosity excluded).



Figs. 331 - 333. *Stenamma westwoodii*, gyne. 331. Alitrunk, lateral view. 332. Head, full face vie 333. Head, lateral view (most pilosity excluded).



Figs. 334 - 335. *Stenamma westwoodii*, wing venation. 334. Gyne. 335. Male, fore wing (note incomplete discoidal cell).



Figs. 336 - 338. *Stenamma westwoodii*, male. 336. Alitrunk, lateral view. 337. Head, full face view. 338. Head, lateral view (most pilosity excluded).

Fig. 339. *Stenamma westwoodii*, knc
distribution; Great Britain and Belgium.

Index

Compiled by Barbara L. Amador

O

P

R

S

T

V