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TAXONOMY OF THE DOLICHODERINE ANT GENUS *TECHNOMYRMEX* MAYR (HYMENOPTERA: FORMICIDAE) BASED ON THE WORKER CASTE

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SYNOPSIS

The taxonomy of the world fauna of *Technomyrmex* is revised, based on the worker caste. Ninety species are recognised of which 37 are described as new. Most species occur in the Oriental-Malesian and Afrotropical regions (45 and 29 species, respectively) and three widely distributed tramp species occur in almost all the zoogeographical regions. Ten formerly infraspecific names are elevated to species rank and 36 names, mostly of infraspecific forms, are relegated to the synonymy. Identification keys are presented, prepared on a regional basis, and descriptions of all valid species are given. The unique strategy of colony reproduction found in the *T. albipes* group is discussed. The genus-group name *Tapinoptera* (type-species: *Tapinoma vexatum* Santschi) is transferred from the synonymy of *Tapinoma* to that of *Technomyrmex* as the type-species belongs in the latter genus.

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INTRODUCTION

Technomyrmex is one of those "forgotten" genera of ants whose species-rank taxonomy to date consists almost entirely of the literature of original descriptions. Apart from a few investigations of the small faunae of single countries (*e.g.* Bingham (1903) for India, Arnold (1915) for South Africa, Wu & Wang (1995) for China and Collingwood & Agosti (1996) for Saudi Arabia) no synthesising taxonomic work has ever been undertaken on a zoogeographical regional or global scale. Of course, the genus is by no means alone in this among the ants, but it is particularly surprising in this case because the genus contains some of the world's most accomplished tramp, invasive and pest species, and has a large group of species with a technique of colony reproduction that is unique in Formicidae.

The genus *Technomyrmex* has always been included in the subfamily Dolichoderinae since the inception of the ants' subfamily system (Forel, 1878; Emery, 1895a; Emery, 1913; Wheeler, W.M. 1922), but the limits of the genera were not particularly accurately defined until Shattuck (1992b) conducted his detailed review of the dolichoderines at genus rank. This allowed the production of modern catalogues of the genus (Shattuck, 1994; Bolton, 1995b), which in turn provided the framework for this investigation. Recent keys to world dolichoderine genera can be found in Hölldobler & Wilson (1990), Shattuck (1992b), Bolton (1994), and a regional key to Neotropical genera has more recently been produced by Palacio & Fernández (2003). A synopsis of the previous taxonomic history of the entire subfamily and its genera is provided by Bolton (2003). By the time of Bolton's (1995a) census of extant Formicidae *Technomyrmex* had amassed 59 extant species-rank taxa, a number raised to 90 in this revision. Ants of the genus *Technomyrmex* are mainly distributed throughout the tropical and sub-tropical zones of the Afrotropical region (29 species) and the Oriental and Malesian regions (45 species). There are smaller faunae in the Malagasy and Austral regions (12 and 13 species respectively) and two species that are restricted to the southern Palaearctic. Strangely, there is also a single, endemic Neotropical species that is restricted to small areas of Costa Rica and Panama.

In certain restricted localities individuals of single *Technomyrmex* species may be very numerous but in general they form only a relatively minor fraction of the total local ant fauna, both in terms of number of species and number of individuals. Locations where individuals of single species occur in huge numbers, other than when invading houses, are generally in stands or plantations of tree crops. Room (1971) found *T. moerens* (recorded as *T. sp.*) to be very common in plantations of *Theobroma cacao* in Ghana, and *T. albipes* on the same crop in Papua New Guinea (Room, 1975). *T. lujae* (recorded as *T. sp. 2*) was the most numerous ant species in the canopies of *Terminalia ivorensis* trees in southern Cameroun (Watt, Stork & Bolton, 2002) where it made up 80% of the total number of canopy ants sampled. *T. albipes* is also very common in coconut plantations in Sri Lanka, Malaysia and Philippines (Way & Bolton, 1997), but never seems to be a dominant species on this crop. Apart from these rather special cases the relative numbers seem low. For instance, at Pasoh Forest Reserve, West Malaysia, Bolton (1998) recorded that *Technomyrmex* accounted for only 4.8% of species (8% of individuals) in canopy samples, and 2% of species (1.5% of individuals) in leaf litter samples. A survey of leaf litter ants carried out in Ghana (Belshaw & Bolton, 1994) found that *Technomyrmex* comprised 2.5% of total species and only 3.5% of total individual ants.

Some recent lists of ant species from single countries, or particular areas within countries, confirm that the number of *Technomyrmex* species, relative to the total number of species present, is always low. For example it is only about 2% in North Korea (Radchenko, 2005), about 2% at Bogor Botanical Gardens, Java (Ito, Yamane, *et al.*, 2001), about 1.5% in two national parks in Vietnam (Eguchi, Bui, *et al.*, 2005), about 2% in the Arabian Peninsula (Collingwood & Agosti, 1996) and about 3% in Madagascar (estimated from Fisher, 1997 and later taxonomic contributions to the island's fauna).

A large proportion of the taxonomic confusion in the genus centres upon three accomplished and much-misidentified common tramp species of the *T. albipes* group,

namely *albipes, difficilis* and *vitiensis*. These three have been very widely spread by commerce and have almost universally all been referred to as *albipes* in the past. They have also been confused with a number of related and widely distributed common species that occur sympatrically with the tramps through parts of their range. Species such as *jocosus* in the Austral region, *pallipes* in the Malagasy and Afrotropical regions, *moerens* in the Afrotropical region and *brunneus* in the Oriental region all feature in the literature misidentified as *albipes*. The genuine tramp species tend to occur sporadically throughout all zoogeographical regions except the Neotropical, where only *difficilis* has been found (in Florida and Puerto Rico), and they are occasionally encountered in hothouses or dwellings in the Palaearctic and Nearctic regions.

The majority of *Technomyrmex* species are arboreal or sub-arboreal, with a very limited number apparently restricted to life in the leaf litter layer, but even those species which nest in the ground mostly also ascend shrubs and trees to forage on the trunks and in the canopy. A very few species appear to be associated with myrmecophytes. Lists of the specialised myrmecophilous plants that have been recorded as housing *Technomyrmex* species are given in Hölldobler & Wilson (1990) and Davidson & McKey (1993). For the most part no names of *Technomyrmex* species are given in these lists but this survey has recorded *laurenti, indicus*, and a single record of *albipes*, from myrmecophyte domatia. Honeydew from a wide range of homopterous insects appears to form the main diet although most species will also scavenge for protein, both alive and dead, usually in the form of other arthropods or their eggs. Colony reproductive strategy in most species seems the same as is general throughout the Formicidae, with alate males and queens engaging in a nuptial flight, but members of the *T. albipes* group have a unique strategy that involves reproductive ergatoid worker-queen intercastes and ergatoid males, as well as the usual alate sexual forms. This feature is discussed under the two species where it has been investigated, *T. difficilis* and *brunneus* (pp. 47, 73).

There are four fossil species currently included in the genus, mostly dubiously so. Two of these are from the Dominican amber, one from the Sicilian amber and one from an impression fossil from China. These are not included in the revision but are discussed separately.

In the revision that follows the species are keyed and described according to zoogeographical region. The tramp species are included in each regional key but their descriptions and full distribution data are included only under the region from which each was originally described.

Standard Measurements and Indices

Measurements

Total Length (TL). The total outstretched length of the ant from the mandibular apex to the gastral apex.

Head Length (HL). The length of the head capsule excluding the mandibles; measured in full-face view in a straight line from the mid-point of the anterior clypeal margin to the mid-point of the posterior margin. In species where one or both of these margins is concave the measurement is taken from the mid-point of a transverse line that spans the apices of the projecting portions.

Head Width (HW). The maximum width of the head behind the eyes, measured in full-face view.

Scape Length (SL). The maximum straight-line length of the scape, excluding the basal constriction or neck that occurs just distal of the condylar bulb.

Pronotal Width (PW). The maximum width of the pronotum in dorsal view.

Weber's Length of Mesosoma (WL). The diagonal length of the mesosoma in profile, from the anteriormost point of the pronotum to the posterior basal angle of the metapleuron.

All measurements are expressed in millimetres.

Indices

Cephalic Index (CI). HW divided by HL, × 100.

Scape Index (SI). SL divided by HW, × 100.

Ocular Index (OI). Maximum diameter of eye divided by HW, × 100.
Eye Position Index (EPI). In full-face view the straight-line length (parallel to the long axis of the head) from the anteriormost point of the eye to the anterior clypeal margin, divided by the straight-line length from the posteriormost point of the eye to the posterior margin, × 100.
Dorsal Thoracic Index (DTI). In dorsal view the length from the mid-point of the anterior pronotal margin to the midpoint of the metanotal groove, divided by PW, × 100.

Depositories of material
Abbreviations are as listed in Brandão (2000).

AMNH American Museum of Natural History, New York, U.S.A.
ANIC Australian National Insect Collection, Canberra City, Australia.
BMNH The Natural History Museum, London, U.K.
CASC California Academy of Sciences, San Francisco, U.S.A.
GNUC Guangxi Normal University, Guilin, Guangxi, China.
HNHM Hungarian Natural History Museum, Budapest, Hungary.
IEGG Istituto di Entomologia "Guido Grandi", Bologna, Italy.
KUEC Kyushu University, Fukuoka, Japan.
KUIC Kagoshima University Faculty of Science, Kagoshma, Japan.
LACM Los Angeles County Museum of Natural History, Los Angeles, CA, U.S.A.
MCSN Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy.
MCZC Museum of Comparative Zoology, Cambridge, MA, U.S.A.
MHNG Muséum d'Histoire Naturelle, Geneva, Switzerland.
MNHN Muséum National d'Histoire Naturelle, Paris, France.
MRAC Musée Royal de l'Afrique Centrale, Tervuren, Belgium.
MSNM Museo Civico di Storia Naturale, Milano, Italy.
NHMB Naturhistorisches Museum, Basel, Switzerland.
NHMW Naturhistorisches Museum, Wien, Austria.
NZSI National Zoological Collection, Zoological Survey of India, Calcutta, India.
OXUM Hope Entomological Collections, University Museum, Oxford, U.K.
SAMC South African Museum, Cape Town, South Africa.
UABC Universitat Autonòma de Barcelona, Bellaterra, Spain.
UASK Ukrainian National Academy of Sciences, Kiev, Ukraine.
UCDC University of California, Davis, California, U.S.A.
USNM U.S. National Museum of Natural History, Washington, D.C., U.S.A.
WAMP Western Australian Museum, Perth, Australia.
ZMHB Museum für Naturkunde der Humboldt-Universität, Berlin, Germany.
ZMUH Zoologisches Institut und Museum der Universität, Hamburg, Germany.

The genus *Technomyrmex*

TECHNOMYRMEX Mayr

Technomyrmex Mayr, 1872: 147. Type-species: *Technomyrmex strenua* Mayr, 1872: 147, by monotypy.
Engramma Forel, 1905a: 180. Type-species: *Engramma lujae* Forel, 1905a: 181, by monotypy. [Synonymy with *Technomyrmex* by Shattuck, 1992b: 153.]
Tapinoptera Santschi, 1925: 348 [as subgenus of *Tapinoma*]. Type-species: *Tapinoma vexatum* Santschi, 1919b: 220, by monotypy. **Syn. n.** [Previously synonymised with *Tapinoma* by Shattuck, 1992b: 146.]
Aphantolepis Wheeler, W.M. 1930: 44. Type-species: *Aphantolepis quadricolor* Wheeler, W.M. 1930: 44, by monotypy. [Synonymy with *Technomyrmex* by Brown, 1953: 5; Shattuck, 1992b: 153.]

DIAGNOSIS OF WORKER

Dolichoderine ants. Masticatory margin of mandible multidentate, with 12 – 14 teeth, without a basal angle; basal margin of mandible denticulate to crenulate. Palp formula 6,4 in the vast majority of species, reduced to PF 5,3 in two species (*pratensis* and *lasiops*) and to PF 4,3 in two species (*lujae* and *reductus*). Median portion of anterior clypeal margin transverse to very deeply incised. Eyes always present. Ocelli absent (but 1 or 3 present in many worker-queen intercastes of the *albipes* group). Antenna 12-segmented, filiform or gradually incrassate towards the apex but without a club. Metanotal groove present. Propodeum unarmed, its dorsum-declivity junction broadly rounded to distinctly angular. Mesotibia and metatibia each with one spur, that on the metatibia pectinate. Petiole extremely reduced, forming a low narrow segment without a node or scale (there is a slight raised surface, immediately behind the peduncle, which provides the insertion-site of the exterior levator muscle). Ventral surface of petiole without, or with a very shallow, lobe. Petiole concealed in dorsal view when gaster is in line with mesosoma, overhung by the anteriorly projecting first gastral tergite. Overhanging portion of first gastral tergite ventrally with a groove that accommodates the entire petiole. Gaster with five visible tergites and sternites, the pygidium small.

This short diagnosis will serve to isolate extant *Technomyrmex* workers from other dolichoderines. A full definition of the genus is provided by Shattuck (1992b).

Among the Dolichoderinae only the genera *Technomyrmex* and *Tapinoma* have the petiole reduced to such an extent that it is entirely overlapped and concealed by the projecting anterior portion of the first gastral tergite when the gaster is in line with the mesosoma. The structure of the gastral apex in *Tapinoma* is unique and immediately diagnostic of the genus. Instead of the usual five tergites only four are visible in dorsal (and sometimes also in lateral) view. This is because the fifth tergite is reflexed, folded below the fourth and in effect forms the apical part of the ventral surface. This usually differentiates *Tapinoma* immediately from *Technomyrmex* but some species of the former have such thin cuticle that the gaster often deforms or collapses on drying, which may make interpretation of the apex difficult. It is worth noting that such deformation of the gastral apex is common in small *Tapinoma* species but is infrequent in *Technomyrmex*.

The synonymy of genus-group names above is mostly the result of the work of Shattuck (1992b), which is confirmed here but with the addition of *Tapinoptera*, which Shattuck had treated as a junior synonym of *Tapinoma* following the provisional synonymy of the name as listed in Brown (1973). *Tapinoptera* was originally described by Santschi (1925) as a subgenus of *Tapinoma*, with *T. vexatum*, a male-based taxon from Morocco, as the type- and only included species. The production of *Tapinoma vexatum* males by a colony of an otherwise unnamed species of *Technomyrmex* in the laboratory of Dr Xavier Espadaler (UABC) proved that *vexatus* was really referable to the latter genus, and so *Tapinoptera* falls into the synonymy of *Technomyrmex*. See also the note under *T. vexatus* (p. 40).

Although the dolichoderine genera are now mostly well defined, thanks mainly to the work of Shattuck (1992b), their phylogeny is still not properly understood. Publications on the phylogeny of the genera include Shattuck (1995), Brandão, Baroni Urbani, *et al.* (1998) and Chiotis, Jermiin & Crozier (2000). Also, Moreau, Bell, *et al.* (2006) included 16 dolichoderine genera and Brady, Schultz *et al.* (2006) included 13 in their more wide-ranging surveys. Apart from the establishment of one or two small clades within Dolichoderinae these studies have failed to produce a strong consensus. What they do indicate, however, is that Shattuck's (1992b) decision that the former tribes of Dolichoderinae were unsupportable appears correct. A recent attempt by Dubovikoff (2005) to re-establish tribes within the subfamily, create new tribes, and even nominate taxa at subtribal rank, has little support and appears misguided in the light of all the previous work.

SYNONYMIC LIST OF WORLD SPECIES

Extant species

***albipes* group**
albicoxis Donisthorpe, 1945 **stat. n.**
albipes (F. Smith, 1861)
= *detorquens* (Walker, 1859)
= *forticulus* (Walker, 1859)
= *nigrum* (Mayr, 1862)
= *albitarse* (Motschoulsky, 1863)
= *albipes* v. *bruneipes* Forel, 1895 **syn. n.**
= *albipes* r. *wedda* Forel, 1913 **syn. n.**
antonii Forel, 1902 **stat. n.**
australops Bolton **sp. n.**
brunneus Forel, 1895 **stat. rev.**
= *modiglianii* var. *angustior* Forel, 1912 **syn. n.**
butteli Forel, 1913
cedarensis Forel, 1915 **stat. n.**
certus Bolton **sp. n.**
cheesmanae Donisthorpe, 1945
curiosus Fisher & Bolton **sp. n.**
difficilis Forel, 1892 **stat. n.**
= *mayri* st. *nitidulans* Santschi, 1930 **syn. n.**
elatior Forel, 1902
= *albipes* var. *cordiformis* Viehmeyer, 1916 **syn. n.**
fisheri Bolton **sp. n.**
fornax Bolton **sp. n.**
furens Bolton **sp. n.**
hades Bolton **sp. n.**
hostilis Bolton **sp. n.**
indicus Bolton **sp. n.**
innocens Fisher & Bolton **sp. n.**
jocosus Forel, 1910
madecassus Forel, 1897
= *madecassus* var. *fusciventris* Forel, 1907 **syn. n.**
mayri Forel, 1891
menozzii (Donisthorpe, 1936) **comb. n.**
mixtus Bolton **sp. n.**
modiglianii Emery, 1900
= *modiglianii* r. *javanus* Forel, 1905 **syn. n.**
moerens Santschi, 1913
= *albipes* ssp. *congolensis* Karavaiev, 1926
= *moerens* v. *nigricans* Santschi, 1930 **syn. n.**
= *incisus* Weber, 1943 (junior homonym) **syn. n.**
= *nequitus* Bolton, 1995 (replacement name) **syn. n.**
= *longiscapus* Weber, 1943 **syn. n.**
myops Bolton **sp. n.**
nigriventris Santschi, 1910
nitens Bolton **sp. n.**
pallipes (F. Smith, 1876) **comb. n.**
= *albipes* ssp. *foreli* Emery, 1893 **syn. n.**
= *atrichosus* Viehmeyer, 1922 **syn. n.**
= *foreli* v. *affinis* Santschi, 1930 **syn. n.**
= *brevicornis* Santschi, 1930 **syn. n.**
= *albipes* ssp. *truncicolus* Weber, 1943 **syn. n.**
= *primroseae* Donisthorpe, 1949 **syn. n.**
pluto Bolton **sp. n.**

prevaricus Bolton **sp. n.**
quadricolor (Wheeler, 1930)
rotundiceps Karavaiev, 1926 **stat. n.**
rusticus Santschi, 1930
semiruber Emery, 1899
setosus Collingwood, 1985
sophiae Forel, 1902
subgracilis Bolton **sp. n.**
tonsuratus Bolton **sp. n.**
vapidus Bolton **sp. n.**
vitiensis Mann, 1921 **stat. rev., stat. n.**
= *albipes* st. *rufescens* Santschi, 1928 **syn. n.**
yamanei Bolton **sp. n.**

***anterops* group**
anterops Fisher & Bolton **sp. n.**

***arnoldinus* group**
arnoldinus Forel, 1913

***bicolor* group**
andrei Emery, 1899
= *andrei* var. *schereri* Forel, 1911 **syn. n.**
= *wolfi* (Forel, 1916) **syn. n.**
= *allecta* (Stitz, 1916) **syn. n.**
= *zumpti* Santschi, 1936 **syn. n.**
antennus Zhou, 2001
bicolor Emery, 1893
gaudens Bolton **sp. n.**
horni Forel, 1912
horrens Bolton **sp. n.**
impressus Bolton **sp. n.**
kraepelini Forel, 1905
lisae Forel, 1913
metandrei Bolton **sp. n.**
obscurior Wheeler, 1928 **stat. n.**
parandrei Bolton **sp. n.**
rector Bolton **sp. n.**
schimmeri Viehmeyer, 1916
sundaicus (Emery, 1900)

***camerunensis* group**
camerunensis Emery, 1899 **stat. n.**
schoedli Bolton **sp. n.**
taylori (Santschi, 1930)

***fulvus* group**
fulvus (Wheeler, 1934)
= *fulvum* ssp. *sublucidum* Wheeler, 1934 **syn. n.**

***gibbosus* group**
gibbosus Wheeler, W.M. 1906
vexatus (Santschi, 1919)

***grandis* group**
grandis Emery, 1887
= *grandis* var. *bandarensis* Forel, 1913 **syn. n.**
shattucki Bolton **sp. n.**

wheeleri (Emery, 1913)
= *smithi* (Wheeler, 1909) (homonym)
= *niasensis* Menozzi, 1932 **syn. n.**

***ilgi* group**
ilgi (Forel, 1910)
= *stygium* (Santschi, 1911) **syn. n.**
= *gowdeyi* (Wheeler, 1922) **syn. n.**

***laurenti* group**
laurenti (Emery, 1899)
= *kohli* (Forel, 1916) **syn. n.**
= *laurenti* var. *congolensis* (Forel, 1916) **syn. n.**

***lujae* group**
lujae (Forel, 1905)
= *lujae* r. *wasmanni* (Forel, 1916) **syn. n.**
= *griseopubens* (Wheeler, 1922) **syn. n.**
= *lujae* v. *pulliceps* (Santschi, 1926) **syn. n.**

***pratensis* group**
lasiops Bolton **sp. n.**
pratensis (F. Smith, 1860)
= *setiferum* (Emery, 1900) **syn. n.**
= *setiferum* var. *javanum* (Forel, 1905) **syn. n.**

***reductus* group**
reductus Bolton **sp. n.**

***schoutedeni* group**
pilipes Emery, 1899
schoutedeni Forel, 1910
= *zimmeri* r. *okiavoensis* (Forel, 1916) **syn. n.**
zimmeri (Forel, 1911)

***strenuus* group**
convexifrons Karavaiev, 1926
mandibularis Bolton **sp. n.**
strenuus Mayr, 1872
tatius Bolton **sp. n.**

***textor* group**
docens Fisher & Bolton **sp. n.**
dubius Bolton **sp. n.**
gilvus Donisthorpe, 1941
parviflavus Bolton **sp. n.**
senex Bolton **sp. n.**
sycorax Bolton **sp. n.**
textor Forel, 1909 **stat. n.**
voeltzkowi (Forel, 1907)
= *voeltzkowi* v. *rhodesiae* (Forel, 1913) **syn. n.**

Fossil species

caritatis Brandão & Baroni Urbani, 1998
deletus Emery, 1891
hispaniolae (Wilson, 1985)
septentrionalis Zhang, 1989

Species inquirendae

incisus (Mukerjee, 1930)
transiens Forel, 1913

THE SPECIES GROUPS OF *TECHNOMYRMEX*

A number of groups of related species can be delimited, with varying degrees of certainty, within the genus. Several individual species that do not fall into any group are left as a residue, usually because each shows striking autapomophies but very few characters that link them to any larger group. For the present each of these isolated species has been placed in its own monotypic group.

albipes group
Worker. Palp formula 6,4. Anterior clypeal margin with a shallow median impression or a small notch (*modiglianii* complex). Frontal carinae with setae present, usually 2 – 3 along each carina. Pronotum usually with at least one pair of setae (only very rarely absent). Propodeal dorsum without setae. Gastral tergites 1 – 4 with setae present, usually numerous and conspicuous (absent only in *curiosus*). Mesosoma relatively short and compact, the mesonotum never with a constricted or elongated appearance in dorsal view or in profile. Predominant sculpture everywhere on head and body finely, densely microreticulate or reticulate-shagreenate, only rarely glassy smooth (*sophiae* complex). Ergatoid morphological intercastes are present between true workers and true (alate) queens. Apterous (ergatoid) as well as alate males are produced. Colony reproductive strategy of this group is apparently unique in Formicidae (see outlines under *brunneus* (p. 73) and *difficilis* (p. 47)).

The presence of worker-queen intercastes (Peeters, 1991) and ergatoid males has not been confirmed in all species currently assigned to the group, but they are known for all the common and widespread species as well as some of the rarer ones. Their presence in the remaining species is implied but awaits confirmation. Samples from within nests are essential to detect these intercaste forms as their function is solely reproductive and they do not engage in any activity outside the nest.

To the present, intercaste females have been detected in the following species: *albicoxis, albipes* (weak), *antonii, brunneus, butteli, curiosus, elatior, difficilis, fisheri, furens, indicus, innocens, jocosus, madecassus, mayri, mixtus, moerens, nigriventris, nitens, pallipes, quadricolor, rusticus, vapidus, sophiae* and *vitiensis*.
Apterous (ergatoid) males have been detected in *albipes, brunneus, difficilis, jocosus, moerens* and *pallipes*.

A number of complexes of related species can be isolated within the group.
1 *T. sophiae* complex (*furens, nitens, quadricolor, sophiae*). Characterised within the group by the loss of the usual shagreenate/microreticulate sculpture, especially on the head, pronotum and first gastral tergite, leaving at least the head glassy smooth. The propodeum is bluntly but quite narrowly rounded and on the dorsum of the head setae are not restricted to the frontal carinae. Restricted to Queensland, Australia. Because of the lack of sculpture these species resemble the *strenuus* group, but members of that group always have setae present on the propodeal dorsum.
2 *T. modiglianii* complex (*elatior, modiglianii, yamanei*). The anterior clypeal margin has a relatively conspicuous median notch that is deeper and more obvious than in any other complex of the group, where the margin has at most a shallow indentation medially. The posterior margin is broadly emarginate across its width in full-face view. Widespread in the Oriental and Malesian regions.
3 *T. semiruber* complex (*hostilis, menozzii, semiruber*). Afrotropical species in which the propodeal dorsum rounds broadly and evenly into the declivity; the true dorsum is very short and forms the anterior part of a broad curve that extends to the propodeal spiracle.
4 *T. cheesmanae* complex (*albicoxis, cheesmanae, mixtus, prevaricus, tonsuratus*). Five species from New Guinea, with *cheesmanae* also occurring in Queensland, in

which the propodeum in profile is rounded rather than angular.
5 *T. albipes* complex (*albipes, brunneus, butteli, curiosus, hades, moerens, nigriventris, pluto, vitiensis*). Setae on the dorsum of the head are restricted to the frontal carinae, none occurs posterior to this. Propodeum in profile is acutely to bluntly angular between dorsum and declivity; dorsum is short. Extremely widespread. This complex contains two of the most successful tramp species, *albipes* and *vitiensis*.
6 *T. cedarensis* complex (*antonii, australops, cedarensis*). Dorsum of head with a single pair of setae behind the level of the eyes, the latter large and located relatively posteriorly on the head capsule. Propodeal dorsum short and meeting the declivity in an angle. Restricted to Queensland and New South Wales in Australia.
7 *T. pallipes* complex (*certus, difficilis, fisheri, fornax, indicus, innocens, jocosus, madecassus, mayri, myops, pallipes, rotundiceps, setosus, subgracilis, vapidus*). Setae on dorsum of head not restricted to frontal carinae, at least one pair present posterior to level of eyes and often more. Eyes smaller and located more anteriorly than in the preceding group. Propodeal dorsum short; junction of dorsum and declivity angulate to bluntly rounded. This complex is grouped for convenience, the residue that remains after other species have been accounted for.

The Afrotropical species *rusticus* is known only from a worker-queen intercaste and does not fit any of the above.

This is easily the largest, most diverse and most widespread group of the genus. It contains all the tramp species as well as a number of species with extremely broad natural ranges and its species are mostly the best represented in museum collections. The unique colony reproductive strategy, assumed here to be universal in the group, needs more detailed individual study and a comparative study across the group.

bicolor group
Palp formula 6,4. Anterior clypeal margin with a large and conspicuous semicircular to U-shaped median notch. Inner margin of notch meets the more lateral portions of the anterior clypeal margin through rounded curves, not marked angles. Dorsum of head behind clypeus, entire dorsal mesosoma, propodeal declivity and first gastral tergite all entirely lack setae. Mesosoma elongate, the mesothorax with an elongated or constricted appearance in dorsal view or in profile. The metathoracic spiracles are frequently borne on small tubercles that break the outline of the dorsum in absolute profile.

The 15 species of this group are divided unevenly between the Afrotropical region (3 species only) and the Oriental-Malesian regions. All are relatively large, conspicuous species and many are size-variable, or weakly to distinctly polymorphic. Several have distinctive contrasting colour patterns on parts of the body or legs, but some are monochrome. The eyes of the Afrotropical species tend to be set more posteriorly on the head capsule than in those from other regions.

camerunensis group
This group contains three Afrotropical species that are very similar to the *bicolor* group in general appearance, with the same elongate, narrowed mesothorax, but with setae present on either the head, pronotum, propodeal declivity or first gastral tergite, often on two or more of these. Setae are always present on the propodeal declivity where they arise from the margin at the level of the spiracle or below it, not from near the junction of dorsum and declivity distinctly above the spiracle. Median clypeal impression or notch is variable in shape and extent but always present. Palp formula in all species is 6,4.

The members of this group may be linked to the *albipes* group by *mayri*, a Malagasy species that seems morphologically intermediate. Worker-queen intercastes remain undetected in the *camerunensis* group.

gibbosus group
Probably closely related to the *albipes* group and with the same short, stocky mesosoma. The anterior clypeal margin has only the weakest of median impressions and setae are entirely lacking from the head behind the clypeus, the mesosoma

including the propodeal declivity, and gastral tergites 1 – 3. With the mesosoma in profile the pronotum and mesonotum form separate curved surfaces and the mesonotum is distinctly convex. Palp formula 6,4.

The group contains just a pair of species from the southern Palaearctic but separated by thousands of miles: one is from Morocco and the other from Japan. The possibility that they have evolved their similarities independently must be entertained.

grandis group
Palp formula 6,4. Large, densely setose species. All have elevated setae on all dorsal surfaces of the head, mesosoma (including the propodeal declivity) and segments 1 – 4 of the gaster. In addition the scapes and leg segments also have elevated setae present. The anterior clypeal margin is at most shallowly concave medially, without a notch.

Two species occur in the Malesian region and a third is present in Queensland, Australia.

pratensis group
Palp formula 5,3. The clypeus has a very deep, U-shaped median incision. The inner margin of the incision meets the anterior clypeal margin in an acute, prominent angle at each side. Sculpture on the head is reduced and superficial. Setae are present on the dorsum of the head behind the clypeus, on the mesosoma and on gastral tergites 1 – 4; the main setae are very long.

Only two species, one Afrotropical and the other widespread in the Oriental and Malesian regions, occupy this small but distinct group.

schoutedeni group
Palp formula 6,4. Anterior clypeal margin transverse or very nearly so, at most very broadly and extremely shallowly concave across its width, without a median impression or notch. Dorsum of head behind clypeus with setae present; setae absent from pronotum, mesonotum and propodeal dorsum but present on propodeal declivity. Setae present on gastral tergites 1 – 4. Mesonotum in profile has a short but very steep declivitous face and the propodeum has a short, almost vertical anterior face immediately behind the metanotal groove. The tuberculate metathoracic spiracles are therefore at the base of the deep impression formed by these two faces.

Three very poorly known species, all Afrotropical.

strenuus group
Palp formula 6,4. Anterior clypeal margin transverse to medially notched. Head and first gastral tergite glassy smooth. Eyes located relatively far posteriorly on the head capsule. Setae present on dorsum of head behind clypeus, on all sclerites of the dorsal mesosoma, including the propodeal dorsum, on the propodeal declivity and on gastral tergites 1 – 4.

Appearing similar to species of the *sophiae* complex of the *albipes* group because of the loss of sculpture, the four Malesian species of this group always have setae on the propodeal dorsum, a character absent from the *albipes* group. Worker-queen intercastes have not been detected in this group but an ergatoid queen of *strenuus* is known.

textor group
Palp formula 6,4. Setae entirely lacking from head behind clypeus, entire mesosoma including the propodeal declivity, and gastral tergites 1 – 2 (sometimes also absent from tergite 3). Anterior clypeal margin with a shallow median concavity to a deep median incision. With mesosoma in profile the dorsal outline of the pronotum and anterior half to two-thirds of mesonotum forms a more or less flat surface. The posterior half to one-third of the mesonotum passes through an angle or step and forms a much more steeply sloping declivitous mesonotal face.

Of the eight species known in this group three are Malesian, three are Afrotropical, one is Malagasy and one occurs in both the Afrotropical and Malagasy regions.

single-species groups
For definitions of these groups see the descriptions of the individual species concerned.
anterops group
A Malagasy species of very uncertain affinities that forms carton nests on foliage.
arnoldinus group
An isolated Afrotropical species with reduced cephalic sculpture, large eyes and clypeal notch, and transverse sculpture present on the propodeal dorsum.
fulvus group
The only Neotropical species of the genus and the only endemic species in the entire New World. Its distribution is limited to small areas of Panama and Costa Rica.
ilgi group
This Afrotropical species is similar to members of the *pratensis* group, but retains a palp formula of 6,4.
laurenti group
A conspicuous Afrotropical species, usually found in association with various myrmecophytes.
lujae group
A very distinctive Afrotropical species. Its palp formula of 4,3 is shared only with the Malesian *reductus*, which otherwise does not appear to be closely related.
reductus group
Like *lujae* this species from Borneo has PF 4,3 but is otherwise quite different.

CHECKLIST OF AFROTROPICAL AND WEST PALAEARCTIC *TECHNOMYRMEX* SPECIES

***albipes* group**
albipes (F Smith, 1861)
= *detorquens* (Walker, 1859)
= *forticulus* (Walker, 1859)
= *nigrum* (Mayr, 1862)
= *albitarse* (Motschoulsky, 1863)
= *albipes* v. *bruneipes* Forel, 1895 **syn. n.**
= *albipes* r. *wedda* Forel, 1913 **syn. n.**
hostilis Bolton **sp. n.**
menozzii (Donisthorpe, 1936) **comb. n.**
moerens Santschi, 1913
= *albipes* ssp. *congolensis* Karavaiev, 1926
= *moerens* v. *nigricans* Santschi, 1930 **syn. n.**
= *incisus* Weber, 1943 (junior homonym) **syn. n.**
= *nequitus* Bolton, 1995 (replacement name) **syn. n.**
= *longiscapus* Weber **syn. n.**
nigriventris Santschi, 1910
pallipes (F. Smith, 1876) **comb. n.**
= *albipes* ssp. *foreli* Emery, 1893 **syn. n.**
= *atrichosus* Viehmeyer, 1922 **syn. n.**
= *foreli* v. *affinis* Santschi, 1930 **syn. n.**
= *brevicornis* Santschi, 1930 **syn. n.**
= *albipes* ssp. *truncicolus* Weber, 1943 **syn. n.**
= *primroseae* Donisthorpe, 1949 **syn. n.**
rusticus Santschi, 1930
semiruber Emery, 1899
setosus Collingwood, 1985
vapidus Bolton **sp. n.**
vitiensis Mann, 1921 **stat. rev., stat. n.**
= *albipes* st. *rufescens* Santschi, 1928 **syn. n.**

***arnoldinus* group**
arnoldinus Forel, 1913

***bicolor* group**
andrei Emery, 1899
= *andrei* var. *schereri* Forel, 1911 **syn. n.**
= *wolfi* (Forel, 1916) **syn. n.**
= *allecta* (Stitz, 1916) **syn. n.**
= *zumpti* Santschi, 1936 **syn. n.**
metandrei Boton **sp. n.**
parandrei Bolton **sp. n.**

***camerunensis* group**
camerunensis Emery, 1899 **stat. n.**
schoedli Bolton **sp. n.**
taylori (Santschi, 1930)

***gibbosus* group**
vexatus (Santschi, 1919)

***ilgi* group**
ilgi (Forel, 1910)
= *stygium* (Santschi, 1911) **syn. n.**
= *gowdeyi* (Wheeler, 1922) **syn. n.**

***laurenti* group**
laurenti (Emery, 1899)
= *kohli* (Forel, 1916) **syn. n.**
= *laurenti* var. *congolensis* (Forel, 1916) **syn. n.**

***lujae* group**
lujae (Forel, 1905)
= *lujae* r. *wasmanni* (Forel, 1916) **syn. n.**
= *griseopubens* (Wheeler, 1922) **syn. n.**
= *lujae* v. *pulliceps* (Santschi, 1926) **syn. n.**

***pratensis* group**
lasiops Bolton **sp. n.**

***schoutedeni* group**
pilipes Emery, 1899
schoutedeni Forel, 1910
= *zimmeri* r. *okiavoensis* (Forel, 1916) **syn. n.**
zimmeri (Forel, 1911)

***textor* group**
parviflavus Bolton **sp. n.**
senex Bolton **sp. n.**
sycorax Bolton **sp. n.**
voeltzkowi (Forel, 1907)
= *voeltzkowi* v. *rhodesiae* (Forel, 1913) **syn. n.**

KEY TO AFROTROPICAL AND WEST PALAEARCTIC *TECHNOMYRMEX* INCLUDING TRAMP SPECIES (workers)

NOTE. The locations and relative lengths of various setae are critical in the determination of many species. Abraded, or old and damaged, specimens may be

difficult or impossible to identify correctly.

1 With head in profile the dorsal surface of the frontal carina, or the dorsum immediately mesad of the frontal carina, entirely without setae.....2
- With head in profile the dorsal surface of the frontal carina, or the dorsum immediately mesad of the frontal carina, with setae present; at least with one seta present somewhere along the length of the frontal carina, or more usually with a row of 2 – 4.....10

2 Second gastral tergite with setae present (absent from the first tergite).....3
- Second gastral tergite with setae absent (also absent from the first tergite).....5

3 Head, mesosoma and petiole yellow to orange, contrasting with the medium to dark brown gaster. (Democratic Republic of Congo, Central African Republic) .....***metandrei*** (p. 28)
- Head, mesosoma, petiole and gaster all uniformly dark brown to black.....4

4 Middle and hind coxae white to yellow, contrasting strongly with the blackish brown to black mesosoma. Basal one-quarter to one third of hind femur dull white to yellow, the remainder dark brown to black. (Liberia, Ivory Coast, Ghana, Nigeria, Cameroun, Gabon, Central African Republic, Democratic Republic of Congo, Angola, Kenya, Uganda).....***andrei*** (p. 19)
- Middle and hind coxae blackish brown to black, the same colour as the mesosoma. Entire hind femur blackish brown to black. (Gabon).....***parandrei*** (p. 31)

5 Maxillary palp with 4 segments, labial palp with 3. With propodeum in profile the spiracle located approximately at the point where dorsum meets declivity. Dorsum of fourth gastral tergite without setae. Scape relatively short, SI 67 - 76. Eye small, OI 17 – 21. Head relatively short and broad, CI 100 or more (Figs 12, 31). (Cameroun, Gabon, Democratic Republic of Congo) .....***lujae*** (p. 26)
- Maxillary palp with 6 segments, labial palp with 4. With propodeum in profile the spiracle located approximately half way down the declivity. Dorsum of fourth gastral tergite (and sometimes also third) with setae present. Scape relatively long, SI > 90. Eye larger, OI 25 or more. Head relatively longer and narrower, CI < 100.....6

6 Anterior clypeal margin with a long, narrowly U-shaped median incision that is at least as long as broad; inner margin of incision meets anterior clypeal margin in a distinct angle at each side (Fig. 34). (Kenya, Tanzania, Zimbabwe, Botswana, South Africa; also in Malagasy region).....***voeltzkowi*** (p. 41)
- Anterior clypeal margin at most with a shallow median impression that is distinctly broader than long; margin of impression (when present) meets anterior clypeal margin through a shallow curve at each side.....7

7 Third gastral tergite with setae present; setae also present on the fourth gastral tergite. (Ghana, Cameroun, Gabon, Central African Republic, Democratic Republic of Congo).....***senex*** (p. 36)
- Third gastral tergite without setae; setae present on the fourth gastral tergite.....8

8 Head and mesosoma yellow. In profile the propodeal dorsum meets the declivity in a blunted or distinct angle. Dorsal outline of the mesonotum in profile with a long, flat anterior section and shorter, much more steeply inclined posterior declivity, the two separated by a distinct step or angle (Figs 15, 16). Smaller species with scape relatively long, HL 0.49 – 0.64, HW 0.41 – 0.54, SI 110 – >120.....9

- Head and mesosoma brown. In profile the propodeal dorsum rounds evenly into the declivity. Dorsal outline of the mesonotum in profile convex, with a sloping declivitous face that is longer than the anterior section, the two not separated by a distinct step or angle (Fig. 13). Larger species with scape relatively short, HL > 0.70, HW > 0.60, SI 90 – 94. (Morocco).....***vexatus*** (p. 40)

9 With propodeum in profile the straight-line length of its dorsum usually less than the depth of the declivity to the spiracle; very rarely the two about equal. Entire body yellow or the gaster slightly darker than the head and mesosoma. Scape relatively shorter, SI 110 – 126. Eye relatively larger, OI 33 – 37. Promesonotum shorter, DTI 130 – 145. Dorsum of head feebly microreticulate or shagreenate. (Ivory Coast, Ghana, Nigeria, Cameroun, Gabon, Central African Republic, Democratic Republic of Congo, Uganda) .....***parviflavus*** (p. 31)
- With propodeum in profile the straight-line length of its dorsum distinctly greater than the depth of the declivity to the spiracle. Head and mesosoma yellow, the gaster black and strongly contrasting. Scape relatively longer, SI 134 – 137. Eye relatively smaller, OI 28 – 31. Promesonotum longer, DTI 162 – 170. Dorsum of head densely sharply reticulate-punctulate.(Gabon).....***sycorax*** (p. 38)

10 Gastral tergites 2 – 3 without setae.....11
- Gastral tergites 2 – 3 with setae present; setae may be restricted to one or two pairs on each segment or may be numerous.....12

11 With head in profile the dorsum with a single pair of setae behind the level of the posterior margin of the eye. With head in full-face view the sides without projecting elevated pubescence. Eyes located more posteriorly, EPI 88 – 93. (Mozambique).....***taylori*** (p. 38)
- With head in profile the dorsum without setae behind the level of the posterior margin of the eye. With head in full-face view the sides with projecting elevated pubescence. Eyes located more anteriorly, EPI 63. (Democratic Republic of Congo).....***rusticus*** (p. 33)

12 Dorsal (outer) surfaces of middle and hind tibiae with numerous suberect to erect setae present.....13
- Dorsal (outer) surfaces of middle and hind tibiae without setae.....14

13 Dorsum of head dull, finely microreticulate to granulose everywhere. First gastral tergite finely densely shagreenate and dull. Pubescence on first gastral tergite dense, masking the surface of the sclerite. (Cameroun) .....***pilipes*** (p. 32)
- Dorsum of head smooth, unsculptured except for minute setal pits. First gastral tergite unsculptured, shining. Pubescence on first gastral tergite short, very sparse and scattered, not masking the surface of the sclerite. (Cameroun) .....***semiruber*** (p. 35)

14 Dorsal surfaces of pronotum and mesonotum without setae.....15
- Dorsal surface of either pronotum or mesonotum, or both of them, with at least one pair of setae present.....18

15 Anterior clypeal margin with a broad, roughly semicircular median excavation or notch. Mesosoma and gaster the same colour or very nearly so. Longest setae on second gastral tergite much longer than maximum diameter of the eye. Mesonotum in profile forms a single slope from promesonotal suture to metathoracic spiracles, without distinct dorsal and declivitous faces that are separated by a step or angle (Figs 18, 19). Scape relatively long, SI > 120.....16

- Anterior clypeal margin transverse or very nearly so, without a semicircular median excavation or notch. Mesosoma and gaster with different and contrasting colours. Longest setae on second gastral tergite shorter than maximum diameter of the eye. Mesonotum in profile with distinct dorsal and declivitous faces that are separated by a step or angle (Fig. 21). Scape relatively short, SI 92 – 108.....17

16 Light brownish yellow species with extremely elongated scape and mesosoma; SI 173 - 189, DTI 232 - 250. With head in profile the dorsum without a pair of setae behind the level of the posterior margin of the eye. Eye located relatively anteriorly on the head, EPI 65 - 73. (Gabon).....***schoedli*** (p. 34)
- Dark brown to black species with much shorter scape and mesosoma; SI 125 – 148, DTI 154 – 182. With head in profile the dorsum with a pair of setae behind the level of the posterior margin of the eye. Eye located relatively more posteriorly on the head, EPI 80 – 95. (Cameroun, Gabon, Central African Republic, Uganda, Kenya).....***camerunensis*** (p. 21)

17 Head and mesosoma yellowish red, gaster black, each gastral segment bordered with yellow posteriorly. (Tanzania).....***zimmeri*** (p. 42)
- Head and mesosoma reddish brown to blackish brown, gaster reddish yellow to orange. (Cameroun, Democratic Republic of Congo).....***schoutedeni*** (p. 34)

18 With head in full-face view the anterior clypeal margin either has an extensive and very distinct, sharply incised semicircular median notch, or has a long and conspicuous U-shaped median incision (Figs 30, 32, 33).....19
- With head in full-face view the anterior clypeal margin is approximately transverse to feebly sinuate, or at most has a small, shallow, inconspicuous median concavity or weak impression.....22

19 With head tilted slightly back from full-face view the posterior margin with only two long setae, one on each side of the midline. In full-face view the posterior margin evenly shallowly concave or with a small shallow median impression (Figs 30, 33). Scape relatively long, SI 82 – 100. Not strongly size-variable species.....20
- With head tilted slightly back from full-face view the posterior margin with 4 - 8 setae, 2 - 4 on each side of the midline. In full-face view the posterior margin with a deep, broadly V-shaped, extensive emargination (Fig. 32). Scape relatively short, SI 58 – 77. Extremely size-variable to weakly polymorphic species, associated with myrmecophytes. (Cameroun, Gabon, Democratic Republic of Congo).....***laurenti*** (p. 25)

20 Propodeal declivity with fine, dense transverse rugulose sculpture. With head in profile the dorsum with a pair of setae between the level of the posterior margin of the eye and the pair at the posterior margin of the head. Eye relatively large, OI 29 – 31. Scape slightly longer, SI 91 – 100. (Tanzania, Zimbabwe).....***arnoldinus*** (p. 20)
- Propodeal declivity without transverse rugulose sculpture. With head in profile the dorsum without a pair of setae between the level of the posterior margin of the eye and the pair at the posterior margin of the head. Eye relatively small, OI 21 – 25. Scape slightly shorter, SI 82 – 88.....21

21 Maxillary palp with 6 segments, labial palp with 4. Dorsum of head behind clypeus with only two pairs of setae: anterior pair at about the midlength of the frontal carinae, posterior pair at the posterior margin; without a pair of setae above the toruli (Fig. 8). Head slightly broader, CI 96 – 100. Eyes located slightly more posteriorly, EPI 80 – 90. (Ethiopia, Uganda, Kenya, Zimbabwe, South Africa).....***ilgi*** (p. 22)

- Maxillary palp with 5 segments, labial palp with 3. Dorsum of head behind clypeus with four pairs of setae: anterior pair above the toruli, two pairs along the length of the frontal carinae, one pair at the posterior margin (Fig. 7). Head slightly narrower, CI 87 – 91. Eyes located slightly more anteriorly, EPI 71 – 77. (Cameroun, Gabon, Democratic Republic of Congo).....***lasiops*** (p. 24)

22 With head in profile the dorsum behind the level of the posterior margin of the eye without setae (*i.e.* setae on the dorsum of the head are restricted to the frontal carinae).....23
- With head in profile the dorsum behind the level of the posterior margin of the eye with one or more pairs of setae present, which may be very short and inconspicuous (*i.e.* setae on the dorsum of the head are not restricted to the frontal carinae).....26

23 Petiole not the same colour as the gaster; petiole yellow to pale brownish yellow and much lighter than the dark brown to black gaster. Mesosoma dull yellow to very pale brown, distinctly lighter than the gaster and contrasting strongly with it. (Ghana, Nigeria, Cameroun, Gabon, Congo, Central African Republic, Kenya, Uganda).....***nigriventris*** (p. 30)
- Petiole the same colour (or very nearly) as the gaster; both either wholly dark brown or black. Mesosoma brown to black, the same colour as the gaster or very nearly so, the two not strongly contrasting.....24

24 Lateral margins of propodeal declivity without projecting setae (Fig. 5). (Ivory Coast, Ghana, Nigeria, Cameroun, Central African Republic, Congo, Democratic Republic of Congo, Sudan, Uganda, Kenya, Tanzania) .....***moerens*** (p. 28)
- Lateral margins of propodeal declivity with 1 – 3 pairs of projecting setae that are similar to those on the first gastral tergite.....25

25 Scape relatively short and promesonotum relatively short and broad, SI 91 – 102, DTI 110 – 124. Eye somewhat smaller, OI 24 – 27. With mesosoma in absolute profile the mesonotal dorsal outline convex, more or less evenly rounded (Fig.1). In same view the junction of the propodeal dorsum and declivity is blunt. (*Tramp species*: Tanzania, South Africa (imported from Mauritius), West Palaearctic (in hothouses)).....***albipes*** (p. 68)
- Scape relatively long and promesonotum relatively long and narrow, SI 104 – 115, DTI 128 – 141. Eye somewhat larger, OI 29 – 32. With mesosoma in absolute profile the mesonotal dorsal outline with a more or less flat anterior section that passes through an obtuse angle to a distinctly more strongly sloped posterior declivity (Fig. 2). In same view the junction of the propodeal dorsum and declivity sharply defined. (*Tramp species*: West Palaearctic (in hothouses only), no Afrotropical records as yet).....***vitiensis*** (p. 104)

26 With head in profile the dorsum behind the level of the posterior margin of the eye with a single pair of setae present (Fig. 3). (*Tramp species*: not yet recorded from Afrotropical region or West Palaearctic hothouses) .....***difficilis*** (p. 47)
- With head in profile the dorsum behind the level of the posterior margin of the eye with two or more pairs of setae that may be very short and inconspicuous (Figs 4, 6, 9, 10) 27

27 Larger species, HL > 0.80, HW > 0.75, SL > 0.70. Propodeum in profile with a long curved dorsum that rounds evenly and very broadly into the declivity; dorsal and declivitous surfaces not distinctly differentiated (Figs 9, 10).....28

- Smaller species, HL < 0.75, HW < 0.75, SL < 0.70. Propodeum in profile with its dorsum short, straight or feebly curved, very narrowly rounded or angular at its junction with the declivity; dorsal and declivitous surfaces distinctly differentiated (Figs 4, 6).....29

28 Head and mesosoma dull orange to orange-yellow, gaster black and very strongly contrasting. Middle and hind tarsi the same orange colour as the tibiae and femora. Posterior margin of head without setae. Pronotum with 4 – 5 pairs of setae; mesonotum with 4 - 5 pairs of setae, at least two of which are located well anterior of the point where the dorsum curves down towards the metanotal groove. (Tanzania).....***hostilis*** (p. 22)

- Head, mesosoma and gaster uniformly blackish brown to black. Middle and hind tarsi yellow, much lighter in colour than the brown tibiae and femora. Posterior margin of head with 2 pairs of setae. Pronotum with 1 – 2 pairs of setae; mesonotum with 1 pair, located posteriorly where the dorsum curves down towards the metanotal groove. (Zimbabwe).....***menozzii*** (p. 27)

29 With head in profile a seta present on the dorsum at about the level of the anterior margin of the eye but no seta at level of posterior margin of eye. More posteriorly on the head there are two pairs of extremely short stubbly setae that are both very much shorter than the seta at the level of the anterior margin of the eye. Either head, mesosoma and gaster about the same colour or the head and mesosoma much lighter than the gaster.....30

- With head in profile a seta present on the dorsum at about the level of the anterior margin of the eye and another, distinctly shorter, at the level of the posterior margin of the eye. More posteriorly on the head there are two pairs of setae that are about equal in length to the seta at the level of the anterior margin of the eye. Head and gaster the same dark brown colour; mesosoma much lighter. (Saudi Arabia, Yemen).....***setosus*** (p. 37)

30 Mesosoma in profile brown to black; gaster the same colour or very nearly so. Eye averaging slightly larger (OI 28 – 33) and located relatively more anteriorly, EPI 55 – 71. (*Tramp species*: Ghana, Cameroun, Gabon, Central African Republic, Democratic Republic of Congo, Angola, Ethiopia, Somalia, Sudan, Kenya, Uganda, Tanzania, Zambia, Zimbabwe, Mozambique, Botswana, Namibia, South Africa, Lesotho, Swaziland, Madeira, Cape Verde Is, West Palaearctic (in hothouses)).....***pallipes*** (p. 56)

- Mesosoma in profile yellow or orange-yellow; gaster approximately the same colour to distinctly darker. Eye averaging slightly smaller (OI 26 – 29) and located relatively more posteriorly, EPI 79 - 86. (Kenya, Tanzania).....***vapidus*** (p. 39)

AFROTROPICAL AND WEST PALAEARCTIC SPECIES OF *TECHNOMYRMEX*

A total of 30 species are found in these regions, of which 25 are Afrotropical endemics, 1 is a West Palaearctic endemic, 2 also occur in the Malagasy region and 2 are tramp species.

The sole West Palaearctic endemic species, *vexatus*, is presently known only from Morocco. Genus *Technomyrmex* otherwise appears, except for introductions of tramp species, to be entirely absent from countries north and east of the Mediterranean, as well as from the remainder of Africa north of the Sahara (present survey and Collingwood & Prince, 1998; Collingwood, 1978; Casevitz-Weulersse, 1990; Poldi, Mei & Rigato, 1995; Agosti & Collingwood, 1987; Kugler, 1988; Tohmé, 1969).

Technomyrmex andrei Emery

(Figs 20, 29)

Technomyrmex andrei Emery, 1899: 488, figs a, b. Holotype worker, GABON: Ogoué (*E. André*) (MCSN) [examined].
Technomyrmex andrei var. *schereri* Forel, 1911b: 283. Holotype worker, LIBERIA: Kap Mount (*Scherer*) (not in MHNG, presumed lost). **Syn. n.**
Engramma wolfi Forel, 1916: 432, fig. 1. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: St Gabriel (*Kohl*) (MHNG) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]
Engramma allecta Stitz, 1916: 394, fig. 9. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: Uelle-Distrikt, Koloka bei Angu, vi.1911 (*Schubotz*) (not in ZMHB, presumed lost) (See note 1.) [Combination in *Technomyrmex* by Shattuck, 1992b: 160.]
Technomyrmex zumpti Santschi, 1937: 102. Holotype male, CAMEROUN: Kumba, Elefantensee, 12-16.x.1935 (*F. Zumpt*) (NHMB) [examined]. **Syn. n.** (See note 2).

NOTE
1 The original description of *allecta* makes it obvious that it is conspecific with the very common and widely distributed *andrei*. Stitz does not mention *andrei* but in his paper (Stitz, 1916: 395, footnote) he compares *allecta* with Forel's *wolfi* (an undisputed synonym of *andrei*), the description of which appeared just a few months before Stitz's publication. From his interpretation of Forel's description Stitz invoked very minor differences in eye position and sculpture so as to retain the two names as separate species. These supposed differences are taxonomically insignificant and are well within the range of variation seen among workers of this species.
2 The males of this genus are so poorly known that any taxonomy based on them must remain somewhat provisional and speculative. However, the holotype male of *T. zumpti* exactly matches worker-associated males of *andrei* that have been examined.

WORKER. *Measurements*: TL 2.7 – 4.3, HL 0.72 – 1.06, HW 0.61 – 0.98, SL 0.78 – 1.08, PW 0.44 – 0.66, WL 1.04 – 1.50 (35 measured). *Indices*: CI 82 – 95, SI 102 – 130, OI 25 – 30, EPI 85 – 100, DTI 144 – 156.
Dorsum of head behind clypeus entirely lacks setae. With head in full-face view the eyes located relatively posteriorly (EPI at least 85 and usually more) and their outer margins fail to break the outline of the sides. Anterior clypeal margin with a conspicuous broad median excavation or notch; inner margin of notch meets the more lateral portions of the anterior clypeal margin through rounded curves, not marked angles. Posterior margin of head with a marked median impression or emargination. Dorsum of mesosoma and declivity of propodeum entirely lack setae. First gastral tergite without setae but long stiff setae are present on gastral tergites 2 – 4, the longest of them longer than the maximum diameter of the eye. Dorsal surfaces of pronotum, mesonotum and propodeum finely and densely reticulate-punctate, usually quite sharply so but sculpture less strongly incised in some samples. Head, mesosoma, petiole and gaster more or less uniformly dark brown to black. Front legs with coxa the same colour as the mesosoma or nearly so; femur, tibia and tarsus the same or lighter, but the trochanter strikingly paler, white to yellow. Middle and hind legs with coxae, trochanters and basal one-quarter to one-third of femora white to yellow; remainder of femora darker except for apices; tibiae same colour as darker part of femora to uniformly paler than femora; tarsi yellow.

The largest, most obvious and most widely distributed leaf litter species of *Technomyrmex* throughout the wet forest zones of the Afrotropical region. It is locally abundant in litter samples throughout west and central Africa and is one of the most commonly collected species of the genus in this region. It nests in and under rotten wood on the forest floor and forages widely in the leaf litter layer but is not known to ascend trees.

The strikingly coloured legs, combined with its setal distribution, emarginate clypeus, posteriorly located eyes and size make *andrei* one of the most easily

recognised African *Technomyrmex* species. Its workers show considerable variation in size and weak allometric variation is present: as HW increases then CI increases but SI decreases.

The closest relatives of *andrei* are *parandrei* and *metandrei*. Both are certainly much rarer and much more limited in distribution. Both species share the general appearance of *andrei* but are distinctly differently coloured, as discussed under their respective headings.

MATERIAL EXAMINED

Ivory Coast: Man, Mt Tonkoui (*Mahnert & Perret*); Tai Forest (*Mahnert & Perret*); Tai Forest (*T. Diomande*). **Ghana**: Mampong (*P.M. Room*); Mampong (*D. Leston*); Asamankese (*D. Leston*); Baudua (*D. Leston*); Atewa (*D. Leston*); Tafo (*D. Leston*); Tafo (*C. Campbell*); Tafo (*R. Belshaw*); Bunso (*D. Leston*); Bunso (*R. Belshaw*); Bechem (*C.A. Collingwood*); Mankrang For. Res., nr Akomadan (*R. Belshaw*). **Nigeria**: Gambari (*B. Bolton*); Gambari, CRIN (*B. Taylor*). **Cameroun**: Ottotomo (*A. Dejean*); Nkoemvon (*D. Jackson*); Mbalmayo (*N. Stork*); Buea, Upper Farm (*B. Malkin*); Prov. Sud, Res. Campo (*B.L. Fisher*); Prov. Sud-Ouest, Korup N.P. (*B.L. Fisher*); Kumba, Elefantensee (*F. Zumpt*). **Gabon**: Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*); La Makandé, For. des Abeilles (*S. Lewis*); For. Des Abeilles (*A. Dejean*); Prov. Ogooue-Maritime, Res. Monts Doudou (*B.L. Fisher*); Res. Monts Doudou (*S. van Noort*); Res. Moukalaba (*B.L. Fisher*); Ogoué (*E. André*). **Central African Republic**: P.N. Dzanga-Ndoki (*B.L. Fisher*); P.N. Dzanga-Ndoki (*S. van Noort*); P.N. Dzanga-Sangha (*B.L. Fisher*); P.N. Dzanga-Sangha (*S. van Noort*). **Democratic Republic of Congo**: Ngayo (*H.O. Lang*); Stanleyville (*H. Kohl*); St Gabriel (*Kohl*); Kinshasa (*Waelbroeck*); Epulu (*S.D. Torti*); Walikale, Kaperuta (no collector's name); Gbanga (no collector's name). **Angola**: Gabela (*P. Hammond*); Salazar (*P. Hammond*). **Kenya**: Kakamega Distr., Buyangu Nat. Res., nr Salazar Circuit (*Snelling & Espira*); Kakamega Distr., Isecheno Nat. Res. (*R.R. Snelling*); Isecheno Nat. Res., Kalunya Glade (*R.R. Snelling*); Kakamega For., Isecheno (*R.R. Snelling*). **Uganda**: Ruwenzori, Bundibugyo (*G.O. Evans*); Bushenyi Distr., Kalinzu Forest (*S. Yamane*).

Technomyrmex arnoldinus Forel

Technomyrmex arnoldinus Forel, 1913b: 222. Syntype workers, ZIMBABWE: Bulawayo (*G. Arnold*) (MHNG) [examined].

WORKER. *Measurements*: TL 2.6 – 3.2, HL 0.62 – 0.73, HW 0.56 – 0.66, SL 0.54 – 0.60, PW 0.38 – 0.46, WL 0.80 – 0.90 (7 measured). *Indices*: CI 86 – 90, SI 91 – 100, OI 29 – 31, EPI 84 – 89, DTI 120 – 136.

Frontal carina with 3 – 4 setae: in profile always one above the torulus, one at level of anterior margin of eye and another at level of posterior margin of eye. Behind this the dorsum with a pair of setae (very rarely 2) about midway to posterior margin, and a final pair at the posterior margin. Anterior clypeal margin with a conspicuous median impression or notch, semicircular or nearly so; depth of notch is variable but it is always distinct. Eyes relatively large and conspicuous, located close to midlength and their outer margins just fail to break, or just touch, the outline of the sides in full-face view. Head weakly shining, the little sculpture that is present is weak and superficial, almost vestigial; without blanketing fine shagreenate or microreticulate sculpture. Pronotal dorsum more or less smooth, with only traces of superficial sculpture. Mesonotum and propodeal dorsum more strongly sculptured, shallowly reticulate-punctate. Declivity of propodeum with fine transverse rugulae at least on basal two-thirds but often over the entire surface. Number of setal pairs on mesosoma: pronotum 2 – 4; mesonotum 2; propodeal dorsum 0; lateral margins of declivity 2 – 3. Gastral tergites 1 – 4 each with setae, the longest on the first tergite at least equal to the maximum diameter of the eye and frequently longer. First gastral tergite only feebly superficially sculptured, shiny. Pubescence on gastral tergites 1 – 4 sparse but long, reclinate to somewhat elevated. Head, mesosoma and petiole yellow to brown; gaster may be the same colour but is usually darker. Legs uniformly yellow to brown, usually slightly lighter than the mesosoma.

T. arnoldinus is quite distinct among the Afrotropical fauna. The presence of transverse

fine rugulose sculpture on the propodeal declivity is unique and immediately isolates the species. Beyond that its relationships are harder to decide. In terms of reduced sculpture on the head, pronotum and gaster it resembles *strenuus* and its allies from the Oriental and Malesian regions, but the depth of the clypeal notch in *arnoldinus* exceeds what is usually seen in those species. The presence of setae on the propodeal dorsum, universal in the *strenuus* group, does not occur in *arnoldinus*.

The species has been swept from low vegetation and also collected in pitfall traps, so, like many other species in this genus, *arnoldinus* probably nests in the earth, either directly or under stones, and forages both terrestrially and on plants.

MATERIAL EXAMINED
Tanzania: Mkomazi Game Res., Maji Kununua (*S. van Noort*); Mkomazi Game Res., gorge 1 km NW Ibaya (*A. Russell-Smith*). **Zimbabwe**: Bulawayo (*G. Arnold*); Bulawayo, Burnside (*G. Arnold*); Bulawayo, Bunthorne Mine (*G. Arnold*); Matopos (*G. Arnold*).

Technomyrmex camerunensis Emery **stat. n.**

(Fig. 18)

Technomyrmex andrei var. *camerunensis* Emery, 1899: 489, fig. c. Syntype workers, CAMEROUN: no loc., 1895 (*Conradt*) (MCSN) [examined].

WORKER. *Measurements*: TL 3.0 – 4.2, HL 0.78 – 0.94, HW 0.65 – 0.83, SL 0.90 – 1.08, PW 0.44 – 0.60, WL 1.14 – 1.44 (15 measured). *Indices*: CI 83 – 92, SI 125 – 148, OI 26 – 28, EPI 80 – 95, DTI 154 – 182.
Frontal carina with 2 – 3 setae: in profile the posteriormost close to the level of the posterior margin of the eye. A single pair of setae present on the dorsum behind this, usually just behind the level of the posterior margin of the eye; this pair the longest on the dorsum and usually longer than the maximum diameter of the eye. With head in full-face view the eyes located relatively posteriorly (EPI 80 or more) and their outer margins fail to break the outline of the sides. Anterior clypeal margin with a median excavation that is variable in depth and extent. Dorsum of mesosoma without setae but lateral margin of propodeal declivity with 1, or more rarely 2, projecting setae, located close to the level of the spiracle. Gastral tergites 1 – 4 each with long, stiff setae present, the longest of them longer than the maximum diameter of the eye. Head, mesosoma, petiole and gaster more or less uniformly dark brown to black. All coxae, femora and tibiae the same colour as the mesosoma or very nearly so; tarsi usually lighter but sometimes only slightly so.

Originally described as a variety of *andrei, camerunensis* is easily distinguished by its decidedly different arrangement of setae. *T. camerunensis* nests in or under rotten wood on the forest floor. It forages in the leaf litter layer and also ascends low vegetation where it has been collected by sweeping.

The species closest related to *camerunensis* appears to be *schoedli*. They share very similar arrangements of setae, but the latter is a much more elongated species with more anteriorly located eyes, and is lighter in colour.

MATERIAL EXAMINED
Cameroun: (no loc.) (*Conradt*); Mbalmayo (*N. Stork*). **Gabon**: Prov. Ogooue-Maritime, Res. Monts Doudou (*B.L. Fisher*); Res. Monts Doudou (*S. van Noort*). **Central African Republic**: P.N. Dzanga-Ndoki (*S. van Noort*); Res. Dzanga-Sangha (*S. van Noort*). **Kenya**: Kakamega Distr., Isecheno Nat. Res. (*R.R. Snelling*). **Uganda**: Bushenyi Distr., Kalinzu Forest (*S. Yamane*).

Technomyrmex hostilis Bolton sp. n.

(Figs 9, 37)

HOLOTYPE WORKER. Measurements: TL 3.5, HL 0.90, HW 0.86, SL 0.84, PW 0.56, WL 1.18. *Indices*: CI 96, SI 98, OI 23, EPI 60, DTI 130.
Frontal carina with 2 setae: in profile the first at the torulus, the second at about the level of the anterior margin of the eye. No seta is present at the level of the posterior margin of the eye. Behind the level of the posterior margin of the eye the dorsum has 2 pairs of setae before the posterior margin, but there are none on the posterior margin itself. All setae on the dorsal head are shorter than the maximum diameter of the eye. Anterior clypeal margin almost transverse, without trace of a median notch or marked concavity. Posterior margin of head shallowly concave medially. Outer margin of eye does not break outline of side in full-face view. Number of setal pairs on mesosoma: pronotum 4 – 5; mesonotum 4 – 5, at least 2 pairs anteriorly on the sclerite and 2 pairs where the surface curves down towards the metanotal groove; propodeal dorsum 0; lateral margin of propodeal declivity 2 – 3. Propodeum in profile with a shallowly convex dorsum that rounds broadly and evenly into the declivity. Gastral tergites 1 – 4 each with short setae that are distinctly shorter than the maximum diameter of the eye. Head, mesosoma and all leg segments orange; middle and hind tarsi the same colour as the tibiae and femora. Gaster black, strongly contrasting with the head and mesosoma.

PARATYPE WORKER. Measurements: TL 3.6, HL 0.92, HW 0.89, SL 0.86, PW 0.57, WL 1.20. *Indices*: CI 97, SI 97, OI 24, EPI 59, DTI 135. As holotype.

Holotype worker (upper of two on pin), **Tanzania** (= Tanganyika on label): Amani, xii.1951, B.M. 1952-73 (*N.L.H. Krauss*) (BMNH).
Paratype. 1 worker (lower of two on pin) with same data (BMNH).

In the Afrotropical fauna the three species *menozzii, hostilis* and *semiruber* form a complex of closely related forms within the *albipes* group. However, these three together are larger (combined HW range of 0.76 – 0.89) than other species of the group, which show a combined HW range of 0.46 – 0.70 for the species *albipes, difficilis, moerens, nigriventris, pallipes, vapidus, vitiensis*. Also in the three species the propodeal dorsum rounds broadly and evenly into the declivity, rather than the two surfaces meeting in a blunted or sharp angle, as is characteristic of the other seven species just mentioned.

T. semiruber is much more densely setose than *hostilis* and *menozzii* and has projecting setae on the scapes and tibiae, features that are absent from the other two. *T. hostilis* is a strikingly bicoloured species with orange head, mesosoma and legs, and a very strongly contrasting black gaster. In contrast *menozzii* has the head, mesosoma and gaster a more or less uniform blackish brown. In addition, *hostilis* has no setae on the posterior margin of the head but has 4 – 5 pairs of setae on the pronotum and the same number on the mesonotum, whereas *menozzii* has setae present on the posterior cephalic margin but has far fewer on the mesosoma, with only 1 – 2 pronotal pairs and a single mesonotal pair. Both species are known from only sparse material, so some variation in these setal characters may be detected when more material is found. The specimens collected by Ward (below) carry the data "ground forager, rainforest edge".

NON-PARATYPIC MATERIAL EXAMINED
Tanzania: Amani (*P.S. Ward*).

Technomyrmex ilgi (Forel)

(Figs 8, 33)

Engramma ilgi Forel, 1910d: 264. Syntype workers, ETHIOPIA: "West Abessinien" no loc.

(*Ilg*) (MHNG) [examined]. [Combination in *Technomyrmex* by Shattuck, 1992b: 160.]
Engramma stygium Santschi, 1911b: 363. Syntype worker and male, KENYA: Nairobi (Wa-Kikouyou et Nasai), 1904 (*C. Alluaud*) (MNHN) [not seen (see note)]. **Syn. n.** [Combination in *Technomyrmex* (as *Technomyrmex ilgi stygius* (Santschi)) by Shattuck, 1992b: 161.]
Engramma ilgi var. *stygium* Santschi: Santschi, 1914: 117.
Engramma gowdeyi Wheeler, W.M. 1922: 207, fig. 53. Syntype workers, UGANDA: Kampala (*C.C. Gowdey*) (MCZC, SAMC, BMNH, LACM) [examined] **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 160.]

NOTE
I have not seen the syntypes of *stygium* but have examined all Santschi's later material, in NHMB (discussed in Santschi, 1914: 117) that bears the name "*Engramma ilgi stygium*" upon their data labels. All are the same species and match the original description of *stygium*.

WORKER. *Measurements*: TL 2.7 – 3.5, HL 0.70 – 0.87, HW 0.70 – 0.85, SL 0.58 – 0.70, PW 0.45 – 0.58, WL 0.78 – 1.04 (15 measured). *Indices*: CI 96 – 100, SI 82 – 87, OI 21 – 25, EPI 80 – 90, DTI 100 – 112.
Dorsum of head behind clypeus with only 2 pairs of setae: in profile the anterior pair located at about the level of the anterior margin of the eye, the second pair at the posterior margin of the head; both pairs slightly shorter than the maximum diameter of the eye. (In a single worker another, much shorter, single seta (not paired) was present closer to the torulus.) Head in full-face view short and broad. Eyes small, located just in front of the midlength and their outer margins set well in from the outline of the sides. Anterior clypeal margin with a conspicuous semicircular to short U-shaped median notch; inner margin of notch meets anterior clypeal margin in a sharp angle on each side. Posterior margin of head broadly shallowly impressed across its width, usually most indented medially. Scape relatively short, SI < 90 in material examined. Mesosoma short and stocky (DTI < 120), very stoutly built; metanotal groove sharply but only shallowly impressed. Propodeum in profile with the dorsum short, the declivity long and sloping. Number of setal pairs on mesosoma: pronotum 1 – 3; mesonotum 2 – 3; propodeal dorsum 0; lateral margin of propodeal declivity 1 – 2, just above the spiracle. Gastral tergites 1 – 4 each with stout setae present, the longest of them usually longer than the maximum diameter of the eye. Sculpture on the head weak and superficial. Colour uniform light brown, dark brown, blackish brown or black; colour appears consistent within nest series but varies between series. Middle and hind tarsi the same colour as the body or a little lighter.

This species resembles *lasiops* but the two are easily separated by the characters given in the key. The most obvious difference lies in their respective palp formulae, PF 6,4 in *ilgi* but PF 5,3 in *lasiops*.

T. ilgi has been found nesting in soil and under rotten wood, and under the loose bark of fallen logs. It forages in the soil and leaf litter but also ascends shrubs and low vegetation, where it tends homopterous insects.

MATERIAL EXAMINED
Ethiopia: "West Abessinien (*Ilg*). **Kenya**: Narok, Loiba Hills, Morije (*Mahnert & Perret*); Laikipia Distr., Mpala Res. Centre (*S. Kamande*); Kakamega Distr., Kakamega For., Isecheno (*R.R. Snelling*); Isecheno For. Res. (*R.R. Snelling*); Isecheno For. Res., Kalunya Glade (*Snelling & Espira*); Isecheno Nat. Res. (*R.R. Snelling*); Mau Escarpment, Elburgon (*Alluaud & Jeannel*); Mt Elgon Nat. Pk (*S. Zoia*). **Uganda**: Zika For., nr Entebbe (*G. Arnold*); Kampala (*C.C. Gowdey*). **Zimbabwe**: Inyanga (*G. Arnold*). **South Africa**: Transvaal, Letaba Valley (*J.J. Cillie*); Pretoria, Salique (*J.C. Faure*).

Technomyrmex lasiops Bolton sp. n.

(Figs 7, 30)

HOLOTYPE WORKER. *Measurements*: TL 2.6, HL 0.68, HW 0.62, SL 0.53, PW 0.42, WL 0.72. *Indices*: CI 91, SI 85, OI 23, EPI 77, DTI 105.
Palp formula 5,3. Dorsum of head behind clypeus with 4 pairs of setae: in profile the first above the toruli; second about at the level of the anterior margin of the eye; third about at the level of the posterior margin of the eye; fourth at the posterior margin of the head. Setal pairs 2 – 4 as long as, or slightly longer than, the maximum diameter of the eye. Anterior clypeal margin with a sharply incised U-shaped median notch that is about as long as broad; inner margin of notch meets anterior clypeal margin in a sharp angle on each side. In full-face view posterior margin of the head slightly indented medially; sides of head convex and convergent anteriorly. Eye relatively small (OI range 21 – 24); outer margins of eyes distinctly fail to break the outline of the sides of the head. Scape relatively short (SI range 83 – 88), with elevated pubescence but lacks setae. Funicular segments 3 – 4 broader than long. Head capsule weakly and only superficially sculptured, without blanketing dense shagreenate or microreticulate sculpture. Mesosoma stocky, short and compact (DTI range 100 – 105). Metanotal groove narrow and shallowly impressed. Propodeal dorsum in profile very short, the declivity a long, more or less flat surface that slopes down to the spiracle. Number of setal pairs on mesosoma: pronotum 1 – 2 (abraded away in holotype but well attested in other material); mesonotum 2 – 3; short propodeal dorsum 0; lateral margin of propodeal declivity 1, just above the spiracle. Gastral tergites 1 – 4 each with setae that are longer than the maximum diameter of the eye. Femora and tibiae with elevated pubescence but without setae. Colour yellowish brown, the gaster slightly darker than the mesosoma. First gastral tergite finely and sparsely superficially sculptured, dully shining, without dense blanketing sculpture.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 2.3 – 2.7, HL 0.54 – 0.68, HW 0.48 – 0.62, SL 0.42 – 0.54, PW 0.34 - 0.43, WL 0.58 – 0.74 (15 measured). *Indices*: CI 87 - 91, SI 83 - 88, OI 21 - 24, EPI 71 - 77, DTI 100 – 110. As holotype but colour varies from dull yellow to light brown; the gaster is usually slightly darker in shade than the mesosoma.

Holotype worker (upper specimen of two on pin), **Cameroun**: Ottotomo, 2.iv.1989 (*A. Dejean*) (BMNH).
Paratype. 1 worker with same data (lower specimen of two on pin) (BMNH).

The closest relative of *lasiops* is certainly the Oriental and Malesian *pratensis* (p. 95), which it resembles and with which it shares a palp formula of 5,3. However, the latter species tends to be larger, has more posteriorly located eyes, and always has more setae on the dorsum of the head.

T. lasiops inhabits leaf litter and rotten wood on the forest floor. Among the Afrotropical fauna it is a very distinctive species because of its reduced PF, stocky build, short scapes, deeply notched clypeus, small eyes, characteristic arrangement of setae on the dorsum of the head and feeble sculpture.

There is a series of 7 queens, with the same data as the Doussala workers recorded below, in CASC. These may originally have been associated with the workers but had been split from them and stored separately. At first glance they appear very different from the workers, which is odd in this genus as most queens resemble their workers. The queens are a uniform very dark brown except for their middle and hind coxae, which are a strongly contrasting off-white to yellowish, and their middle and hind tibiae and tarsi, which are similarly more lightly coloured. They apparently also naturally lack setae on the first gastral tergite. Not a single seta or pit is present on this sclerite in any specimen, in contrast to the workers where they are conspicuous. However, long setae that are the same as those in the workers are obvious on gastral tergites 2 – 4. Despite these striking differences I suspect that the queens are correctly associated with the

lasiops workers because they share the palp formula of 5,3, the characteristic arrangement of long setae on the dorsal head, and the clypeal notch is similar but somewhat smaller.

In CASC there is also a single male, again from the same locality, which has PF 5,3 and is most probably conspecific with the queens and workers from that locality.

NON-PARATYPIC MATERIAL EXAMINED
Gabon: Prov. Ogooue-Maritime, Res. Monts Doudou, Doussala (*B.L. Fisher*); Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*). **Democratic Republic of Congo**: Epulu (*S.D. Torti*).

Technomyrmex laurenti (Emery)

(Figs 11, 32)

Tapinoma laurenti Emery, 1899: 487. Syntype workers and queens, DEMOCRATIC REPUBLIC OF CONGO: no loc. (*Laurent*) (MRAC) [not seen] and CAMEROUN: no loc. (*Conradt*) (MCSN). [Combination in *Engramma* by Emery, 1913: 38; in *Technomyrmex* by Shattuck, 1992b: 161.]
Engramma kohli Forel, 1916: 429. Syntype workers and queens, DEMOCRATIC REPUBLIC OF CONGO: St Gabriel (*Kohl*) (MHNG) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]
Engramma laurenti var. *congolensis* Forel, 1916: 431. Syntype workers and putative queen, DEMOCRATIC REPUBLIC OF CONGO: St Gabriel and Bengemeza (*Kohl*) (MHNG) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

WORKER. *Measurements*: TL 1.8 – 4.0, HL 0.55 - 1.08, HW 0.52 – 1.08, SL 0.40 – 0.64, PW 0.30 - 0.57, WL 0.52 – 1.06 (25 measured). *Indices*: CI 94 - 102, SI 58 - 77, OI 18 - 21, EPI 60 - 80, DTI 104 – 127.
Frontal carina with 2 – 4 setae: in profile the posteriormost at the level of the posterior margin of the eye. Behind this the cephalic dorsum to the posterior margin lacks setae but the posterior margin itself with 4 – 6 setae across its width. Head broad and strongly cordate in full-face view, with a deeply cleft, broadly V-shaped posterior margin (which becomes more extensive as worker size increases); sides convex and converging anteriorly. Eyes relatively small and located in front of midlength (EPI 80 or less, decreasing as worker size increases), outer margins of eyes conspicuously fail to break the outline of the sides. Clypeus broad, with an anterior apron and a conspicuous median notch that is sharply defined and usually approximately semicircular; inner margin of notch meets the anterior clypeal margin in a right-angle or near right-angle on each side. Scape relatively short, SI 77 or less (SI decreases with increased size so that smallest workers have highest SI). Funicular segments 2 – 8 about as broad as long or slightly broader than long. Mesosoma stocky, short and compact (DTI, above). Dorsal surfaces of pronotum and mesonotum, and declivity of propodeum, each with several pairs of setae present. Gastral tergites 1 – 4 each with numerous setae, the longest of them usually about equal in length to the maximum diameter of the eye, though samples may occur with these setae slightly longer or shorter. Colour very variable; dorsum of head and mesosoma may be uniformly coloured or have areas of lighter and darker cuticle. Lightest samples have a dull yellow head and mesosoma, with the gaster very rarely the same colour, usually slightly to considerably darker, pale brown to very dark brown. Petiole and middle and hind coxae may be same colour as mesosoma or slightly to distinctly lighter. Intermediate shades occur through to the darkest samples, which are uniformly dark brown, sometimes with the petiole and middle and hind coxae distinctly lighter.

T. laurenti is a very distinct, strikingly size-variable species (with some allometric variation) whose nest sites seem usually to be in the domatia of myrmecophytes, although its exclusive use of such sites has not been confirmed. Among the material examined for this study *laurenti* has been recorded from domatia in the genera *Leonardoxa, Scaphopetalum, Cola, Plectronia* and *Delpydora* (for earlier records see

Wheeler, 1922; McKey, 1984; Hölldobler & Wilson, 1990). It has also been found in modified leaves of a *Diospyros* species, as well as foraging freely on other vegetation and on the ground.

As described above, variations in colour and colour pattern are extensive. Because this variation occurs against a fixed suite of very obvious strong characters colour is not awarded any taxonomic significance here. The few queens examined all have light middle and hind coxae, regardless of the coxal colour of their workers.

The head shape of *laurenti*, with its small eyes, emarginate clypeus, deeply excised posterior margin, short scapes, and the overall short, stocky build, are all reminiscent of *lujae*, but the latter species entirely lacks setae on the dorsal head and body, as well as having a reduced palp formula of 4,3; *T. laurenti* has PF 6,4, the usual count in the genus.

MATERIAL EXAMINED

Cameroun: Mbalmayo (*N. Stork*); nr Kribi, 10 km W Bipirdi (*D. McKey*); S Prov., Ebodji (*D. McKey*); SW Prov., Illoani, SW of Rumpi Hills (*D. McKey*); SW Prov., Rumpi Hills, Masaka (*D. McKey*); SW Prov., Meme Div., S Bakundu For. Res. (*D. McKey*); Douala-Edea Res., nr Lake Tissongo, 15 km E Mouanko (*D. McKey*); Prov. Sud, Res. Campo (*B.L. Fisher*); Res. Campo (*D.M. Olson*); Pan Pan (*A. Dejean*). **Gabon**: La Makandé, For. des Abeilles (*S. Lewis*); For. Des Abeilles (*A. Dejean*); Prov. Ogooue-Maritime, Res. Monts Doudou, (*B.L. Fisher*); Res. Monts Doudou (*S. van Noort*); Res. Moukalaba (*B.L. Fisher*); Prov. Estuaire, F.C. Mondah (*B.L. Fisher*); Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*). Central African Republic: P.N. Dzanga-Ndoki (*B.L. Fisher*); Res. Dzanga-Sangha (*B.L. Fisher*) **Democratic Republic of Congo**: St Gabriel (*Kohl*); Niapu (*H.O. Lang*); Epulu (*S.D. Torti*).

Technomyrmex lujae (Forel)

(Figs 12, 31)

Engramma lujae Forel, 1905a: 181. Syntype workers and males, DEMOCRATIC REPUBLIC OF CONGO: Kasai, Kondue (*Luja*) (MHNG) [examined]. [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

Engramma lujae r. *wasmanni* Forel, 1916: 432. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: no loc. (*Kohl*) (MHNG) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

Engramma griseopubens Wheeler, W.M. 1922: 206, fig. 52. Holotype worker, DEMOCRATIC REPUBLIC OF CONGO: Lukolela to Basoko (*H.O. Lang*) (AMNH) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 160.]

Engramma lujae var. *pulliceps* Santschi, 1926: 244. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: Makanga (*Kohl*) (NHMB) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.] (See note.)

NOTE

Syntypes of *pulliceps* are two workers, each on a separate pin. They have no data except for a label "*Engramma Lujae* For. v. *pulliceps* Sants. type." The data given in the synopsis above is thus from the original description. The specimens match the description perfectly and are certainly the syntypes.

WORKER. *Measurements*: TL 2.7 - 3.7, HL 0.72 - 0.86, HW 0.74 – 0.95, SL 0.54 – 0.64, PW 0.48 - 0.58, WL 0.84 – 0.98 (15 measured). *Indices*: CI 100 - 110, SI 67 - 76, OI 17 - 21, EPI 46 - 54, DTI 100 - 110.

Palp formula 4,3. Dorsum of head posterior to clypeus entirely lacks setae. Head in full-face view relatively very broad (CI 100 or more). Clypeus with a broad, conspicuous median emargination that is approximately semicircular and forms a wide notch; inner margin of notch meets anterior clypeal margin in an angle on each side. Posterior margin of head broadly emarginate; sides of head convex and convergent anteriorly. Eyes relatively small (OI < 25) and located far forward (EPI < 60), their outer margins are far from the sides of the head in full-face view and conspicuously fail to break the outline of the sides. Scape short (SI < 85). Mesosoma entirely lacks setae and is short

and compact; mesonotum convex in profile; metanotal groove narrow but impressed, abutted by the metathoracic spiracles. Propodeal dorsum in profile shallowly sloping posteriorly; propodeal spiracle high, located adjacent to the point where the slope of the dorsum curves into the declivity rather than half or more the distance down the declivity. Gastral tergites 1 – 4 entirely lack setae; a few are present on the gastral sternites, projecting ventrally. Scapes and legs without setae. Colour variable, from uniform light brown to blackish brown, often with the head lighter in shade than the body. In darkly coloured samples the head may be reddish brown to dull red and contrast with the darker body. Legs the same colour as the mesosoma throughout.

This stoutly built, size-variable, arboreal species is immediately recognisable by its combination of reduced palp formula, complete lack of dorsal setae, broadly emarginate clypeal margin, short scapes, very broad head upon which the small eyes are located relatively far forward, and highly placed propodeal spiracle. It has no obvious close relatives and is unlikely to be confused with any other species. The PF 4,3 is also found only in the Borneo species *reductus* (p. 98) but apart from the palp formula the two are very different and have obviously independently evolved this feature.

T. lujae may be locally extremely numerous. It is the "*Technomyrmex* 2" of Watt, Stork & Bolton (2002), the most abundant arboreal ant recorded from the canopies of *Terminalia ivorensis* trees in Mbalmayo Forest Reserve, Cameroun.

MATERIAL EXAMINED
Cameroun: Mbalmayo (*N. Stork*); SW Prov., Rumpi Hills, Big Ngwandi (*D. McKey*). **Gabon**: La Makandé, For. des Abeilles (*S. Lewis*); For. des Abeilles (*A. Dejean*). **Democratic Republic of Congo**: Kasai, Kondue (*Luja*); Makanga (*Kohl*); Lukolela to Basoko (*H.O. Lang*).

Technomymrex menozzii (Donisthorpe) **comb. n.**

(Fig. 10)

Tapinoma menozzii Donisthorpe, 1936: 526. Holotype worker and paratype workers, ZIMBABWE: Chirinda Forest, Dec. 1935 (*G. Arnold*) (BMNH) [examined].

WORKER. *Measurements*: TL 3.4 - 3.5, HL 0.82 - 0.85, HW 0.76 – 0.78, SL 0.75 – 0.78, PW 0.48 - 0.50, WL 0.98 – 1.04 (4 measured). *Indices*: CI 92 - 94, SI 99 - 100, OI 24 - 26, EPI 57 - 63, DTI 125 - 128.
Frontal carina with 2 setae: in profile the first at the torulus, the second at about the level of the anterior margin of the eye. No seta is present at the level of the posterior margin of the eye but behind this level the dorsum has 1 other pair of setae before the posterior margin and 4 setae are present across the posterior margin itself. All setae on the dorsal head are shorter than the maximum diameter of the eye. Anterior clypeal margin evenly very shallowly concave medially but without trace of a median notch. Posterior margin of head broadly shallowly concave across its width. Outer margins of eyes do not break the outline of the evenly convex sides in full-face view. Number of setal pairs on mesosoma: pronotum 1 - 2; mesonotum 1, located where the surface curves down towards the metanotal groove; propodeal dorsum 0; lateral margins of propodeal declivity 2. Propodeum in profile with shallowly convex dorsum that rounds broadly and evenly into the declivity. Gastral tergites 1 – 4 each with short setae that are distinctly shorter than the maximum diameter of the eye. Head, mesosoma and gaster more or less uniformly blackish brown to black. Middle and hind tarsi yellow, distinctly lighter than the brown tibiae and femora.

This species, known only from the type-series (several of which are tenerals that lack full adult colour), is closely related to *hostilis* and *semiruber*. The three are differentiated by the characters given in the key and the notes under *hostilis*.

MATERIAL EXAMINED
Zimbabwe: Chirinda For. (*G. Arnold*).

Technomyrmex metandrei Bolton sp. n.

HOLOTYPE WORKER. *Measurements*: TL 3.5, HL 0.84, HW 0.72, SL 0.87, PW 0.52, WL 1.22. *Indices*: CI 86, SI 121, OI 28, EPI 94, DTI 152.
Answering the description of *andrei* except for colour, as follows. Head, mesosoma and petiole dull orange, gaster brown with extensive yellowish areas on the tergites. Gastral sternites 1 – 5 the same colour as the petiole. Front coxa same colour as mesosoma, trochanter yellow; femur and tibia as coxa or slightly lighter. Middle and hind coxae and trochanters pale yellow, femora and tibiae light brownish yellow; tarsi pale yellow. Setae on gastral segments 2 – 4 are mostly lost by abrasion or are adherent to the surface, but the setal pits are clearly visible.

PARATYPE WORKERS (2, of which only smallest is measured as head of larger paratype is severely crushed). *Measurements*: TL 3.1, HL 0.76, HW 0.67, SL 0.84, PW 0.49, WL 1.10. *Indices*: CI 88, SI 125, OI 25, EPI 94, DTI 145.
First paratype (head crushed) as holotype but gaster darker and the paler dorsal areas less conspicuous. Setae are distinct on gastral tergites 2 – 4. Second paratype smaller than holotype. Head, mesosoma, petiole and legs yellow, the middle and hind coxae slightly lighter. Gaster brown with pale areas dorsally as in holotype.

Holotype worker, **Central African Republic**: P.N. Dzanga-Ndoki, 37.9 km. 169°S Lidjombo, 2°22'N, 16°10'E, 360 m., 21.v.2001, #4130, sifted litter (leaf mold, rotten wood) rainforest, CASENT 0424010 (*B.L. Fisher*) (CASC).
Paratypes. 2 workers with same data as holotype but CASENT 0420688 (head crushed) and CASENT 0425775 (CASC).

Only four specimens of this species are known, the type-series and the single specimen mentioned below, which is slightly smaller than the smallest paratype and about as pale in colour.

NON-PARATYPIC MATERIAL EXAMINED
Democratic Republic of Congo: Epulu (*S.D. Torti*).

Technomyrmex moerens Santschi

(Fig. 5)

Technomyrmex moerens Santschi, 1913: 312, fig. 4. Syntype workers, CONGO: Mt Boma (thus on data labels, not M'Boumou as in description), 1907 (*A. Weiss*) (NHMB) [examined].
Technomyrmex albipes subsp. *congolensis* Karavaiev, 1926: 443. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: M'boma, no. 2099 (no collector's name) (UASK) [examined]. [Unresolved junior secondary homonym of *congolensis* Forel, 1916: 431.] [Synonymy by Santschi, 1930a: 69.] (See note 1.)
Technomyrmex moerens var. *nigricans* Santschi, 1930a: 69. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: Kunungu, 2.iv.1921 (*H. Schouteden*) and Luebo, Kamaiembi, 19.ix.1921 (*H. Schouteden*) (NHMB) [examined] **Syn. n.** (See note 2.)
Technomyrmex incisus Weber, 1943: 380, pl. 16, fig. 37. Holotype worker-queen intercaste (not worker), SUDAN: Imatong Mts, Lotti Forest, 5.viii., No. 1445a (*N.A. Weber*) (MCZC) [examined]. [Junior secondary homonym of *Engramma incisum* Mukerjee, 1930: 155.] **Syn. n.** (See note 3.)
Technomyrmex nequitus Bolton, 1995b: 402. [Replacement name for *incisus* Weber.] **Syn. n.**
Technomyrmex longiscapus Weber, 1943: 381, pl. 16, fig. 41. Holotype worker, SUDAN: Imatong Mts, Lotti Forest, 5.viii., No. 1446 (*N.A. Weber*) (MCZC) [examined]. **Syn.n.** (See note 3.)

NOTES
1 Both syntypes of this taxon are extremely badly damaged. Only the very abraded gaster of one specimen and the glue-obscured mesosoma of the other remain. However, careful examination of these fragments indicates that Santschi's (1930a) synonymy of

congolensis Karavaiev with *moerens* was correct.
2 Santschi (1930a) mentions two more worker syntypes of *nigricans* in the text, both from Democratic Republic of Congo: Ganda Sundi (*H. Schouteden*) and Benza Mazola (*R. Mayné*), which have not been seen.
3 The two Weber (1943) names, *incisus* and *longiscapus*, respectively apply to a worker-queen intercaste and a perfectly ordinary worker of *moerens*. When describing *incisus* Weber overlooked the three small ocelli (median best developed) that are present and did not recognise the incipient development of the mesoscutellum that his holotype exhibited, although he did comment that there was a "deep incision between the mesonotum and epinotum" (= propodeum). As the collection data of the two holotypes are exactly alike and their accession numbers consecutive, it is probable that both had their origin in a single colony.

WORKER. *Measurements*: TL 2.4 – 3.1, HL 0.57 – 0.65, HW 0.50 – 0.58, SL 0.54 – 0.66, PW 0.29 – 0.40, WL 0.70 – 0.88 (25 measured). *Indices*: CI 87 – 92, SI 104 – 120, OI 27 – 33, EPI 54 – 65, DTI 125 – 136.
Frontal carina with 2 (very rarely 3) setae: in profile the posteriormost seta close to the level of the anterior margin of the eye. Dorsum of head posterior to this entirely lacks setae. With head in full-face view the anterior clypeal margin with a very weak, shallow median indentation; sides of head shallowly convex and the posterior margin of the head with a small shallow indentation medially. Eyes located well in front of midlength, EPI above. With mesosoma in profile the mesonotal outline is usually distinctly angled, with a step in the outline that separates dorsal and declivitous faces. Number of setal pairs on mesosoma: pronotum usually 1 long pair (longer than maximum diameter of eye), uncommonly a second shorter pair also present; mesonotum 0; propodeal dorsum 0; lateral margin of propodeal declivity 0. Gastral tergites 1 – 4 with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite usually greater than the maximum diameter of the eye. Head, mesosoma, petiole and gaster uniformly brown to black; in some the gaster may be slightly darker than the mesosoma. Middle and hind coxae varying from yellow, much lighter than the mesosoma, to the same colour as the mesosoma. Femora and tibiae of middle and hind legs about the same colour as the mesosoma or gaster. Tarsi of middle and hind legs dull yellow, paler than the femora and tibiae.

Colour of the middle and hind coxae and relative lengths of the longest hairs on the first gastral tergite vary in workers of this species as it is currently conceived. In some populations the middle and hind coxae are yellow and contrast strongly with the darker mesosoma, but in others these coxae are as darkly coloured as the mesosoma. There are, however, many samples intermediate in shade. All queens examined had light coxae, regardless of their colour in the workers. The longest setae on the first gastral tergite are usually distinctly longer than the maximum diameter of the eye, but there are populations in which the setae are noticably shorter, about equal to the maximum diameter of the eye. No taxonomic significance is currently attached to these variants; all are retained as a single species within the diagnosis outlined above.

Worker-queen intercastes are common in *moerens*, see notes under *vitiensis* (p. 104), *difficilis* (p. 47) and *brunneus* (p. 73). The description above relates to forms with basic worker morphology: without ocelli, without differentiation of mesonotum into mesoscutum and mesoscutellum, without development of a prominent metanotum and without a spermatheca. In the most worker-like intercastes an extra short pair of setae may occur on the slightly developed mesoscutellum.

T. moerens is widely distributed and fairly common in forest and woodland zones of sub-Saharan Africa but has not been recorded outside the Afrotropical region. It is very similar to *vitiensis* but always lacks setae on the propodeal declivity and has the setae on the first gastral tergite sparser but longer, usually longer than the maximum diameter of the eye. In *moerens* EPI is 54 – 65, the eye usually somewhat more anteriorly placed than in *vitiensis*, where EPI is 64 – 84.

Foraging is carried out both on the ground and arboreally but nests are usually

constructed in wood, either in fallen timber or in twigs and branches of standing trees. This species is common in cocoa plantations in Ghana and is the species referred to as *T. sp.* by Room (1971). It may also be the species referred to by Terron (1972) in his notes on alate and ergatoid males of a species close to *albipes* in Cameroun.

MATERIAL EXAMINED
Ivory Coast: Biankouma (*R. Lucius*). **Ghana**: Mampong (*P.M. Room*); Tafo (*B. Bolton*); Tafo (*C. Campbell*); Enchi (*D. Leston*); Bunso (*R. Belshaw*); Poano (*R. Belshaw*); Sagymasi (*R. Belshaw*); Nankasi (*R. Belshaw*); Efiduase (*R. Belshaw*); Atewa (*D. Leston*); Atewa For., Akodom (*R. Belshaw*); Atewa, Kibi (*R. Belshaw*); Jachei (*R. Belshaw*). **Nigeria**: Ibadan (*A. Russell-Smith*); Benin, Asaba (*B. Malkin*); Gambari, CRIN (*B. Taylor*). **Cameroun**: Mbalmayo (*N. Stork*); Ottotomo (*A. Dejean*); Pan Pan (*A. Dejean*); Sangmelima (*A. Dejean*); Nkoemvon (*D. Jackson*); Prov. Sud, Campo (*B.L. Fisher*); Res. De Campo (*D.M. Olson*); SW Prov., Rumpi Hills, Big Ngwandi (*D. McKey*). **Gabon**: Prov. Ogooue-Maritime, Res. Monts Doudou (*B.L. Fisher*); Res. Monts Doudou (*S. van Noort*); Res. Moukalaba (*B.L. Fisher*); Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*). **Central African Republic**: P.N. Dzanga-Ndoki (*S. van Noort*); P.N. Dzanga-Ndoki (*B.L. Fisher*); Res. Dzanga-Sangha (*S. van Noort*); Res. Dzanga-Sangha (*B.L. Fisher*). **Congo**: Mt Boma (*A. Weiss*). **Democratic Republic of Congo**: Kunungu (*H. Schouteden*); Luebo, Kamaiembi (*H. Schouteden*); Ituri, Mont Hoyo (*Ross & Leech*); Matadi (*Ross & Leech*); Epulu (*Ross & Leech*); Epulu (*S.D. Torti*); M'boma (no collector's name). **Sudan**: Imatong Mts, Lotti Forest (*N.A. Weber*). **Kenya**: Kakamega Distr., Isecheno For. Res., Isecheno (*R.R. Snelling*); Isecheno For. Res., Kalunya Glade (*R.R. Snelling*); Kakamega Forest (*T Wagner*). **Uganda**: Dedewe Forest, nr Kampala (*G. Arnold*); Bushenyi Distr., Kalinzu Forest (*S. Yamane*). **Tanzania**: Amani (*P.S. Ward*).

Technomyrmex nigriventris Santschi

Technomyrmex nigriventris Santschi, in Forel, 1910b: 22 (footnote). Syntype workers, CONGO: Brazzaville (*Weiss*) (NHMB) [examined].

WORKER. *Measurements*: TL 2.2 – 2.7, HL 0.52 – 0.62, HW 0.46 – 0.56, SL 0.46 – 0.58, PW 0.32 – 0.36, WL 0.72 – 0.84 (10 measured). *Indices*: CI 88 – 92, SI 100 – 108, OI 26 – 29, EPI 52 – 67, DTI 126 – 132.
Frontal carina with 2 setae: in profile the first above the torulus and the second at about the level of the midlength of the eye. Dorsum of head posterior to this entirely lacks setae. Anterior margin of clypeus with a small, shallow median indentation. Posterior margin of head in full-face view almost transverse, medially flattened or extremely shallowly concave. With head in full-face view the eyes located relatively anteriorly (EPI < 70), their outer margins just fail to break, or just break, the outline of the sides. Mesosoma in profile with mesonotum evenly curved and metanotal groove impressed. Propodeal dorsum short, much shorter than depth of declivity to spiracle; dorsum meets declivity in a blunt angle. Number of setal pairs on mesosoma: pronotum 2, length about equal to maximum diameter of eye; mesonotum 1, shorter than pronotal setae; propodeal dorsum 0; lateral margin of propodeal declivity usually with 1. Gastral tergites 1 – 4 each with numerous setae, the longest on the first tergite about equal to the maximum diameter of the eye or slightly shorter. Head, mesosoma, petiole and legs yellow to brownish yellow, the head often darker than the mesosoma. Gaster dark brown, much darker than the mesosoma and petiole and strongly contrasting to them.

This small species forages mainly in the leaf litter and topsoil, but may also ascend low vegetation. In Nigeria it has been found nesting under a flake of bark near the base of a living tree, but presumably it also nests in rotten wood in the topsoil as it occurs in leaf litter samples. A very few intercastes between worker and queen castes are known but do not appear to be developed as frequently as in *moerens, pallipes* or others of the group. *T. nigriventris* is related to *albipes* and its immediate allies but is distinguished by its colour pattern, distribution of setae on the head and small size, the first of these being the most obvious when compared to other Afrotropical congeners.

MATERIAL EXAMINED
Ghana: Enchi (*D. Leston*); Wiawsaw (*D. Leston*); Atewa (*D. Leston*); Tafo (*B. Bolton*); Tafo (*D. Leston*); Tafo (*R. Belshaw*); Aburi (*P.M. Room*). **Nigeria**: Gambari (*B. Bolton*); Gambari, CRIN (*B. Taylor*). **Cameroun**: Nzi (*A. Dejean*); Nkoemvon (*D. Jackson*). **Gabon**: Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*); Prov. Ogooue-Maritime, Res. de la Moukalaba-Dougoua (*S. van Noort*); Res. Monts Doudou (*S. van Noort*); Res. Monts Doudou (*B.L. Fisher*). **Congo**: Brazzaville (*Weiss*). **Central African Republic**: P.N. Dzanga-Ndoki (*S. van Noort*); Res. Dzanga-Sangha (*B.L. Fisher*). **Kenya**: Kakamega Distr., Isecheno, Kakamega For. (*R.R. Snelling*). **Uganda**: Entebbe Bot. Gdns (*D.N. McNutt*).

Technomyrmex parandrei Bolton **sp. n.**

HOLOTYPE WORKER. *Measurements*: TL 3.7, HL 0.84, HW 0.74, SL 0.90, PW 0.54, WL 1.22. *Indices*: CI 88, SI 122, OI 27, EPI 97, DTI 145.
Answering the description of *andrei* except for colour, as follows. Head, mesosoma, petiole and gaster black. Front coxa and femur blackish brown to black, the trochanter yellow. Middle and hind coxae black except for dorsum which is yellow; trochanters yellow; femora blackish brown to black; tibiae and tarsi pale dull yellow, the tibiae tinged with brown on the ventral surfaces.

Gastral setae damaged. None is present on the second tergite but the setal pits are clearly visible. Gastral tergite 3 with 1 seta present that is adherent to the surface; pits indicate the sites of others. Adherent setae are present on the fourth tergite. These conditions are clearly artifacts of collection and preservation, not the normal condition which is most probably as in *andrei*.

PARATYPE WORKER. *Measurements*: TL 3.5, HL 0.87, HW 0.76, SL 0.90, PW 0.54, WL 1.24. *Indices*: CI 87, SI 118, OI 28, EPI 100, DTI 151. As holotype. Setae on gastral tergites 2 – 4 similarly partially abraded but are conspicuous on tergite 3.

Holotype worker, **Gabon**: Prov. Ogooue-Maritime, Res Monts Doudou, 24.5 km. 303° WNW Doussala, 2°14.0'S, 10°23.9'E, 18.iii.2000, 630 m., sifted litter (leaf mold, rotten wood) rainforest, #2276(26)46 (*B.L. Fisher*) (CASC).
Paratype. 1 worker with same data but #2276(24)44 (CASC).

This species is very close to *andrei* but the leg colours are so different that separation as a distinct species appears justified. Other species that have populations with differently coloured middle and hind coxae or femora show quite frequent intermediate shades, but no specimens of *andrei*, out of the hundreds examined, shows a colour pattern intermediate between it and *parandrei*.

Technomyrmex parviflavus Bolton **sp. n.**

(Fig. 15)

HOLOTYPE WORKER. *Measurements*: TL 2.3, HL 0.55, HW 0.46, SL 0.54, PW 0.34, WL 0.70. *Indices*: CI 84, SI 117, OI 35, EPI 70, DTI 135.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a shallow but distinct median impression that is broader than long; less than semicircular. Posterior margin of head in full-face view shallowly emarginate, the indentation deepest medially. Eyes relatively large and located in front of the midlength; in full-face view their outer margins almost touch the outline of the sides. Dorsum of head with weak, and in places superficial, microreticulate sculpture. Dorsal surfaces of mesosoma, and declivity of propodeum, entirely lack setae. In profile the mesonotal dorsal outline with a horizontally flat, or nearly flat, anterior section and a much shorter, much more steeply sloped declivitous surface posteriorly, the two separated by a distinct angle or step in the outline. Propodeal dorsum extemely shallowly convex in profile and meeting the straight declivity through a blunted angle; straight-line length of dorsum distinctly

less than depth of declivity to the spiracle. Gastral tergites 1 – 3 without setae, gastral tergite 4 with 2 – 3 pairs of setae present. Head, mesosoma, petiole and legs dull yellow, the head slightly darker than the mesosoma. Gaster slightly darker, a light yellowish brown.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 1.9 – 2.9, HL 0.49 – 0.62, HW 0.41 – 0.52, SL 0.48 – 0.66, PW 0.29 – 0.40, WL 0.66 – 0.88 (20 measured). *Indices*: CI 81 – 89, SI 110 – 126, OI 33 – 37, EPI 64 – 77, DTI 130 – 145. Frequently as holotype but some workers a uniformly dull yellow, the gaster exactly the same colour as the mesosoma. The eyes may break the outline of the sides in full-face view; variation in eye position relative to sides may be seen in single series. Sculpture of the dorsal head may appear smeared, or in places structureless or almost effaced. The propodeal dorsum may be flat in profile; very rarely the straight-line length of the dorsum is only slightly less than the depth of the declivity to the spiracle. There is considerable variation in relative length of the scape but no taxonomic significance can currently be attached to this character.

Holotype worker, **Ghana**: Bunso, ii.1992, leaf litter (*R. Belshaw*) (BMNH).
Paratypes. 7 workers and 1 queen, with the same data as the holotype (BMNH, CASC).

A small but widely distributed species that inhabits the leaf litter layer but also ascends low vegetation. It is closest related to *sycorax*. Differences that separate the two are noted in the key and under the latter species.

T. parviflavus is superficially similar to the Malagasy *docens* (p. 50) but the latter has a much longer propodeum where the straight-line length of the dorsum is distinctly greater than the depth of the declivity to the spiracle; *docens* also has smaller eyes (OI 23 – 25) and shorter scapes (SI 104 – 109).

NON-PARATYPIC MATERIAL EXAMINED
Ivory Coast: Tai Forest (T. Diomande). **Ghana**: Mampong (*P.M. Room*); Enchi (*D. Leston*); Tafo, Cocoa Res. Inst. (*R. Belshaw*); Poano (*R. Belshaw*); Kade (*R. Belshaw*); Asiakwa (*R. Belshaw*). **Nigeria**: Gambari (*B. Bolton*); Gambari, CRIN (*B. Taylor*). **Cameroun**: Mbalmayo (*N. Stork*); Ottotomo (*A. Dejean*); Prov. Sud-Ouest, Bimbia For. (*B.L. Fisher*); Korup N.P. (*B.L. Fisher*); Prov. Sud, P.N. Campo (*B.L. Fisher*); Res. de Campo (*D.M. Olson*). **Gabon**: Makokou (*I. Lieberburg*); Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*); Prov. Ogooue-Maritime, Res. Monts Doudou (*B.L. Fisher*); Res. Moukalaba (*B.L. Fisher*); Prov. Estuaire, Pointe Ngombe, Ekwata (*B.L. Fisher*); F.C. Mondah (*B.L. Fisher*). **Central African Republic**: P.N. Dzanga-Ndoki (*B.L. Fisher*); Res. Dzanga-Sangha (*B.L. Fisher*). **Democratic Republic of Congo**: Epulu (*S.D. Torti*). **Uganda**: Bushenyi Distr., Kalinzu Forest (*S. Yamane*).

Technomyrmex pilipes Emery

Technomyrmex pilipes Emery, 1899: 490. Syntype queens, CAMEROUN: no loc., 1895 (*Conradt*) (MCSN) [examined].

ALATE QUEEN. *Measurements*: TL 5.4, HL 1.16, HW 1.11, SL 1.02, PW 0.96, WL 1.80. *Indices*: CI 96, SI 92, OI 30, EPI 66.
Closely related to *schoutedeni*, with same head shape and general appearance, but with setae very dense. Prominent fine setae project from all surfaces of the scapes and the dorsal (outer) surfaces of the middle and hind tibiae. Those on the scape are about equal to its maximum width while those on the tibiae are shorter than the maximum width of the segment from which they arise. With head in full-face view the anterior clypeal margin is almost transverse, with only the slightest hint of a median impression; posterior margin of head evenly shallowly concave. Dense fine projecting setae present all across posterior margin of head and along entire length of sides of head. Similar setae abundant all over the dorsum of the head and on its ventral surface, longest on the dorsum close to the posterior margin. All dorsal surfaces of mesosoma with numerous fine setae and setae present on propodeal declivity. Gastral segments 1 – 4 densely

clothed with setae of variable length, the longest on the first tergite shorter than the maximum diameter of the eye. Head, mesosoma and gaster all about the same shade of dappled reddish to blackish brown.

As this species is known only from the queen its position in the key is somewhat conjectural. However, it is probably safe to assume that the extremely dense pilosity shown by the queen will be reflected in the worker caste as an equivalence of pilosity applies to almost all other *Technomyrmex* species where both castes are known. It is suspected that the worker of *pilipes* will look like an extremely densely hairy version of *schoutedeni*, perhaps without the marked bicoloured pattern of the latter.

MATERIAL EXAMINED
Cameroun: no loc. (*Conradt*).

Technomyrmex rusticus Santschi

Technomyrmex rusticus Santschi, 1930a: 72, figs. 43-45. Syntype worker-queen intercaste (not worker), DEMOCRATIC REPUBLIC OF CONGO: Kunungu, 4.iv.1921 (*H. Schouteden*) (NHMB) [examined]. (See note.)

NOTE
The surviving syntype, of an original two of this taxon, is a worker-queen intercaste, not a worker as stated in the original description. Small but distinct ocelli are present and the mesosoma has a differentiated mesoscutum and mesoscutellum, as well as a small but well-defined and prominent metanotum. From Santschi's (1930a) comments and figures I suspect that both were intercastes. The type-locality of *rusticus* is the same as one of the series of *moerens nigricans* and the two samples were collected only two days apart, but because of the radically different distribution of setae between intercastes of *moerens* and *rusticus*, and other characters, I doubt that the latter is conspecific with the former.

WORKER-QUEEN INTERCASTE. *Measurements*: TL 3.7, HL 0.80, HW 0.79, SL 0.67, PW 0.56, WL 1.12. *Indices*: CI 99, SI 85, OI 32, EPI 63, DTI 132.
Frontal carina with a single seta: in profile at the level of the anterior portion of the eye; head posterior to this entirely lacks setae. Anterior clypeal margin with an extremely weak median concavity. Posterior margin of head shallowly impressed medially. Three small ocelli present. In full-face view the relatively large eye breaks the outline of the side of the head. Prominent fine elevated pubescence dense on the dorsal head and in full-face view clearly projecting from the sides both in front of and behind the eyes. Leading edge of scape with similar elevated pubescence but without setae. Dorsal mesosoma with fine dense pubescence but without setae. Lateral margins of propodeal declivity with 3 pairs of setae. Mesonotum separated into a large mesoscutum and a small but clearly differentiated mesoscutellum, conspicuous both in profile and in dorsal view. A narrow but elevated and prominent metanotum is present. Gastral tergites 1 – 3 without setae, tergite 4 with two pairs of setae present. Colour of head, mesosoma, petiole, gaster and all leg segments a very uniform dark brown.

It was thought that the lack of setae on gastral tergites 1 – 3 could be due to abrasion, but setal sockets have not been detected and distinct setae and their sockets remain on tergite 4, so lack of setae on tergites 1 - 3 must be considered as normal.

MATERIAL EXAMINED
Democratic Republic of Congo: Kunungu (*H. Schouteden*).

Technomyrmex schoedli Bolton sp. n.

(Figs 19, 28)

HOLOTYPE WORKER. *Measurements*: TL 5.0, HL 1.14, HW 0.82, SL 1.42, PW 0.56, WL 1.85. *Indices*: CI 72, SI 173, OI 29, EPI 73, DTI 232.
Frontal carina with 2 setae: in profile the first at about the level of the anterior margin of the eye, the second at about the level of the midlength of the eye (see paratype notes); never a seta directly above the torulus. Head posterior to this, and entire mesosomal dorsum, without setae. Propodeal declivity with a single pair of setae, located at about the level of the spiracle. Head and mesosoma extremely elongated and narrow, scape very long (see indices); legs long and slender, maximum length of hind femur 1.66 (this length through entire type-series 1.64 – 1.90). Anterior clypeal margin with a conspicuous broad, roughly semicircular median emargination that is sharply incised. With head in full-face view the outer margins of the eyes distinctly fail to break the outline of the sides. Sides of head behind eyes shallowly convex and conspicuously convergent posteriorly, so that head width across posterior margin is markedly less than the width immediately behind the eyes. In profile and in dorsal view the mesonotum is very slender, constricted in front of the metathoracic spiracles; the latter far anterior to the metanotal groove; in dorsal view the minimum width of the mesonotum is only about 0.45 × PW. Propodeum elongate, in profile the dorsum rounds broadly into the declivity and the straight-line dorsal length is distinctly greater than the depth of the declivity to the spiracle. First gastral tergite with a pair of stiff setae (see paratype notes); gastral tergites 2 – 4 each with 1 – 2 pairs of long setae. Head, mesosoma, petiole, gaster and legs all light brownish yellow to light brown.

PARATYPE WORKERS. *Measurements*: TL 4.5 - 5.1, HL 1.02 – 1.20, HW 0.74 - 0.89, SL 1.36 – 1.60, PW 0.51 – 0.60, WL 1.70 – 1.94 (6 measured). *Indices*: CI 70 - 74, SI 173 - 189, OI 28 - 30, EPI 65 - 73, DTI 232 - 250. As holotype but the entire van Noort series of paratypes without setae on the first gastral tergite and without setal pits on that sclerite, as is also the case with Fisher paratype 2244(10)18, which makes "first gastral tergite lacks setae" the predominant condition in the species. In all paratypes the anterior seta on the frontal carina is absent, the only one present being that at about the level of the midlength of the eye.

Holotype worker, **Gabon**: Prov. Ogooue-Maritime, Res. Monts Doudou, 25.2 km. 304° NW Doussala, 2°13.6'S, 10°23.7'E, 640 m., 14-19.iii.2000, #2282, on low vegetation, rainforest (*B.L. Fisher*) (CASC).
Paratypes. 2 workers with same data as holotype but 14.iii.2000, #2244(10)18 and #2246(5)3 (CASC). 6 worker, **Gabon**: Prov. Ogoové-Maritime, Réserve des Monts Doudou, 25.2 km. 304°NW Doussala, 2°13.63'S, 10°23.67'E, 660 m., 16.iii.2000, sweep, coastal lowland rainforest, undergrowth, low canopy in forest, #GAOO-S93-2, #GAOO-S105-2, #GAOO-S112-5, #GAOO-S124-2, #GAOO-S126-4, #GAOO-S134-4 (*S. van Noort*) (CASC, BMNH).

This large, slender and spectacularly elongated arboreal species is one of the most easily recognised in the region solely from its measurements and indices: its head is narrower (CI 70 – 74) and its scapes and mesosoma much longer than in any other species (SI 173 – 189; DTI 232 – 250). It is named in honour of Dr Stefan Schödl, a friend and colleague, formerly of NHMW, who died in 2005.

Technomyrmex schoutedeni Forel

(Figs 21, 35)

Technomyrmex schoutedeni Forel, 1910a: 447. Syntype workers, queen, male, DEMOCRATIC REPUBLIC OF CONGO: Bena Dibulé (*Luja*) (NHMG, SAMC, MCSN) [examined].

Engramma zimmeri r. *okiavoensis* Forel, 1916: 431. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: Okiavo Riv., near St Gabriel (*Kohl*) (MHNG) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

NOTE
All worker syntypes of *schoutedeni* show varying degrees of abrasion, which in most is extreme, and some are partially obscured by glue. Summing what pilosity remains on the syntypes gives the setal pattern described below, which is duplicated in the syntypes of *okiavoensis* and the Cameroun material examined.

WORKER. *Measurements*: TL 3.9 – 4.7, HL 0.84 – 0.99, HW 0.77 – 0.93, SL 0.78 – 0.90, PW 0.54 – 0.66, WL 1.16 – 1.40 (10 measured). *Indices*: CI 91 – 97, SI 92 – 108, OI 25 – 28, EPI 58 – 71, DTI 142 – 147.
Dorsum of head behind clypeus with numerous setae; in profile the dorsum from clypeal suture to level of posterior margin of eye with 2 – 3 longer pairs and several shorter pairs. Behind level of posterior margin of eye there is 1 long pair about midway to the posterior margin and another long pair very close to the posterior margin. Ventral surface of head with short setae present. Leading edge of scape with a few standing short setae present, especially in the distal half; these setae shorter than the maximum width of the scape. Anterior clypeal margin transverse or very nearly so, without a median indentation or notch. In full-face view the posterior margin is shallowly emarginate; sides of head convex, strongly convergent in front of eyes so that maximum width across the clypeus is only 0.65 – 0.75 × HW. Eyes of moderate size (OI 25 – 28), located in front of midlength (EPI < 80), their outer margins just break the outline of the sides. Dorsum of mesosoma without setae but propodeal declivity with 2 curved pairs, the first of them very close to the dorsum. Mesonotum in profile with an almost vertical declivitous face posteriorly, this declivity separated from the anterior portion of the mesonotum by a marked angle or step. Metathoracic spiracles borne on conspicuous, prominent tubercles. Propodeum in profile with a short, almost vertical anterior face that rises from the metanotal groove; dorsum posterior to this is long and shallowly convex, and rounds broadly into the declivity. Propodeal spiracle high on the side; in profile the straight-line dorsal length of the propodeum is much greater than the depth of the declivity to the spiracle. Gastral tergites 1 – 4 each with sparse setae. Dorsal (outer) surfaces of middle and hind tibiae without setae. Head and mesosoma brown to blackish brown, sometimes with a reddish tint. Gaster dull yellow to orange-brown, much lighter than head and mesosoma.

This large and conspicuous arboreal species is very closely related to *zimmeri*. The two are currently separated only on colour pattern, as noted in the key and notes to the latter species. *T. pilipes* is also closely related but has very much denser pilosity, including the presence of setae on the tibiae and all dorsal sclerites of the mesosoma.

MATERIAL EXAMINED
Cameroun: Mbalmayo (*N. Stork*). **Democratic Republic of Congo**: Bena Dibulé (*Luja*); Stanleyville (*H. Kohl*); Okiavo Riv., near St Gabriel (*Kohl*).

Technomyrmex semiruber Emery

Technomyrmex semiruber Emery, 1899: 489. Syntype worker, CAMEROUN: no loc., 1895 (*Conradt*) (MCSN) [examined].

WORKER. Measurements: TL 3.0, HL 0.77, HW (approximate as right side of head is crushed) 0.76, SL 0.74, PW 0.50, WL 1.00. *Indices*: CI 99, SI 97, OI 25, EPI 67, DTI 134.
Dorsum of head smooth and shining, with abundant setae of varying length (too many to count easily), the longest about equal to the maximum diameter of the eye. Ventral surface of head with numerous short setae. Anterior clypeal margin almost transverse, with only an extremely shallow and feeble concavity across the median portion.

Clypeus smooth and shining. Outer margin of eye just touches outline of side in full-face view. Scape, especially leading edge and dorsum, with numerous erect fine setae; most slightly shorter than maximum scape width but the longest about subequal to the scape width. Pronotal dorsum smooth and shining except for setal pits; numerous setae present on pronotum, shorter than the maximum diameter of the eye. Mesonotum in profile with a transverse anterior section and a steep declivitous face, the two surfaces of equal length. Metathoracic spiracle on a strongly prominent tubercle. Propodeum in profile with a long, shallowly convex dorsum that rounds broadly and evenly into the declivity. Propodeal spiracle very high on the declivity. Mesonotum without setae, propodeum with a couple of pairs posteriorly (above the spiracle), but both surfaces appear to have suffered some abrasion. Middle and hind tibiae with short suberect to erect setae that are shorter than the maximum tibial width. Pubescence on legs much denser than on gaster. Gastral tergites 1 – 4 each with abundant setae, the longest subequal to the maximum diameter of the eye. Gastral tergites strongly shining; gastral pubescence short and very sparse. Head, mesosoma, petiole, gaster and appendages glossy light brown; gaster glossy dark brown.

T. semiruber is very distinctive and is related to the East African species *menozzii* and *hostilis*, but is easily distinguished from them by its much denser pilosity and presence of erect setae on the scapes and tibiae. See notes under *hostilis*.

Given the amount of terrestrial and arboreal collecting that has taken place in Cameroun in recent years it is amazing that this very distinctive species remains known only from its type-series.

MATERIAL EXAMINED
Cameroun: no loc. (*Conradt*).

Technomyrmex senex Bolton **sp. n.**

(Fig. 17)

HOLOTYPE WORKER. *Measurements*: TL 2.7, HL 0.61, HW 0.52, SL 0.66, PW 0.38, WL 0.88. *Indices*: CI 85, SI 127, OI 27, EPI 80, DTI 147.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a shallow median impression that is broader than long; less than semicircular. Posterior margin of head in full-face view weakly indented medially. Eyes of moderate size and located just in front of the midlength; in full-face view the outer margins of the eyes just fail to reach the outline of the sides. Median portion of clypeus and entire dorsum of head with fine, very dense reticulate-punctulate sculpture. Dorsal surfaces of mesosoma and declivity of propodeum entirely lack setae. In profile the mesonotal dorsal outline with a horizontally flat, or nearly flat, anterior section and a much shorter, much more steeply sloped declivitous surface posteriorly, the two separated by a distinct angle or step in the outline. Propodeal dorsum more or less flat in profile and meeting the straight declivity in an angle; straight-line length of dorsum slightly greater than depth of declivity to the spiracle. Dorsal surfaces of pronotum, mesonotum and propodeum finely reticulate-punctulate. Gastral tergites 1 – 2 without setae, gastral tergites 3 - 4 each with 2 – 3 pairs present that are longer than the maximum diameter of the eye. (In the holotype gastral tergite 4 is partially retracted below tergite 3, probably due to the specimen drying from alcohol, so the setae on 4 have been flattened down.) First gastral tergite finely shagreenate, less strongly sculptured than the dorsal mesosoma. Colour dark brown throughout except for the trochanters and the middle and hind coxae, which are yellow (see notes below). Middle and hind tarsi lighter than the tibiae and femora.

NON-PARATYPIC WORKER MATERIAL. *Measurements*: TL 2.5 – 2.8, HL 0.58 – 0.64, HW 0.48 – 0.54, SL 0.60 – 0.66, PW 0.34 – 0.39, WL 0.82 – 0.90 (15 measured). *Indices*: CI 82 – 88, SI 122 – 129, OI 26 – 30, EPI 70 – 80, DTI 140 – 158. Head and body colour varies from dark brown to black. The middle and hind coxae are usually

the same colour as the mesosoma and femora, but sometimes, as in the holotype, they are yellow. Intermediate shades exist and coxal colour does not seem to be associated with any other character. All variants occur in all known populations and therefore the feature is not accorded any taxonomic significance at species-rank here. In some specimens the reticulate-punctulate sculpture of the head is weaker and not as sharply developed as in the holotype.

Holotype worker, **Gabon**: Makokou, x.1972 (*I. Lieberburg*) (BMNH).

This widely distributed species inhabits the leaf litter layer but also ascends low vegetation. Its closest relatives are *parviflavus* and *sycorax* but both these species lack setae on the third gastral tergite and have the head and mesosoma yellow.

Very badly abraded specimens of *moerens* that have lost almost all their setae may be confused with *senex* as the two are similarly coloured and both produce samples with pale coxae. Such abraded samples of *moerens* can be distinguished because the cephalic sculpture is uniformly fine and not reticulate-punctulate, the dorsal length of the propodeum in profile is distinctly less than the depth of the declivity to the spiracle, the scapes are shorter (SI 102 – 119) and the eyes are located more anteriorly on the head (EPI 54 – 65).

NON-PARATYPIC MATERIAL EXAMINED
Ghana: Kukurantumi (*D. Leston*). **Cameroun**: Prov. Sud, Res. Campo (*B.L. Fisher*); Prov. Sud-Ouest, Bimbia For. (*B.L. Fisher*). **Gabon**: Prov. Ogooue-Maritime, Res. Monts Doudou (*S. van Noort*); Ogooue-Maritime, Res. Moukalaba-Dougoua (*S. van Noort*); Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*); Prov. Estuaire, Pointe Ngombe, Ekwata (*B.L. Fisher*). **Central African Republic**: P.N. Dzanga-Ndoki (*S. van Noort*); P.N. Dzanga-Ndoki (*B.L. Fisher*); Res. Dzanga-Sangha (*S. van Noort*); Res. Dzanga-Sangha (*B.L. Fisher*). **Democratic Republic of Congo**: Kama (*Ross & Leech*).

Technomyrmex setosus Collingwood

Technomyrmex setosus Collingwood, 1985: 243, fig. 12. Holotype and paratype workers, SAUDI ARABIA: Wadi Shugub, 7.iv.1983 (*C.A. Collingwood*) (location of types not known, not in NHMB). (See note.)

NOTE
The type-series can not be located. NHMB, the depository designated in the original description, has no record of them. However, in World Museum Liverpool are two workers with the data SAUDI ARABIA: Shaqiq, 8.iv.1983, presumably collected by Collingwood and incorrectly labeled as types in the Collingwood collection. The locality Shaqiq is not noted for this species either in Collingwood (1985) or Collingwood & Agosti (1996). Interpretation of *setosus* in this study is therefore based on these two specimens, which match the original description but not the rather sketchy figure.

WORKER. Measurements: TL 2.9 - 3.0, HL 0.64 - 0.67, HW 0.59, SL 0.64 – 0.66, PW 0.41, WL 0.80 – 0.82 (2 measured). *Indices*: CI 88 - 92, SI 108 – 112, OI 25 – 27, EPI 75 – 78, DTI 132.
Frontal carina with 2 setae: in profile one above the torulus and one at about the level of the anterior portion of the eye. Posterior to this is 1 pair of much shorter setae at level of posterior margin of eye, 1 pair between the latter and the posterior margin of the head that are shorter than the maximum diameter of the eye, and 2 pairs at the posterior margin itself, a median pair and a much more lateral pair, all shorter than the maximum diameter of the eye. Scapes and tibiae without setae. Anterior clypeal margin transverse or at most with an extremely feeble median impression. In full-face view the posterior margin of the head appears transverse or even very slightly convex, but when head is tilted slightly forward from full-face the margin appears very shallowly evenly concave across its entire width. Outer margins of eyes just fail to break the outlines of the sides

in full-face view. Number of setal pairs on mesosoma: pronotum 1; mesonotum 2; propodeal dorsum 0; lateral margin of propodeal declivity 2. Mesonotum in profile evenly rounded, without a differentiated declivitous face. Propodeal dorsum in profile very short, much shorter than depth of declivity to the spiracle; dorsum and declivity meet in an angle. Gastral tergites 1 – 4 with dense greyish pubescence and each with several pairs of setae, the longest on the first tergite about equal to the maximum diameter of the eye or fractionally shorter. Head and gaster brown to dark brown; mesosoma a much lighter yellowish brown and distinctly contrasting. All leg segments a dull dirty yellow, slightly lighter than the mesosoma.

Several localities in Saudi Arabia and Yemen are given for *setosus* by Collingwood (1985) and Collingwood & Agosti (1996).

MATERIAL EXAMINED
Saudi Arabia: Shaqiq (*C.A. Collingwood* (?))

Technomyrmex sycorax Bolton sp. n.

(Fig. 16)

HOLOTYPE WORKER. *Measurements*: TL 3.0, HL 0.64, HW 0.54, SL 0.74, PW 0.39, WL 0.98. *Indices*: CI 84, SI 137, OI 30, EPI 164.
Answering the description of *parviflavus* but differing as follows. Scape relatively longer, eyes slightly smaller, promesonotum more slender (compare indices). Propodeum in profile with a dorsal straight-line length that is distinctly greater than the depth of the declivity to the spiracle. Head, mesosoma, petiole and legs yellow but gaster black, the colours strongly contrasting. Sculpture of dorsal head more strongly developed, consisting of sharply defined minute reticulate-punctulation.

PARATYPE WORKERS. *Measurements*: TL 2.7 – 3.0, HL 0.60 – 0.64, HW 0.50 – 0.52, SL 0.67 – 0.70, PW 0.37, WL 0.86 – 0.98 (2 measured). *Indices*: CI 81 – 83, SI 134 – 135, OI 28 – 31, EPI 73 – 74, DTI 162 – 170. As holotype.

Holotype worker, **Gabon**: Prov. Ogooue-Maritime, Res. Monts Doudou, 25.2 km. 304° NW Doussala, 2° 13.6'S, 10° 23.7'E, 14.iii.2000, 640 m., #2246(19)-2, beating low vegetation, rainforest (*B.L. Fisher*) (CASC).
Paratypes. 1 worker from same locality but 24.3 km. 307° NW Doussala, 2° 13.4'S, 10° 24.4'E, 9.iii.2000, 375 m., #2200(18)-19, sifted leaf litter (leaf mold, rotten wood), rainforest (*B.L. Fisher*); 1 worker **Gabon**: Prov. Ogoové-Maritime, Réserve des Monts Doudou, 25.2 km. 304° NW Doussala, 2° 13.63'S, 10° 23.67'E, 17.iii.2000, sweep, GA00-S126, coastal lowland rainforest, undergrowth, low canopy in forest (*S. van Noort*) (BMNH, CASC).

Known from only three workers from Gabon, one from leaf litter and the other two swept from low vegetation. Essentially *sycorax* is a slightly larger and more elongated close relative of *parviflavus*. The former also has longer scapes and smaller eyes, has the propodeal dorsum longer with respect to the declivity, and has body colours that strongly contrast between mesosoma and gaster.

Technomyrmex taylori (Santschi)

Engramma tailori Santschi, 1930b: 269. Syntype workers, MOZAMBIQUE: (EAP and EA Portug. on data labels), Inhaka, 15.vii.1929, in mangrove stump (*Taylor*) (NHMB) [examined]. [Also described as new (but spelled *taylori*, regarded here as a justified emendation of spelling) by Santschi, in Taylor, J.S. 1931: 42. Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

WORKER. *Measurements*: TL 3.2 – 3.3, HL 0.78 – 0.82, HW 0.72 – 0.75, SL 0.69 – 0.75, PW 0.52 – 0.54, WL 1.04 – 1.10 (7 measured). *Indices*: CI 91 – 94, SI 96 – 100, OI 27 – 28, EPI 88 – 93, DTI 128 – 136.
Frontal carina with a single seta, just behind the torulus. Dorsum of head posterior to this with only a single pair of setae, located about two-thirds the distance between the level of the posterior margin of the eye and the posterior margin of the head; posterior margin itself without setae. Anterior clypeal margin with a conspicuous wide median notch that is broader than long. Posterior margin of head in full-face view with a very shallow median impression. Eyes moderately large and set just in front of midlength of head (OI & EPI, above). Metathoracic spiracle on a conical tubercle. Number of setal pairs on mesosoma: pronotum 0; mesonotum 1, posteriorly on the sclerite; propodeal dorsum 0; lateral margin of propodeal declivity 1. Gastral tergites 1 – 3 lack setae but the fourth gastral tergite with 2 pairs. Pubescence on first gastral tergite sparse, short and scattered, not masking the underlying cuticle. Colour of head, mesosoma, petiole and gaster uniform medium to dark brown. Middle and hind coxae fractionally lighter brown than mesosoma.

Known only from the type-series this species is easily identified by its unique distribution of setae. Each of the 7 syntypes is abraded or damaged in some way (one has the head missing) and no single specimen shows the full setal array. However, summing the setae present on each individual gives the array described above. The complete absence of setae from gastral tergites 1 – 3 appears accurate as no trace of setal pits can be seen on these sclerites in any specimen, whereas they are visible on tergite 4.

MATERIAL EXAMINED
Mozambique: Inhaka (*Taylor*).

Technomyrmex vapidus Bolton **sp. n.**

(Fig. 6)

HOLOTYPE WORKER. *Measurements*: TL 3.2, HL 0.72, HW 0.70, SL 0.66, PW 0.47, WL 0.94. *Indices*: CI 97, SI 94, OI 26, EPI 82, DTI 123.
Frontal carina with 2 setae: one above the torulus, the other at the level of the anterior margin of the eye. No seta at level of posterior margin of eye but dorsum posterior to this with 2 pairs of short stubbly setae: anterior pair about midway between level of posterior margin of eye and posterior margin of head, posterior pair very close to or at the posterior margin; all are about half the length of the seta at the level of the anterior margin of the eye. In addition the posterior margin of the head with an even shorter seta on each side, located close to the corners. In full-face view median portion of anterior clypeal margin broadly shallowly concave; posterior margin of head broadly and very shallowly concave. Eyes moderate (OI range 26 – 29), located slightly in front of midlength (EPI range 79 – 86); in full-face view outer margins of eyes fail to break the outline of the sides. Dorsum of propodeum short and more or less flat, meeting the steeply sloped declivity in a blunted angle. Number of setal pairs on mesosoma: pronotum 3; mesonotum 1; propodeal dorsum 0; lateral margins of propodeal declivity 2, above the level of the spiracle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; all shorter than the maximum diameter of the eye. Head light orange-brown, mesosoma and petiole dull yellow, gaster slightly darker. Legs about the same colour as mesosoma, the middle and hind tibiae not strikingly darker than the tarsi.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 2.6 – 3.2, HL 0.61 – 0.72, HW 0.54 – 0.70, SL 0.55 – 0.68, PW 0.38 – 0.47, WL 0.78 – 0.94 (15 measured). *Indices*: CI 90 – 97, SI 94 – 104, OI 26 – 29, EPI 79 – 86, DTI 115 – 123.
As holotype but number of pairs of mesosomal setae variable: pronotum with 1 – 3;

mesonotum with 0 – 2; lateral margins of propodeal declivity 1 – 3. In some instances a seta may be single, not paired. The outer margins of the eyes of smaller workers just touch the outline of the sides in full-face view. In some specimens the small outer pair of setae on the posterior margin of the head may be absent (but could merely be abraded away). Gaster is usually distinctly darker than mesosoma but in some is about the same colour. The head varies from yellow, through brownish yellow, to orange-brown.

Holotype worker (upper of two on pin), **Kenya**: Gatab, Mt Kulal, 9.viii.1979 (*J. Darlington*) (BMNH).
Paratype. 1 worker (lower of two on pin) with same data (BMNH).

T. vapidus nests under stones and forages both on the ground and in low vegetation. It is closely related to *pallipes* and has a very similar complement and arrangement of setae. However, it is more brightly coloured than *pallipes* and has smaller eyes that are located distinctly more posteriorly on the head capsule. In addition, the posterior cephalic margin of *vapidus* usually has an extra short seta on each side, located close to the corners, that are not seen in *pallipes*. These are missing in some smaller workers of *vapidus*, but whether they have not developed or have merely been abraded away has not been established. A few weak intercastes between worker and queen have been detected, but they are at the worker-like end of the sequence and do not seem as common as in *pallipes, moerens* or other species where intercastes are regularly developed.

NON-PARATYPIC MATERIAL EXAMINED
Kenya: Kajiado (*G. Nyamasyo*). **Tanzania**: Mkomazi Game Res., nr Ibaya (*H.G. Robertson*); Mkomazi Game Res., Ibaya and Ibaya Camp (*S. van Noort*); Mkomazi Game Res., river course nr Zange (*S. van Noort*); Mkomazi Game Res., Ngurunga (*G. McGavin*); Mkomazi Game Res., Ubani (*G. McGavin*); Mkomazi Game Res., ascent of Maji Kununua (*S. van Noort*).

Technomyrmex vexatus (Santschi)

(Fig. 13)

Tapinoma vexatum Santschi, 1919b: 220 (footnote). Syntype males, MOROCCO: Tanger, 1897 (*Vaucher*) (NHMB) [examined]. (See note.) [Combination in *Technomyrmex* by Cagniant & Espadaler, 1993: 92.]
Tapinoma (Tapinoptera) vexatum Santschi: Santschi, 1925: 348.

NOTE
Dr Xavier Espadaler (UABC) collected a *Technomyrmex* colony in Morocco in 1986 and reared it in his laboratory. In 1988 this colony produced males which have proved identical to the syntypes of *Tapinoma vexatum*. Hence the species was correctly transferred to *Technomyrmex* by Cagniant & Espadaler (1993: 92) and further *Tapinoptera*, a monotypic subgenus of *Tapinoma* of which *T. vexatum* is the type-species, falls into the synonymy of *Technomyrmex*. For details see under the taxonomic synopsis of *Technomyrmex* (p. 5).

WORKER (not previously described). *Measurements*: TL 3.1 – 3.4, HL 0.72 – 0.78, HW 0.68 – 0.76, SL 0.64 – 0.70, PW 0.44 – 0.48, WL 0.90 – 0.96 (10 measured). *Indices*: CI 94 – 99, SI 90 – 94, OI 22 – 25, EPI 68 – 76, DTI 118 – 130.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with an insignificant median indentation to almost transverse. In full-face view the posterior margin of the head very shallowly impressed and the sides shallowly convex. Eyes of moderate size, close to midlength and their outer margins just fail to break the outline of the sides. Sculpture of head very weak and superficial, an effaced microreticulation. Dorsum of mesosoma and propodeal declivity entirely lack setae. With mesosoma in profile the mesonotal dorsal outline consists of an anterior section that is short and flat to feebly convex; posterior to this the surface curves broadly and evenly into a longer,

more steeply sloped posterior section that descends to the narrow metanotal groove. Propodeum in profile with a short convex dorsal surface that rounds evenly into the declivity, the two surfaces not separated by an angle. Sculpture reduced and superficial on dorsal mesosoma and first gastral tergite; pubescence on the latter very short and sparse, not masking the surface of the sclerite. Gastral tergites 1 – 3 without setae; gastral tergite 4 with 2 – 3 pairs present. Scapes and tibiae without setae. Colour a uniform medium brown; the head sometimes, and the gaster usually, very slightly darker than the mesosoma. Legs also brown, the middle and hind tarsi slightly lighter than the femora and tibiae.

Presently known only from Morocco, the closest known relative of *vexatus* is the east Palaearctic *gibbosus* (p. 81), which it clearly resembles. However, in *gibbosus* the eyes are larger and located distinctly farther forward on the head capsule (*gibbosus* OI 27 – 29, EPI 50 – 58) and the posterior cephalic margin is indented medially.

These two species are separated by an enormous distance and it is interesting to speculate if they shared an immediate common ancestor, or if they are the remnants of a fairly distinctive species group that once extended across the width of the southern Palaearctic, or if each has acquired the shared characters by convergence from unrelated ancestors.

MATERIAL EXAMINED
Morocco: Sebta (*X. Espadaler*).

Technomyrmex voeltzkowi (Forel)

(Figs 14, 34)

Tapinoma voeltzkowi Forel, 1907: 84. LECTOTYPE worker (by present designation), KENYA: Malindi (*Voeltzkow*) (ZMHB, see note). [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]
Tapinoma voeltzkowi var. *rhodesiae* Forel, 1913c: 139. Syntype workers, ZIMBABWE: Bulawayo, 12.iv.1912 (*G. Arnold*) (MHNG) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

NOTE
T. voeltzkowi was described from two workers which on analysis are seen to belong to different species. The first, designated as lectotype above, matches the original description, especially as regards the obvious clypeal incision and lack of setae. The second, from W. Pemba [probably now Pemba Prov., Tanzania], Fundu I. (*Voeltzkow*) does not match the original description. This specimen is a worker of *T. pallipes*, and is hereby excluded from the type-series and from further consideration of *voeltzkowi*.

WORKER. *Measurements*: TL 2.7 – 3.7, HL 0.66 – 0.92, HW 0.54 – 0.87, SL 0.63 – 0.80, PW 0.36 – 0.54, WL 0.82 – 1.12 (15 measured). *Indices*: CI 83 – 95, SI 92 – 116, OI 26 – 31, EPI 80 – 100, DTI 120 – 140.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a long, narrow, U-shaped median incision that is at least as long as wide; inner margin of incision meets anterior clypeal margin in a distinct angle at each side. Posterior margin of head in full-face view indented medially to broadly emarginate; depth of emargination usually increases with overall size but in some large workers extent of emargination is still small. Sides of head convex, more strongly so in larger workers than in smaller. Outer margins of eyes conspicuously fail to break the outline of the sides. Allometric variation present: as worker size increases CI increases and SI decreases; the largest workers have the broadest heads and shortest scapes. Dorsum of mesosoma and declivity of propodeum entirely lack setae. Mesonotal dorsum in profile more steeply sloped in its posterior half than anteriorly; metanotal groove weakly impressed. Gastral tergites 1 – 3 without setae; fourth gastral tergite with 1 – 2 pairs of setae present. Head, mesosoma, petiole and gaster light brown to blackish brown,

sometimes the gaster a little darker than the mesosoma. Coxae, tibiae and tarsi lighter than mesosoma; femora usually darker than tibiae and tarsi.

For the present all samples that answer this description are being retained as a single species, though I suspect that a close complex of sibling forms may eventually be analysed. Most of the material examined is represented only by individuals or short series of workers, but these are confusing. In some series all appear to be roughly the same size but in others the workers are distinctly polymorphic. Colour is very variable but does not appear linked to any other character that can be isolated. Thus, for the present, any specimen that fits the characters in the key and matches the above description is referred to *voeltzkowi*.

The species appears to be wholly terrestrial as samples have only been recorded from ground nests and from under rocks. Individual workers have been collected in pitfall traps and in sifted litter from dry forests.

MATERIAL EXAMINED

Kenya: Laikipia Distr., Mpala Res. Centre (*S. Kamande*). **Tanzania**: Kizimbon (*Löhr*); Mkomazi Game Res., Kisima (*G. McGavin*); Mkomazi Game Res., Dindera Dam (*H.G. Robertson*); Mkomazi Game Res., Ibaya (*A. Russell-Smith*). **Zimbabwe**: Bulawayo (*G. Arnold*); Mtarazi River, Honde Valley (*W.L. Brown*). **Botswana**: Shorobe (*A. Russell-Smith*). **South Africa**: Natal, Ukilinga Res. Farm, nr Pietermaritzburg (*B. Chambers*); KwaZulu-Natal, Karkloof (*S.S. Lu*); Transvaal, Sabie Sand Game Res. (*J. Swart*); Tvl, Premier Mine, Cullinan (*P. Hawkes*); Tvl, Kruger Nat. Pk (*A.J. Prins*). **Madagascar**: Prov., Toliara, 4.4 km. 148° SSE Lavanono (*Fisher et. al.*); Prov. Mahajanga, P.N. Baie de Baly, 12.4 km. 337° NNW Soalala (*Fisher et al.*); Prov. Antsiranana, For. Bekaraoka, 6.8 km. 60° ENE Daraina (*Fisher et al.*).

Technomyrmex zimmeri (Forel)

Engramma zimmeri Forel, 1911a: 370. Holotype worker, TANZANIA: Amani (*Zimmer*) (holotype lost, not in MHNG). [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

WORKER. From the original description this species is very close to *schoutedeni* and will answer the description of that species except for colour. In *zimmeri* the gaster is stated as being black (but each gastral segment with a yellow posterior margin), distinctly darker than the head and mesosoma which are yellowish red. Conversely, in *schoutedeni* the gaster is reddish yellow to orange, distinctly lighter than the reddish brown to blackish brown head and mesosoma.

CHECKLIST OF MALAGASY *TECHNOMYRMEX* SPECIES

***albipes* group**

albipes (F Smith, 1861)
= *detorquens* (Walker, 1859)
= *forticulus* (Walker, 1859)
= *nigrum* (Mayr, 1862)
= *albitarse* (Motschoulsky, 1863)
= *albipes* v. *bruneipes* Forel, 1895 **syn. n.**
= *albipes* r. *wedda* Forel, 1913 **syn. n.**

curiosus Fisher & Bolton **sp. n.**

difficilis Forel, 1892 **stat. n.**
= *mayri* st. *nitidulans* Santschi, 1930 **syn. n.**

fisheri Bolton **sp. n.**

innocens Fisher & Bolton **sp. n.**

madecassus Forel, 1897
= *madecassus* var. *fusciventris* Forel, 1907 **syn. n.**

mayri Forel, 1891
pallipes (F. Smith, 1876) **comb. n.**
= *albipes* ssp. *foreli* Emery, 1893 **syn. n.**
= *atrichosus* Viehmeyer, 1922 **syn. n.**
= *foreli* v. *affinis* Santschi, 1930 **syn. n.**
= *brevicornis* Santschi, 1930 **syn. n.**
= *albipes* ssp. *truncicolus* Weber, 1943 **syn. n.**
= *primroseae* Donisthorpe, 1949 **syn. n.**
vitiensis Mann, 1921 **stat. rev., stat. n.**
= *albipes* st. *rufescens* Santschi, 1928 **syn. n.**

***anterops* group**
anterops Fisher & Bolton **sp. n.**

***textor* group**
docens Fisher & Bolton **sp. n.**
voeltzkowi (Forel, 1907)
= *voeltzkowi* v. *rhodesiae* (Forel, 1913) **syn. n.**

KEY TO MALAGASY *TECHNOMYRMEX* INCLUDING TRAMP SPECIES (workers)

NOTE. The locations and relative lengths of various setae are critical in the determination of some species. Abraded, or old and damaged, specimens may be difficult or impossible to identify correctly.

1 With head in profile the dorsal surface of the frontal carina, or the dorsum immediately mesad of the frontal carina, without setae.....2
- With head in profile the dorsal surface of the frontal carina, or the dorsum immediately mesad of the frontal carina, with setae present; usually 2 – 4 along the frontal carina.....3

2 Median portion of anterior clypeal margin broadly, evenly, shallowly concave; margin of concavity meets the more lateral anterior clypeal margin through a shallow curve on each side. Third gastral tergite with at least one pair of setae present. Eyes located more anteriorly, EPI 62 – 69. (Madagascar) .....***docens*** (p. 50)
- Median portion of anterior clypeal margin with a conspicuous long U-shaped incision; inner margin of incision meets the more lateral anterior clypeal margin in a distinct angle on each side (Fig. 34). Third gastral tergite without setae. Eyes located more posteriorly, EPI 80 or more. (Madagascar; also in Afrotropical region).....***voeltzkowi*** (p. 41)

3 With head in profile the dorsum behind the level of the anterior margin of the eye entirely lacks setae (*i.e.* setae on the dorsal head are restricted to the frontal carinae).....4
- With head in profile the dorsum behind the level of the anterior margin of the eye with one or more pairs of setae present (*i.e.* setae on the dorsal head are not restricted to the frontal carinae).....6

4 Dorsum of pronotum and declivity of propodeum each with at least one pair of setae present. Gastral tergites 1 – 2 each with numerous conspicuous setae present, the setae relatively long and always distinct.....5
- Dorsum of pronotum and declivity of propodeum entirely lack setae (Fig. 25). Gastral tergites 1 – 2 usually entirely lack setae; rarely one or both may have a single short pair. (Madagascar).....***curiosus*** (p. 46)

5 Scape relatively short and promesonotum relatively short and broad, SI 91 – 102, DTI 110 – 124. Eye somewhat smaller, OI 24 – 27. With mesosoma in absolute profile the mesonotal dorsal outline convex, more or less evenly rounded (Fig. 1). In same view the junction of the propodeal dorsum and declivity is blunt. (*Tramp species*: Madagascar, Mauritius, Seychelles Is, Rodrigues I., Réunion I., Chagos Archipelago).....***albipes*** (p. 68)

- Scape relatively long and promesonotum relatively long and narrow, SI 104 – 115, DTI 128 – 141. Eye somewhat larger, OI 29 – 32. With mesosoma in absolute profile the mesonotal dorsal outline with a more or less flat anterior section that passes through an obtuse angle to a distinctly more strongly sloped posterior declivity (Fig. 2). In same view the junction of the propodeal dorsum and declivity sharply defined. (*Tramp species*: Seychelles Is, Réunion I.) .....***vitiensis*** (p. 104)

6 Propodeal declivity without projecting marginal setae that arise above the level of the spiracle; either setae are entirely absent or they arise directly behind the spiracle or from below the level of the spiracle (Figs 22, 23, 24).....7

- Propodeal declivity with projecting marginal setae that arise conspicuously above the level of the spiracle; setae rarely also arise directly behind the spiracle or below the level of the spiracle (Figs 3, 4, 26, 27).....9

7 With propodeum in absolute profile the dorsum relatively short: straight-line length of dorsum less than depth of declivity to the spiracle (Fig. 24). Lateral margin of propodeal declivity without projecting setae. Smaller (HW 0.52 – 0.59), dull yellow species. (Madagascar).....***fisheri*** (p. 51)

- With propodeum in absolute profile the dorsum relatively long: straight-line length of dorsum at least as great as depth of declivity to the spiracle. Lateral margin of propodeal declivity with one or more projecting setae present (in abraded specimens setal pits may be visible). Larger (HW 0.60 – 0.90), not dull yellow species.....8

8 In profile the propodeal dorsum rounds broadly and evenly into the declivity (Fig. 22). Eyes located more anteriorly, EPI 50 – 60. Pronotum with several pairs of minute setae, their length less than half the maximum diameter of the eye. Setae on first gastral tergite sparse and minute, their length less than half the maximum diameter of the eye. Full adult colour of head reddish, the gaster dark brown and the femora and tibiae yellow to brownish yellow. (Madagascar).....***anterops*** (p. 45)

- In profile the propodeal dorsum meets the declivity in a blunt angle (Fig. 23). Eyes located more posteriorly, EPI 72 – 82. Pronotum with a single pair of setae, their length just less than the maximum diameter of the eye. Setae on first gastral tergite distinct, their length much greater than half the maximum diameter of the eye. Full adult colour of head blackish brown to black, the gaster about the same colour and the femora and tibiae about the same or only slightly lighter. (Madagascar).....***mayri*** (p. 55)

9 Full adult colour of head, mesosoma and usually also gaster yellow to light brownish yellow (gaster may be somewhat infuscated with respect to mesosoma). With head in profile a seta present on dorsum at level of anterior margin of eye and another at or close to level of posterior margin of eye (Figs 26, 27).....10

- Full adult colour of head, mesosoma and gaster dark brown to black. With head in profile a seta present on dorsum at level of anterior margin of eye but without a seta at or close to level of posterior margin of eye (Figs 3, 4).....11

10 Mesonotum with 2 - 4 pairs of setae (usually 2), lateral margins of propodeal declivity with 2 – 3 pairs of setae (setal pits very conspicuous); the posterior mesonotal pair and those on the declivity are as long as the setae on the

pronotum. In dorsal view the metathoracic spiracles are very close to, or abut, the metanotal groove; distance separating them is less than the diameter of the metathoracic spiracle (Fig. 26). (Madagascar, Comoro Is)...***madecassus*** (p. 53)

- Mesonotum with 1 pair of short setae, lateral margins of propodeal declivity with 1 pair of short setae (setal pits inconspicuous); both pairs much shorter than the setae on the pronotum. In dorsal view the metathoracic spiracles are widely separated from the metanotal groove; distance separating them is at least equal to the diameter of the metathoracic spiracle (Fig. 27). (Madagascar) .....***innocens*** (p. 52)

11 Tarsus of hind leg distinctly much lighter in colour than the femur and tibia; femur and tibia about the same colour as the mesosoma and gaster. Dorsum of head behind level of posterior margin of eye usually with a single pair of setae, located about two-thirds the way between the level of the posterior margin of the eye and the posterior margin of the head (Fig. 3). Eyes located somewhat more posteriorly, EPI 72 – 86. Mesosoma slightly more elongate, DTI 127 – 135. (*Tramp species*: Madagascar).....***difficilis*** (p. 47)

- Tarsus of hind leg the same colour as the femur and tibia; entire leg distinctly lighter than the mesosoma and gaster. Dorsum of head behind level of posterior margin of eye with two pairs of very short, inconspicuous setae; first pair located about two-thirds the way between the level of the posterior margin of the eye and the posterior margin of the head; second pair at the posterior margin (Fig. 4). Eyes located somewhat more anteriorly, EPI 55 – 71. Mesosoma slightly shorter and broader, DTI 120 – 128. (*Tramp species*: Madagascar, Rodriguez I., Mauritius, Réunion I., Farquhar Atoll).....***pallipes*** (p. 56)

MALAGASY SPECIES OF *TECHNOMYRMEX*

The fauna currently consists of 12 species, of which 7 are endemic, 3 are tramp species and two are shared with the Afrotropical region. Fisher (1997) counted 290 Madagascan ant species and later (Fisher, 2000) added a further 71 species, to give a recent total of 361. Thus in terms of number of species *Technomyrmex* represents only about 3.3 % of the Malagasy ant fauna.

Technomyrmex anterops Fisher & Bolton **sp. n.**

(Figs 22, 36)

HOLOTYPE WORKER. *Measurements*: TL 4.1, HL 0.96, HW 0.90, SL 0.92, PW 0.58, WL 1.32. *Indices*: CI 94, SI 102, OI 22, EPI 53, DTI 150.
Frontal carina with 2 setae: in profile the anterior above the torulus, the posterior at about the level of the anterior margin of the eye. Dorsum of head posterior to this with 2 - 3 pairs of setae: 1 - 2 short pairs to about the level of the posterior margin of the eye and 1 longer pair located just over half way between level of posterior margin of eye and posterior margin of head. No setae on the posterior margin and all setae on dorsum are shorter than maximum diameter of eye. Posterior margin of head concave in full-face view and anterior clypeal margin with a small shallow median indentation. Sides of head convex behind the eyes, more or less straight and convergent anteriorly in front of the eyes. Eyes located far in front of midlength, EPI 53; outer margin of eye does not break the outline of the side. Number of setal pairs on mesosoma (all shorter than maximum diameter of eye): pronotum 3; mesonotum 1 (minute); propodeal dorsum 0; lateral margins of propodeal declivity 1 - 2, located directly behind the spiracle, none arise above the level of the spiracle. With mesosoma in profile the mesonotal outline forms a long shallow slope, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Dorsum of propodeum long in profile,

shallowly convex and meeting the declivity through a broadly rounded curve; straight-line length of dorsum greater than depth of declivity to spiracle and the spiracle distinctly inset from the margin of the declivity. Gastral tergites 1 – 4 each with sparse very short setae; those on the first and second tergites distinctly less than half the maximum diameter of the eye. Head reddish brown; mesosoma lighter, yellowish brown; gaster dark brown to blackish brown. Petiole pale, about the same colour as the hind coxae. Legs lighter than mesosoma, dull yellow to light brownish yellow; middle and hind tasi about the same colour as the tibiae.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 3.3 – 4.2, HL 0.84 – 0.96, HW 0.72 – 0.90, SL 0.82 – 1.00, PW 0.47 - 0.58, WL 1.16 – 1.36 (10 measured). *Indices*: CI 86 - 95, SI 100 - 116, OI 22 - 25, EPI 50 - 60, DTI 150 – 162. As holotype but in the smallest paratype (CASENT 0097892) the posterior margin of the head is more deeply impressed, the sides of the head in front of the eyes are shallowly concave and the outer margins of the eyes just touch the outline of the sides in full-face view. Some paratypes lack full adult colour and are lighter everywhere than the holotype. The pronotal dorsum has 2 – 4 pairs of short setae and the minute pair of setae on the mesonotum are easily lost by abrasion. Head shape varies with size; smaller workers generally have the sides behind the eyes less strongly convex than larger workers.

Holotype worker, **Madagascar**: Fianarantsoa Prov., Ranomafana N.P., Talatakely, 900 m., 21°14.9'S, 47°25.5'E, 14.iv.1998, CASENT 0097891, ANTL 2602 (*J. Schweikert*) (CASC).
Paratypes. 4 workers with same data but CASENT numbers 0097888, 0097889, 0097890, 0097892 (CASC).

This conspicuous, size-variable and distinctively coloured species makes carton nests on foliage. Apart from this its size, anteriorly located eyes, broadly rounded propodeum where the dorsum curves evenly into the declivity and very short gastral setae combine to make this species very distinct among the Malagasy *Technomyrmex*.

The nest series from Andrasibe collected by Ward also contains a few alate queens. The total number of specimens known is small, but no worker-queen intercastes have been seen.

NON-PARATYPIC MATERIAL EXAMINED
Madagascar: Prov. Antsiranana, For. Ambanitaza (*B.L. Fisher*); Antsiranana, Sakalava Beach (*R. Harin'Hala*); Prov. Toamasina, For. Ambatovy (*B.L. Fisher*); 8 km. ESE Andrasibe (= Perinet) (*P.S. Ward*); Res. Perinet-Analamazoatra (*D.M. Olson*).

Technomyrmex curiosus Fisher & Bolton **sp. n.**

(Fig. 25)

HOLOTYPE WORKER. *Measurements*: TL 2.9, HL 0.70, HW 0.68, SL 0.61, PW 0.46, WL 0.80. *Indices*: CI 94, SI 97, OI 24, EPI 71, DTI 109.
Frontal carina with 2 setae: in profile the first above the torulus and the second at about the level of the anterior margin of the eye; both are much shorter than the maximum diameter of the eye. Posterior to this the dorsum entirely lacks setae. In full-face view median portion of anterior clypeal margin evenly shallowly concave; posterior margin of head with a slight median indentation; sides of head evenly convex. Eyes of moderate size and located well in front of midlength; in full-face view outer margins of eyes just fail to touch the outline of the sides. Dorsum of mesosoma and propodeal declivity entirely lack setae. With mesosoma in profile the mesonotum is rounded and evenly convex. Metanotal groove in profile not impressed; metathoracic spiracles abut the metanotal groove in dorsal view. Propodeum in absolute profile does not have differentiated dorsal and declivitous surfaces. Instead a single evenly rounded surface is

present, the dorsal portion of which is very short and rounds evenly, without trace of an angle, into the declivity proper. Gastral tergites 1 – 2 lack setae (see below) but tergites 3 – 4 each have sparse, scattered short setae present. Head, mesosoma, petiole and gaster black. Coxae and femora about the same colour as the mesosoma, tibiae and tarsi slightly lighter.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 2.6 – 2.9, HL 0.68 – 0.72, HW 0.64– 0.68, SL 0.60 – 0.64, PW 0.44 – 0.48, WL 0.72 – 0.83 (10 measured). *Indices*: CI 94 – 97, SI 90 – 97, OI 24 – 26, EPI 68 – 76, DTI 108 – 113.
In most workers the mesonotum is evenly curved, but in some it has a small posterior declivity. These seem intermediate between true workers and the most worker-like intercastes where the mesonotum is slightly expanded posteriorly. The vast majority of workers have no setae on the first and second gastral tergites but one or two have a single pair on one or both of the sclerites. This feature seems most prevalent in intercastes and it may be that apparent workers with such setae are in fact extremely worker-like intercastes. Colour of the tibiae and tarsi is somewhat variable; frequently the two are of similar colour but the tarsi may be lighter. The Betsch material mentioned below, a single specimen from the same locality as the type-series, is brown and had probably not attained its full adult colour.

Holotype worker, **Madagascar**: Prov. Fianarantsoa, P.N. Andringitra, 2100 m., 22°10.84'S, 46°54.04'E, 16.iv.2006, native grass, BLF 13814, 0070366-RES (*Fisher et al.*) (CASC).
Paratypes. 7 workers with same data as holotype; 1 intercaste with same data but BLF 13816, 0070363-RES; 5 workers, 2 intercastes, 1 male with same data but BLF 13817, 0068743-RES; 7 workers with same data but BLF 13818, 0068745-RES; 1 worker with same data but BLF 13820, 0070365-RES; 8 workers, 3 males with same data but BLF 13821, 0070364-RES (CASC, BMNH).
[A number of specimens remain in alcohol for each of these series, in CASC. They should also be included as paratypes.]

Apart from the tramp species *albipes*, and the as yet unrecorded *vitiensis*, this is the only Madagascan *Technomyrmex* species that has setae present on the frontal carinae but absent from the head posterior to this. *T. curiosus* is easily distinguished from both these tramps by its complete lack of mesosomal setae and the general absence of setae from the first and second gastral tergites.

At first glance *curiosus* looks like a rather stocky specimen of *difficilis* that has lost all of its mesosomal setae and almost all of its gastral setae. Apart from the greatly reduced number of setae, other obvious differences from *difficilis* include the short, compact mesosoma in *curiosus*, where the promesonotum is almost as broad as long (DTI 108 - 113, as opposed to DTI 127 – 135 in *difficilis*), and the shape of the propodeum in profile, as described above, which is different from the more angular shape seen in *difficilis*.

NON-PARATYPIC MATERIAL EXAMINED
Madagascar: Prov. Fianarantsoa, Res. Andringitra, Glacis Sud du Plateau d'Andohariana (*J.-M. Betsch*).

Technomyrmex difficilis Forel **stat. n.**

(Fig. 3)

Technomyrmex mayri r. *difficilis* Forel, 1892: 242. Syntype workers and queen, MADAGASCAR: Nosibé, Village de l'Imerina (*Sikora*) (MHNG) [examined].
Technomyrmex mayri st. *nitidulans* Santschi, 1930a: 72, figs 31-33. Syntype workers, MADAGASCAR: Nosi-Bé (*Decarpentries*) (NHMB) [examined]. **Syn. n.**

WORKER. *Measurements*: TL 2.4 – 3.1, HL 0.57 – 0.76, HW 0.52 – 0.69, SL 0.52 – 0.74, PW 0.36 – 0.47, WL 0.74 – 1.02 (35 measured). *Indices*: CI 89 – 97, SI 95 – 107, OI 25 – 30, EPI 72 – 86, DTI 127 – 135.

Frontal carina with 2 (very rarely 3) setae: in profile the first above the torulus, the second at about the level of the anterior margin of the eye; when a third seta present it is between these two. Dorsum of head posterior to this with a single pair of setae, in profile located just over half way between level of posterior margin of eye and posterior margin of head, not at the posterior margin; this pair of setae distinctly shorter than the posteriormost seta on the frontal carina (see notes below). Anterior clypeal margin with a very weak, shallow median indentation. With head in full-face view the sides shallowly convex and the posterior margin with a small shallow indentation medially. Eyes located in front of midlength, EPI < 90; outer margin of eye breaks the outline of the side. Number of setal pairs on mesosoma: pronotum 1 – 2; mesonotum 0 – 1 (usually 1); propodeal dorsum 0; lateral margins of propodeal declivity 1 – 2, above the level of the spiracle. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Dorsum of propodeum short in profile and meeting the declivity in an angle; length of dorsum less than depth of declivity to spiracle. In dorsal view the metathoracic spiracles are very close to, or abut, the metanotal groove. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is usually slightly less than the maximum diameter of the eye but sometimes the two are subequal. Head, mesosoma, petiole and gaster dark brown to black; in profile the gaster may be slightly lighter than the mesosoma. Coxae, femora and tibiae the same colour as the mesosoma or slightly lighter; never with strongly contrasting lighter coxae. Tarsi of middle and hind legs yellowish white to yellow, distinctly paler than the tibiae.

Closely related to *albipes* but separated by the presence of setae on the dorsum of the head behind the level of the posterior margin of the eye (never developed in *albipes*) and by having the promesonotum somewhat longer and more slender, DTI 127 – 135 (as opposed to DTI 110 – 124 in *albipes*). This species has been confused many times with *albipes*, and isolated specimens with the characteristic cephalic setae abraded away are difficult to identify. In such specimens the eye may give a clue to the correct identity because in general, with the head in full-face view the eye in *albipes* workers is flatter and less convex than in *difficilis* so that the outer margin usually just fails to break the outline of the side of the head in the former but distinctly interrupts the outline of the side in the latter. There is some variation of this feature in both species. Additionally, the mesonotum generally has a pair of setae present in *difficilis* whereas mesonotal setae are generally absent in *albipes*. Again this character is variable because *difficilis* samples are known where mesonotal setae are lacking and *albipes* samples are known in which a pair is present.

Of all the material examined a few specimens from Madagascar and one specimen from U.S.A. had an extra pair of short setae on the dorsum of the head, behind the universally present pair. Whether these are genuine workers or the most worker-like form of intercaste remains to be seen. These individuals may resemble *pallipes* in this character but samples of the latter always have the middle and hind femora and tibiae distinctly lighter in colour than the mesosoma and do not have tarsi that are much paler than the tibiae. Malagasy material of *difficilis* tends to differ slightly from that of the rest of the world. The cuticle of the head and mesosoma is somewhat more glossy, the angle through which the propodeal dorsum meets the declivity is blunter and setae on the first gastral tergite are shorter. These differences seem consistently to isolate the Malagasy population, but at present I am not convinced that they are sufficient to justify separation at species-rank

T. difficilis was originally described as a race of *mayri*, but the two are quite different. *T. difficilis* is a smaller species with shorter scapes, relatively larger eyes and a shorter, more compact mesosoma (compare measurements and indices). In addition, the metathoracic spiracles of *mayri*, in dorsal view, do not abut the metanotal groove, and the propodeal dorsum is longer, its straight-line length in profile is greater than the

depth of the declivity to the spiracle. Finally, the propodeal declivity of *mayri* does not have setae that arise above the level of the spiracle whereas such setae are always present in *difficilis*.

Worker-queen intercastes are produced in *difficilis*, and according to Warner (2003, unpublished thesis) these may make up nearly half the colony. Intercastes have reproductive functions and are not usually found outside of nests; foraging behaviour appears to lie strictly in the domain of true workers. As is known in several other species of the *albipes* group ergatoid males, as well as the usual alates, are produced by *difficilis*. The alate males mate with alate queens in the usual nuptial flight, which initiates new nests. The queens of these colonies eventually die off and are replaced by reproductive worker-queen intercastes, all grades of which have spermathecae (absent from true workers) and they mate with ergatoid males. Nests in this condition then multiply by fission and produce polydomous colonies that are later able to produce new generations of alate queens and males.

In recent synoptic works on the Australian ant fauna that mention *albipes*, that of Shattuck (1999) is most probably *difficilis*, and the unnamed species of Andersen (2000) is certainly *difficilis* as his figure 29 has the right proportions and clearly shows the posteriorly placed pair of setae on the head. *T. difficilis* has also successfully colonised the state of Florida, U.S.A., where it was first described, as *albipes*, by Deyrup (1991) and later included under that name by Vail, Davis, *et al.* (1994) and Deyrup, Davis & Cover (2000). It also seems probable that a proportion of the material listed as *albipes* by Wilson & Taylor (1967) will be *difficilis*.

In his unpublished thesis Warner (2003) succinctly summarises the nature of *difficilis* (misidentified as *albipes* in the study) as an invasive in Florida, U.S.A. He says that it "nests at or above ground level in numerous locations within the landscape, home and suburban woodland habitats. Nests are frequently found in trees and bushes, tree holes, under palm fronds and old petiole bases, under leaves on trees, in loose mulch, under debris, in leaf-litter, both on the ground and in rain gutters, wall voids, and attics. Nests tend to be found outside of structures more than inside." He points out that its main foods are plant nectar and honeydew but that the ants will also feed on dead insects and other protein. In houses they forage most commonly in kitchens and bathrooms, the best sources of food and water, as well as on exterior structures. Like some other species in the group (*e.g. pallipes, jocosus*) they have been found nesting in electrical fixtures. Outdoors, workers of this species are most commonly encountered on vegetation although, like most or maybe all other species in the *albipes* group, they also nest and forage terrestrially.

MATERIAL EXAMINED

Vietnam: Cam Ranh Bay, Kan Hoa Prov. (*T.R. Taylor*). **Thailand**: NE region, Chi Riv., Kalasin (*K. Ogata*). **Malaysia**: Negeri Sembilan, Pasoh For. Res. (*Lewis & Jackson*); Sabah, Tawau (*M. Pfeiffer*). **Singapore**: Kent Ridge (*P.S. Ward*); Botanic Gdns (*Csiki*); no loc. (*Biró*). **Indonesia**: Flores, Manggarai Dist., Golo Leleng (*M.I. Wibara*); Krakatau Is, Panjang I. (*K. Ogata*). **Philippines**: Luzon, Benguet, Baguio (*S. Schödl*); Luzon, Batangas, 7 km S Lian (*C.K. Starr*); Luzon, Camarines Sur, Pili (*C.K. Starr*); Bukidnon, Musuan Maramag (*Starr & Pinto*); Surigao del N., Bayagnan I. (*S. Schödl*). **Papua New Guinea**: Wau (*P.S.Ward*). **Australia**: Northern Territory, Stapleton (*G.F. Hill*); NT, Berrimah (*R.R. Snelling*); NT, Sawcut Gorge (*Taylor & Feehan*); NT, Black Point, Coburg Pen. (*T.A. Weir*); Queensland, Torres Strait, Wyer I. (*H. Heatwole*); Torres Strait, Murray I., Maeri (*H. Heatwole*); Queensland, 1 km NW Cape Tribulation (*A.L. Wild*); Qld, ENE Mt Tozer (*J.C. Cardale*); Qld, W of Cooktown (*J.E. Feehan*); Qld, Hinchinbrook I. Gayundah Ck (*Monteith, Davies, Thompson & Gallon*); Qld, 13 km WNW Lockhart River (*A.L. Wild*); Qld, 10 km NW Lockhart Riv. (*P.S. Ward*); Qld, 10 km NW Lockhart Riv. (*A.L. Wild*); Qld., Rounded Hill (*I.D. Naumann*). **Marianas Is.**: Guam I., Lamlam (*N.L.H. Krauss*); Guam I., Mt Alifan (*N.L.H. Krauss*). **Micronesia**: Caroline Is, Truk Is, Fefan I., Mt Iron (*J.L. Gressitt*). **Madagascar**: Prov. Antananarivo, Res. Ambohitantely, NE Ankazobe (*Rabeson et al.*); Antananarivo, NE Andranomay (*Fisher et al.*); Prov. Antsiranana, For. Antsahabe, W. Daraina (*Fisher at al.*); Antsiranana, Ampasindava, Ambilanivy (*Fisher et al.*); Antsiranana, Res. Spec. Ankarana, SSW Anivorano-Nord (*Fisher et al.*); Antsiranana, Res. Analamerana, Anivorano-Nord (*B.L. Fisher*); Antsiranana, For. Binara, SW Daraina (*Fisher et al.*); Antsiranana, For. Ambato, Ambanja (*B.L. Fisher*); Antsiranana, P.N. Montaigne d'Ambre (*R. Harin'Hala*); Antsiranana, N Joffreville (*R. Harin'Hala*); Antsiranana, Sakalava Beach (*R.*

Harin'Hala); W Sakalava Beach (*Schlinger et al.*); Antsiranana, Montaigne Français (*R. Harin'Hala*); Antsiranana, For. Anabohazo, WSW Maromandia (*Fisher et al.*); Antsiranana, R.S. Manongarivo, SW Antanambao (*B.L. Fisher*); Prov. Fianarantsoa, For. Atsirakambiaty, WNW Itremo (*Fisher et al.*); Fianarantsoa, P.N. Isalo, Ambovo Springs, N Ranohira (*Fisher et al.*); Prov. Mahajanga, P.N. Ankarafantsika, Ankoririka (*E. Rabeson*); P.N. Ankarafantsika, Tsimaloto (*Rabeson et al.*); P.N. Ankarafantsika, Ampijoroa (*Rabeson et al.*); P.N. Ampijoroa (*Rin'Ha & Irwin*); P.N. Ankarafantsika, Ampijoroa (*Fisher et al.*); P.N. Tsingy de Bemaraha, E. Bekopaka (*Fisher et al.*); P.N. Tsingy de Bemaraha, ESE Antsalova (*Fisher et al.*); Mahajanga, Res. Bemarivo, SW Besalampy (*Fisher et al.*); Mahajanga, P.N. Namoroka, NW and WNW Vilanandro (*Fisher et al.*); Mahajanga, Mahavavy Riv., SE Mitsinjo (*Fisher et al.*); Mahajanga, For. Ambohimanga (*Fisher et al.*); Prov. Toliara, S.F. Mandena, NNE Tolagnaro (*B.L. Fisher*); Nosibé, Village de l'Imerina (*Sikora*); Nosi-Bé (*Decarpentries*); 25 km. NNE Ankazobe (*P.S. Ward*); Station Forestière Ampijoroa (*P.S. Ward*); Res. Ankarana, SE Matsaborimanga (*P.S. Ward*). **U.S.A.**: Florida, Broward Co., Plantation (*R. Scheffren*); FL, Broward Co., Fort Lauderdale (*J. Warner*); FL, Brevard Co., Palm Bay (*Z. Prusak*); FL, Sarasota Co., Myakka River State P. (*J. Longino*); FL, Jupiter (*J.K. Wetterer*); FL, Juno (*J.K. Wetterer*); Washington, King Co., Seattle Woodland Park Zoo, tropical house (*J. Longino*). **Puerto Rico**: San Juan, Park Luis Muñez Marín (*J.K. Wetterer*).

Technomyrmex docens Fisher & Bolton **sp. n.**

HOLOTYPE WORKER. *Measurements*: TL 2.5, HL 0.59, HW 0.52, SL 0.56, PW 0.36, WL 0.80. *Indices*: CI 88, SI 108, OI 23, EPI 62, DTI 140.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin evenly shallowly concave medially. Posterior margin of head in full-face view more or less transverse, shallowly concave when tilted forward slightly from full-face view. Eyes of moderate size and located well in front of the midlength; in full-face view their outer margins fail to touch the outline of the sides. Dorsal surfaces of mesosoma and declivity of propodeum entirely lack setae. Propodeal dorsum approximately flat in profile and meets the declivity through a blunted angle; straight-line length of dorsum distinctly greater than depth of declivity to the spiracle. Gastral tergites 1 – 2 each with a single pair of setae; gastral tergites 3 - 4 each with 2 – 3 pairs of setae present, those on the fourth tergite the longest on the gaster (see notes below). Head, mesosoma, petiole, gaster and legs yellow.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 2.4 – 2.7, HL 0.58 – 0.64, HW 0.52 – 0.56, SL 0.56 – 0.60, PW 0.34 – 0.37, WL 0.77 – 0.86 (15 measured). *Indices*: CI 87 – 91, SI 104 – 109, OI 23 – 25, EPI 62 – 69, DTI 140 – 149.
As holotype but degree of concavity of posterior margin of head is variable, from more or less transverse to shallowly concave medially. The number of gastral setae is variable. Often no setae (or their pits) can be detected on gastral tergite 1 and sometimes the same applies to tergite 2. Gastral tergite 3 always has at least 1 distinct pair (usually 2) and tergite 4 always has 2 – 3 pairs, with very distinct pits. Some of this may be the result of abrasion but most appears to be natural variation. The specimens from Andranobe mentioned below (2 workers only) have two distinct pairs of setae on the second gastral tergite and a less concave median clypeal margin than is seen in most of the type-series.

Holotype worker, **Madagascar**: Prov. Antsiranana, Ampasindava, Ambilanivy, 3.9 km. 181° S Ambaliha, 600 m., 13°48'S, 48°10'E, 4-9.iii.2001, ex dead twig above ground, rainforest, CASENT 0439766-3290 (*B.L. Fisher et al.*) (CASC).
Paratypes. 9 workers with same data but CASENT numbers 0439761-3273, 0439762-3273, 0439764-3290, 0439767- 3290, 0439768-3290 (CASC).

T. docens seems closest related to the similar African species *parviflavus*, but the latter (p. 31) has much larger eyes (OI 33 – 37) and longer scapes (SI 110 – 126), and always lacks setae on gastral tergites 1 – 3. Also, the propodeal dorsal length of *parviflavus* is less than the depth of the declivity to the spiracle.

The only other species on Madagascar that is known to lack setae on the entire dorsum of the head behind the clypeus is *voeltzkowi*, but in that species the clypeus has a long narrow median incision, eyes that are located more posteriorly (EPI 80 – 100) and a third gastral tergite that lacks setae.

T. docens produces ergatoid queens but worker-queen intercastes are apparently not developed, at least, none has been seen; also, no alate queens are present in the material examined.

NON-PARATYPIC MATERIAL EXAMINED

Madagascar: Prov. Antsiranana, Ampasindava, Ambilanivy, Ambaliha (*Fisher et al.*) [three series with exactly the same data as the type-series but some "beating low vegetation", some "sifted litter" and a few "pitfall trap"; all may have their origin in a single colony]; Prov. Toamasina, P.N. Mananara-Nord (*Fisher et al.*); SSE Ambanizana, Andranobe (*B.L. Fisher*); 19 km. ESE Maroantsetra (*P.S. Ward*).

Technomyrmex fisheri Bolton **sp. n.**

(Fig. 24)

HOLOTYPE WORKER. *Measurements*: TL 2.3, HL 0.60, HW 0.54, SL 0.60, PW 0.34, WL 0.77. *Indices*: CI 90, SI 111, OI 26, EPI 64, DTI 147.

Frontal carina with 2 setae: in profile the posterior of these located at about the level of the anterior margin of the eye and the longest on the dorsum. Dorsum of head posterior to this with a pair of short setae above the eye and another pair about two-thirds the distance to the posterior margin (cephalic setae are somewhat variable, see comments below). Anterior clypeal margin with a small, shallow median impression. With head in full-face view the sides shallowly convex and the posterior margin with a shallow median concavity. Eyes located well in front of midlength, EPI 64; outer margin of eye almost touches the outline of the side in full-face view. Number of setal pairs on mesosoma: pronotum 0 (1 in some specimens, see below); mesonotum 0; propodeal dorsum 0; lateral margins of propodeal declivity 0. In dorsal view the metathoracic spiracles are separated from the metanotal groove by at least the diameter of the spiracle; the spiracles do not abut the metanotal groove. Dorsum of propodeum meets the declivity in a blunt angle in profile; length of dorsum less than depth of declivity to spiracle. Gastral tergites 1 – 4 each with setae distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is distinctly less than the maximum diameter of the eye. Head, mesosoma, petiole and gaster dull brownish yellow, dorsum of head and gaster somewhat infuscated; legs yellow throughout.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 2.3 – 2.6, HL 0.57 – 0.65, HW 0.52 – 0.59, SL 0.55 – 0.62, PW 0.34 – 0.40, WL 0.75 – 0.88 (15 measured). *Indices*: CI 89 – 93, SI 105 – 111, OI 25 – 26, EPI 60 – 67, DTI 142 – 150. Setae on head behind clypeus variable in number. In many workers and worker-queen intercastes the short pair above the eye is missing, leaving the dorsum with just three pairs of setae. In several an extra pair of short setae is developed at the posterior margin and in a few the pair above the eye as well as the pair at the posterior margin are present, giving the dorsum 5 pairs in total. The pronotum often lacks setae but a single pair may be present. Where setae have been abraded off small pits, that are darker in colour than the surrounding cuticle, are usually visible. Colour varies from yellow to light brown throughout.

Holotype worker: **Madagascar**: Prov. Antsiranana, Nosy Be, Res. Lokobe, 6.3 km. 112° ESE Hellville, 30 m., 13°25'S, 48°20'E, 19-24.iii.2001, CASENT 0435387, BLF 3426(10), beating low vegetation, rainforest (*Fisher et al.*) (CASC).

Paratypes. 8 workers and 1 worker-queen intercaste with same data as holotype but CASENT nos. 0435381, 0435383, 0435386, 0435388 (intercaste), 0435389, 0435390, 0435391. 10 workers with same data but BLF 3426(9) and CASENT nos. 0435392,

0435393, 0435394, 0435395 (CASC, BMNH).

Among the small, yellow Malagasy species that have setae present on the cephalic dorsum *T. fisheri* is immediately characterised by its consistent lack of setae on the mesonotum and propodeal declivity. It is much less densely setose than the common *madecassus* and even in abraded specimens the two are easily distinguished as *madecassus* always has very conspicuous setal pits on the mesonotum and propodeal declivity that are absent from *fisheri*. Also, in *madecassus* the metathoracic spiracles abut the metanotal groove in dorsal view, whereas they are some distance anterior to the metanotal groove in *fisheri*. *T. innocens* differs from *fisheri* as it has 2 – 3 pairs of pronotal setae, a single short pair on the mesonotum and 1 – 2 pairs on the propodeal declivity.

Most of the material examined was obtained by beating low vegetation but some was collected from twigs that were still attached to trees and others were found in a rotten log on the forest floor. Worker-queen intercastes are known.

NON-PARATYPIC MATERIAL EXAMINED
Madagascar: Prov. Antsiranana, Ampasindava, Ambilanivy (*Fisher et al.*); Antsiranana, R.S. Manongarivo, SW Antanambao (*B.L. Fisher*); For. Anabohazo, WSW Maromandia (*Fisher et al.*); Antsiranana, Nosy Be, Res. Lokobe, ESE Hellville (*Fisher et al.*); Antsiranana, For. Ambato, Ambanja (*B.L. Fisher*); Antsiranana, For. Antsahabe, Daraina (*B.L. Fisher*); Antsiranana, Res. Analamerana, Anivorano-Nord (*B.L. Fisher*); Antsiranana, P.N. Marojejy (*Rin'Ha & Irwin*); Prov. Mahajanga, P.N. Namoroka, NW Vilanandro (*Fisher et al.*); Prov. Toliara, Res. Ambohijanahary, NW Ambaravaranala (*Fisher et al.*).

Technomyrmex innocens Fisher & Bolton **sp. n.**

(Fig. 27)

HOLOTYPE WORKER. *Measurements*: TL 2.8, HL 0.65, HW 0.60, SL 0.62, PW 0.40, WL 0.86. *Indices*: CI 92, SI 103, OI 25, EPI 63, DTI 137.
Frontal carina with 2 setae: in profile the posterior of these located at about the level of the anterior margin of the eye and the longest on the dorsum. Dorsum of head posterior to this with a pair of shorter setae at about the level of the posterior margin of the eye and with three pairs posterior to this; the longest of these three pairs about two-thirds the distance to the posterior margin of the head and the posteriormost pair just in front of the posterior margin (cephalic setae are somewhat variable, see comments below). Setal pits visible as darker pinpoints on paler cuticle. Anterior clypeal margin with a small, shallow median impression. With head in full-face view the sides shallowly convex and the posterior margin with a shallow median concavity. Eyes located well in front of midlength, EPI 63; outer margin of eye almost touches the outline of the side in full-face view. Number of setal pairs on mesosoma: pronotum 2; mesonotum 1, very short and located on the posterior one-third; propodeal dorsum 0; lateral margins of propodeal declivity 1, very short and located above the spiracle. In dorsal view the metathoracic spiracles are widely separated from the metanotal groove, not abutting it (distance separating them is at least equal to the diameter of the metathoracic spiracle). Dorsum of mesonotum evenly curved in profile. Dorsum of propodeum meets the declivity in a blunt angle; length of dorsum less than depth of declivity to spiracle. Gastral tergites 1 – 4 each with setae distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is distinctly less than the maximum diameter of the eye. Head, mesosoma, petiole and gaster yellow, dorsum of head and gaster weakly brownish yellow; legs yellow throughout.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 2.3 – 3.1, HL 0.55 – 0.71, HW 0.51 – 0.64, SL 0.52 – 0.64, PW 0.32 – 0.43, WL 0.68 – 0.95 (15 measured). *Indices*: CI 88 – 94, SI 96 – 110, OI 25 – 28, EPI 60 – 70, DTI 133 – 143. Setae on head behind clypeus somewhat variable in number and position. Two, three (the usual number) or four pairs may be present on the dorsum behind the level of the

posterior margin of the eye. Where only two pairs are present behind the level of the posterior margin of the eye there is a short pair above the eye; apparently this and the following pair of setae have shifted slightly anteriorly from the position seen in the holotype, as both have the same number of setae present. Where four pairs are present there is an additional pair behind the level of the posterior margin of the eye. The pronotum may have 3 pairs of setae. Where setae have been abraded off small pits, that are darker in colour than the surrounding cuticle, are usually visible. Colour varies from yellow to light brown throughout.

Holotype worker, **Madagascar**: Prov. Mahajanga, P.N. Namoroka, 17.8 km. 329° WNW Vilanandro, 100 m., 16°22.6'S, 45°16.6'E, 8-12.xi.2002, CASENT 0485542, BLF 6510(11), beating low vegetation, tropical dry forest (*Fisher et al.*) (CASC).
Paratypes. 3 workers with same data as holotype but CASENT 0022497, BLF 6506(17), sifted litter; CASENT 0022500, BLF 6506(19); CASENT 0485538, BLF 6510(9). 2 workers + 1 intercaste, same locality but 9.8 km. 300° WNW Vilanandro, 140 m., 16°28.0'S, 45°21.0'E, 4-8.xi.2002, CASENT 0474760 and CASENT 0474761, BLF 6448(13) (*Fisher et al.*) (CASC).

There are three small, yellow to light brownish yellow Malagasy species that have setae present on the dorsal head behind the level of the posterior margin of the eye. Of these *madecassus* is overall the most densely setose and has very distinct setal pits. It also has the metathoracic spiracles abutting, or very close to, the metanotal groove in dorsal view, has 2 - 4 pairs of mesonotal setae and has 2 - 3 pairs of setae present on the lateral margins of the propodeal declivity. Even in abraded specimens the pits of these setae remain very conspicuous. In contrast *innocens* has much less distinct setal pits, has the metathoracic spiracles relatively widely separated from the metanotal groove in dorsal view and has only a single, very short pair of mesonotal setae; like *madecassus* it has setae present (a single short pair) on the propodeal declivity. Like *innocens, fisheri* has its metathoracic spiracles some distance from the metanotal groove, but *fisheri* is characterised by its lack of setae (and setal pits) on the mesonotum and propodeal declivity.

Most of the material examined was obtained by beating low vegetation but some was collected from litter, some from rotten wood and some from rotten sticks on the forest floor. Worker-queen intercastes are known, as are alate queens.

NON-PARATYPIC MATERIAL EXAMINED
Madagascar: Prov. Antsiranana, Montagne Français, SE Diego Suarez (*Fisher et al.*); Antsiranana, For. Binara, SW Daraina (*Fisher et al.*); Antsiranana, Res. Analamerana, Anivorano-Nord (*B.L. Fisher*); Antsiranana, Res. Spec. Ambre, SW Sakaramy (*Fisher et al.*); Antsiranana, P.N. Montagne d'Ambre (*R. Harin'Hala*); Antsiranana, For. Ambanitaza, Antalaha (*B.L. Fisher*); Prov. Mahajanga, Res. Bemarivo, SW Beslampy (*Fisher et al.*); Mahajanga, P.N. Tsingy de Bemahara, E Bekopaka (*Fisher et al.*); Prov. Toliara, For. de Petriky, W Tolagnaro (*B.L. Fisher*); Toliara, Res. Ambohijanahary, NW Ambaravaranala (*Fisher et al.*).

Technomyrmex madecassus Forel

(Fig. 26)

Technomyrmex madecassus Forel, 1897: 199. Holotype worker, MADAGASCAR: Nossi-Bé (*Voeltzkow*) (NHMG) [examined]
Technomyrmex madecassus var. *fusciventris* Forel, 1907: 86. Holotype worker, COMORO IS: Moheli, ix. 1903 (*Voeltzkow*) (MHNG) [examined]. **Syn. n.**

WORKER. *Measurements*: TL 2.2 – 3.1, HL 0.54 – 0.71, HW 0.48 – 0.65, SL 0.50 – 0.64, PW 0.35 – 0.46, WL 0.68 – 0.90 (30 measured). *Indices*: CI 89 – 95, SI 97 – 105, OI 24 – 27, EPI 64 – 74, DTI 124 – 134.
Frontal carina with 2 - 3 setae: in profile the posterior of these is located at about the level of the anterior margin of the eye and is the longest on the dorsum. Dorsum of head

posterior to this with a pair of shorter setae at about the level of the posterior margin of the eye and sometimes with an additional short pair anterior to this, above the eye. Behind the level of the posterior margin of the eye the dorsum with 2 – 3 pairs of setae, of which the pair about two-thirds the distance to the posterior margin is the longest. Posterior margin itself rarely also with an additional, more laterally placed pair of short setae. All setal pits conspicuous in dorsal view. Anterior clypeal margin with a small, shallow median impression. With head in full-face view the sides shallowly convex and the posterior margin with a shallow median concavity. Eyes located well in front of midlength, EPI 64 - 74; outer margin of eye just fails to touch, or just touches, the outline of the side in full-face view. Number of setal pairs on mesosoma: pronotum 1 – 4 (usually 2 – 3, only rarely 1 or 4), pits very conspicuous; mesonotum 2 – 4 (usually 2, less commonly 3, uncommonly 4), these setae conspicuous and usually about as long as those on the pronotum, and with very conspicuous pits; propodeal dorsum 0; lateral margins of propodeal declivity 2 – 3 (rarely with 2 on one side and 3 on the other), with very obvious pits in dorsal view. In dorsal view the metathoracic spiracles are very close to, or actually abut, the metanotal groove (distance separating them is usually distinctly less than the diameter of the metathoracic spiracle). Dorsum of mesonotum evenly curved in profile, more steeply sloped posteriorly than anteriorly. Dorsum of propodeum meets the declivity in a blunt angle; length of dorsum less than depth of declivity to spiracle. Gastral tergites 1 – 4 each with setae distributed everywhere on the sclerites; maximum length of setae on first gastral tergite varying from slightly less than, to slightly greater than, the maximum diameter of the eye. Head, mesosoma, petiole and gaster yellow to brownish yellow, often with head and/or the gaster somewhat infuscated with respect to the mesosoma; legs yellow to brownish yellow throughout.

T. madecassus is closest related to *innocens*. The main characters that distinguish them are given in the key and under the latter species, but it can also be added that the mesosoma of *madecassus* tends to be somewhat shorter and stouter (DTI 124 – 134) than *in innocens* (DTI 133 – 143).

Probably the most common endemic species of *Technomyrmex* in Madagascar *madecassus*, like all its close relatives, has a fully developed set of worker-queen intercastes as well as alate queens. The species nests and forages in a wide range of habitats and has been found on the forest floor in leaf litter, in fallen twigs and branches and in rotten logs and tree stumps, as well as being caught in pitfall traps. It also forages extensively on vegetation and nests in twigs and branches on trees.

MATERIAL EXAMINED

Madagascar: Prov. Antananarivo, Andranomay, SSE Anjozorobe (*Fisher et al.*); Antananarivo, P. Tsimbazaza (*Bartolozzi*); Prov. Antsiranana, Res. Spec. Ankarana, SW and SSW Anivorano-Nord (*Fisher et al.*); Antsiranana, Montagne Français, SE Diego Suarez (*Fisher et al.*); Antsiranana, For. Andavakoera, ENE Ambilobe (*Fisher et al.*); Antsiranana, For. Bekaraoka, ENE Doraina (*Fisher et al*); Antsiranana, P.N. Montagne d'Ambre (*R. Harin'Hala*); Antsiranana, Res. Spec. Ambre, SW Sakaramy (*Fisher et al.*); Antsiranana, For. Binara, SW Daraina (*Fisher et al.*); Antsiranana, Res. Analamerana, Anivorano-Nord (*B.L. Fisher*); Antsiranana, Ampasindava, Ambilanivy, S Ambahila (*Fisher et al.*); Antsiranana, For. Ampondrabe, NNE Daraina (*Fisher et al*); Antsiranana, For. Orangea, Remena (*B.L. Fisher*); Antsiranana, Sakalava Beach (*R. Harin'Hala*); Antsiranana, For. Ambato, Ambanja (*B.L. Fisher*); Antsiranana, Ambondrobe, Vohemar (*B.L. Fisher*); Antsiranana, For. Anabohazo, WSW Maromandia (*Fisher et al.*); Antsiranana, Nosi Be, Res. Lokobe, ESE Hellville (*Fisher et al.*); Antsiranana, R.S. Manongarivo, SW Antanambao (B.L. Fisher); Prov. Fianarantsoa, For. Ananalava, W Ranohira (*Fisher et al.*); Fianarantsoa, P.N. Ranomafana (*R. Harin'Hala*); Fianarantsoa, P.N. Isalo, Sahanafa Riv., N Ranohira (*Fisher et al.*); P.N. Isalo, N Ranohira (*Fisher et al.*); nr Isalo P.N. (*M. Irwin et al.*); nr Isalo P.N. (*R. Harin'Hala*); Prov. Mahajanga, For. Tsimembo, NNW Soatana (*Fisher et al*); Mahajanga, P.N. Tsingy de Bemaraha, ESE Antsalova (*Fisher et al.*); Tsingy de Bemaraha, E & ENE Bekopaka (*Fisher et al.*); Mahajanga, P.N. Ankarafantsika, Ankoririka (*E. Rabeson et al.*); P.N. Ankarafantsika, Ampijoroa (*Fisher et al.*); P.N. Ampijoroa (*Rin'Ha & Irwin*); Mahajanga, P.N. Baie de Baly, NNW Soalala (*Fisher et al.*); Mahajanga, P.N. Namoroka, NW and WNW Vilanandro (*Fisher et al.*); Mahajanga, For. Ambohimanga, Mampikony (*B.L. Fisher*); Mahajanga, Res. Bemarivo, SW Besalampy (*Fisher*

et al.); Mahajanga, Mahavavy Riv., SE Mitsinjo (*Fisher et al*); Prov. Toamasina, Mahavelona (*A. Pauly*); Toamasina, Manakambahiny, Farihy, Alaotra (*A. Pauly*); Toamasina, Andasibe P.N. (*R. Harin'Hala*); Prov. Toliara, Mahafaly Plateau, ENE Itampolo (*Fisher et al.*); Toliara, Res. Berenty, For. Bealoka, NNW Amboasary (*Fisher et al.*); Res. Berenty, For. Malaza, NW Amboasary (*Fisher at al.*); Toliara, Res. Beza Mahafaly (*P.S. Ward*); Toliara, Res. Beza Mahafaly, E Betioky (*B.L. Fisher*); Toliara, P.N. Tsimanampetsotsa, Mitoho (*Fisher et al.*); P.N. Tsimanampetsotsa, SE Efoetse (*Fisher et al.*); P.N. Tsimanampetsotsa, Bemanateza (*Fisher et al.*); Toliara, For. Mite, WNW Tongobory (*Fisher et al.*); Toliara, Kirindy Mite, SE Belo sur Mer (*Fisher et al.*); Toliara, s. Isoky-Vohimena For. (*B.L. Fisher*); Toliara, Kirindy, ENE Marofandilia (*Fisher et al.*); Toliara, P.N. Kirindy Mite, SE Belo sur Mer (*Fisher et al.*); Toliara, Res. Cap. Sainte Marie, W Marovato (*Fisher et al.*); Toliara, Vohibasia For., NE Sakaraha (*B.L. Fisher*); Toliara, For. Beroboka, SE Ankidranoka (*Fisher et al*); Toliara, P.N. Andohahela, ENE Tsimelahy (*Fisher et al.*); Andohahela N.P., Tsimelahy (*M. Irwin et al.*); P.N. Andohahela, Manantalinjo (*Fisher et al.*); 6 km. SSW Eminiminy, Res. Andohahela (*P.S. Ward*); 1 km. E Mahamavo, Res. Andohahela (*P.S. Ward*); Toliara, Zomitse P.N. (*R. Harin'Hala*); P.N. Zombitse, E Sakaraha (*B.L. Fisher & Fisher et al.*); Toliara, Res. Ambohijanahary, NW Ambaravaranala (*Fisher et al.*); Toliara, Antafoky (*M.G.F.*); Toliara, Sept Lacs (*M.G.F.*); Toliara, Manderano (*M.G.F.*); Toliara, Ranobe (*M.G.F.*); Toliara, Manombo (*M.G.F.*); Toliara, Tsinjoriaky, E. Tsifota (*Fisher et al.*); Toliara, Tsimembo, NNW Soatana (*Fisher et al.*); Toliara, For. Petriky, W Tolagnaro (B.L. Fisher); 48 km ENE Morondava (*D.M. Olson*). **Comoro Is**: Moheli (*Voeltzkow*).

Technomyrmex mayri Forel

(Fig. 23)

Technomyrmex mayri Forel, 1891: 99, pl. 3, fig. 6. Syntype worker and male, MADAGASCAR: 30 mi. NW of Tamatave, 25.ix.1889 (*O'Swald*) (ZMUH) [examined by B.L. Fisher]. (See note.)

NOTE
Type-compared material has been supplied by Brian L. Fisher (CASC) and excellent photographs of the syntypes are available on his Malagasy ant web-site.

WORKER. *Measurements*: TL 2.7 – 4.0, HL 0.66 – 0.84, HW 0.60 – 0.79, SL 0.68 – 0.87, PW 0.38 – 0.52, WL 0.84 – 1.20 (25 measured). *Indices*: CI 91 – 95, SI 108 – 116, OI 23 – 26, EPI 72 – 82, DTI 132 – 154.
Frontal carina with 2 setae: first above the torulus, second at the level of the anterior margin of the eye. Dorsum of head posterior to this with a single pair of setae, in profile located about half way between level of posterior margin of eye and posterior margin of the head, not at the posterior margin. Anterior clypeal margin with a small median concavity; posterior margin of head shallowly concave in full-face view and the sides convex. Eyes located in front of midlength, EPI < 90; outer margin of eye fails to break the outline of the side. Number of setal pairs on mesosoma: pronotum 1; mesonotum 0; propodeal dorsum 0; lateral margins of propodeal declivity usually 1, rarely 2, the setae arising directly behind or slightly below the level of the spiracle; without setae that arise from the margin above the level of the spiracle. With mesosoma in profile the mesonotal outline forms a long shallow slope, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Dorsum of propodeum relatively long in profile and meeting the declivity in a blunt angle; straight-line length of dorsum is at least equal to depth of declivity to spiracle. The spiracle itself is anterior to the margin of the declivity, not at the margin. In dorsal view the metathoracic spiracles do not abut the metanotal groove. Gastral tergites 1 – 4 each with setae present; maximum length of setae on first gastral tergite is usually slightly less than the maximum diameter of the eye but sometimes the two are subequal. Head, mesosoma, petiole and gaster dark brown to blackish brown. Coxae, femora and tibiae the same colour as the mesosoma or slightly lighter. Tarsi of middle and hind legs dull brownish yellow to dull yellow, paler than the tibiae.

Superficially *mayri* resembles a larger and more slender version of *difficilis*, but is easily distinguished by the structure of the propodeum. In *difficilis* the length of the propodeal dorsum in profile is always much less than the depth of the declivity to the spiracle and marginal setae arise from the declivity above the level of the spiracle. By contrast, in *mayri* the length of the propodeal dorsum in profile is at least equal to the depth of the declivity to the spiracle, and may be more; marginal setae arise from the declivity directly behind the spiracle or even slightly below it, but none arise above it. Workers of *mayri* tend to be larger than those of *difficilis* and have longer scapes and a more elongated, narrow mesosoma, compare the above dimensions of *mayri* with those of *difficilis*: HL 0.57 – 0.65, HW 0.52 – 0.61, SI 95 – 105, DTI 127 – 135. Finally, the metathoracic spiracles in *difficilis* abut, or very nearly abut, the metanotal groove in dorsal view, whereas in *mayri* the spiracles are usually noticably anterior to the metanotal groove. See also the notes under *difficilis*.

The setae on the propodeal declivity seem particularly prone to loss by abrasion in this species. Sometimes their pits can be seen, particularly in specimens where full adult colour has not been attained, but in fully coloured specimens the pits are usually not apparent.

T. mayri nests terrestrially in and under rotten wood. It forages through the leaf litter and in fallen twigs and timber and has been collected from pitfall traps, but it also forages extensively on low vegetation and may nest in dead twigs above the ground. Worker-queen intercastes are present, as well as alate queens.

MATERIAL EXAMINED

Madagascar: Prov. Antsiranana, R.S. Manongarivo (*B.L. Fisher*); R.S. Manongarivo, SW Atanambao (*B.L. Fisher*); Antsiranana, Ampasindava, Ambilanivy (*Fisher et al.*); Ampasindava, S. Ambahila (*Fisher et al.*); Antsiranana, P.N. Marojejy (*Fisher et al.*); P.N. Marojejy, NNE Andapa (*Fisher et al.*); Marojejy (*Quinter & Nguyen*); Marojejy, NW Manantenina (*E.L. Quinter*); Antsiranana, For. Binara (*Fisher et al.*); Antsiranana, Sakalava Beach (*R. Harin'Hala*); Antsiranana, For. Antsahabe (*Fisher et al.*); Antsiranana, P.N. Montagne d'Ambre (*Schlinger et al.*); Prov. Fianarantsoa, R.S. Ivohibe (*B.L. Fisher*); Fianarantsoa, P.N. Ranomafana (*R. Harin'Hala*); P.N. Ranomafana (*Rin'Ha & Irwin*); P.N. Ranomafana (*J.S. Schwiekert*); P.N. Ranomafana, Vatoharanana (*Fisher et al.*); 3 km. W Ranomafana, nr Ifanadiana (*P.S. Ward*); Ranomafana Nat. Pk, Talatakely (*Lee & Ribardo*); S Ambalavao (*B.L. Fisher*); Fianarantsoa, W Andrambovato (*Fisher et al.*); Prov. Toamasina, Mont Anjanaharibe, Ambinanitelo (*Fisher et al.*); Toamasina, Mont. Akirindro (*Fisher et al.*); Toamasina, P.N. Mantadia (*H.J. Ratsirarson*); Toamasina, Mahavelona (Foulpointe) (*A. Pauly*); Toamasina, For. Ambatovy (*B.L. Fisher*); Toamasina, 25 km. W Morarano-Chrome (*A. Pauly*); Prov. Toliara, P.N. Andohahela, ESE Mahamavo (*Fisher et al.*); 9.2 km. WSW Befingotra, Res. Anjanaharibe-Sud (*B.L. Fisher*); 6.9 km. NE Ambanizana (*B.L. Fisher*); 70.7 km. NNE Tolanaro, Mahermano Mt. (*K.C. Embertson*); 9.2 km. N Tolanaro, Ilapiry Mt. (*K.C. Embertson*); 5.3 km. SSE Ambanizana, Andranobe (*B.L. Fisher*).

Technomyrmex pallipes (F. Smith) **comb. n.**

(Fig. 4)

Tapinoma pallipes Smith, F. 1876: 447. Syntype workers, ROGRIGUEZ I. (BMNH) [examined]. [Misspelled as *pallidipes* by Dalla Torre, 1893: 166.]

Technomyrmex albipes subsp. *foreli* Emery, 1893: 249. Syntype workers, MADAGASCAR: Tamatavé (MHNG) [examined]. **Syn .n.**

Technomyrmex atrichosus Viehmeyer, 1922: 214. Syntype workers, KENYA: Shirati, v.1909 (*Katona*) (ZMHB) [examined]. **Syn. n.** (See note.)

Technomyrmex foreli var. *affinis* Santschi, 1930a: 71. [First available use of *Technomyrmex albipes* st. *foreli* var. *affinis* Santschi, 1914: 119 (unavailable name).] Syntype workers, KENYA ("Afr. Or. Angl."): Naivasha, Déc. 1911, 1900 m, st. 14, no. 694/14 (*Alluaud & Jeannel*) (MHNG) [examined]. **Syn. n.**

Technomyrmex brevicornis Santschi, 1930a: 71, figs. 34-36. Syntype workers, ANGOLA: S.P. de Loanda, 24.ii.1913 (*Silvestri*) (syntypes are labeled *Technomyrmex foreli brevicornis*) (NHMB) [examined]. **Syn. n.**

Technomyrmex albipes subsp. *truncicolus* Weber, 1943: 380. Syntype workers, SUDAN:

Equatoria, Imatong Mts, 6200 ft, 24.vii.-5.viii.1939, No. 1382 (*N.A. Weber*) (MCZC) [examined] **Syn. n.**

Technomyrmex primroseae Donisthorpe, 1949: 273. Holotype and paratype workers, MAURITIUS: Le Pouce Mt, 2.xi.1948, no.126 (*R. Mamet*) (BMNH) [examined]. **Syn. n.**

NOTE

The two syntype workers of *atrichosus* are extremely abraded specimens of *pallipes* on which very few of the diagnostic setae remain. However, nineteen more workers from the same series, not considered in the original description, are preserved in HNHM. All of these are also extremely abraded, but summing all the setae that remain on these specimens gives the characteristic setal array of *pallipes*.

WORKER. *Measurements*: TL 2.3 – 2.8, HL 0.52 – 0.68, HW 0.46 – 0.64, SL 0.45 – 0.64, PW 0.33 – 0.37, WL 0.65 – 0.72 (30 measured). *Indices*: CI 84 – 94, SI 92 – 106, OI 28 – 33, EPI 55 – 71, DTI 120 – 128.

Frontal carina with 2 setae: in profile the anterior above the torulus, the posterior at the level of the anterior portion of the eye; both of these shorter than the maximum diameter of the eye. No seta present at level of posterior margin of eye. Posterior to this the dorsum with 2 pairs of inconspicuous, extremely short stubbly setae, both of which are less than half the length of the seta above the eye: anterior pair about midway between level of posterior margin of eye and posterior margin of head, posterior pair very close to or at the posterior margin (easily abraded). In full-face view median portion of anterior clypeal margin extremely shallowly concave or feebly indented; posterior margin of head at most very slightly concave or impressed medially, sometimes almost transverse. Eyes relatively large and located in front of midlength, EPI < 80; in full-face view outer margins of eyes touch, or more usually break, the outline of the sides. Number of setal pairs on dorsal mesosoma: pronotum 1 – 3, shorter than maximum diameter of eye; mesonotum 1, about half the length of the pronotal setae and located at the point where the slope of the mesonotal dorsum changes; propodeal dorsum 0; lateral margins of propodeal declivity 2 (rarely 3), above the level of the spiracle. With mesosoma in profile the posterior one-third of the mesonotum is more steeply sloped than the anterior two-thirds. Metanotal groove distinct but only shallowly impressed. Dorsum of propodeum short and more or less flat, meeting the steeply sloped declivity in a blunted angle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; usually all are distinctly shorter than the maximum diameter of the eye. Head, mesosoma and gaster uniformly light brown to uniformly black, with all shades attested between these extremes; sometimes the gaster is slightly darker than the mesosoma. Legs lighter than head and body, varying from pale yellow to dull brownish yellow. Tibiae and tarsi are always the same colour, the former never considerably darker than the latter; femora may be somewhat darker, in whole or in part, than the tibiae.

The arrangement of setae and their relative lengths is characteristic of this small but relatively large-eyed species. A similar arrangement is seen only in the closely related *vapidus* of Kenya and Tanzania, but that species is larger, brightly coloured, and has more posteriorly located eyes.

A series of intercastes is present between worker and queen in which 0, 1 or 3 ocelli are developed and the mesosoma gradually increases in size and complexity. The mesonotum gradually differentiates into mesoscutum and mesoscutellum and in larger individuals a small prominent metanotum is also developed. Ergatoid males are produced as well as alate males and queens.

T. pallipes is a common and very widely distributed species in the Afrotropical and Malagasy regions, and is present as an introduction on the Atlantic islands off Africa. It has also been recorded from hothouses, and once from a dwelling, in the West Palaearctic. Nest sites appear opportunistic, being constructed in the ground under stones, in or under rotten wood, under the bark of living trees, in rotten parts of standing trees and in hollow stems and twigs of plants. The species efficiently colonises areas

disturbed by human activities and may be prevalent in plantations of tree and shrub crops. In Madagascar it is common in parks and gardens and in South Africa it is known to invade houses, where it may nest in bizarre locations such as electricity transformers or light fixtures. In other countries it has been recorded as entering houses in search of sugary food or water. Foraging is carried out both terrestrially and arboreally. When foraging on shrubs and trees *pallipes* tends a wide range of homopterous insects. The species called *albipes* in Samways, Nell & Prins (1982), associated with outbreaks of red scale on citrus in South Africa, is most probably *pallipes*, as also is the species referred to as *albipes* by Prins, Robertson & Prins (1990) in their synopsis of pest ants of South Africa.

MATERIAL EXAMINED

Ghana: Tafo (*C. Campbell*); Legon (*D. Leston*); Abodum (*D. Leston*); Bunso (*R. Belshaw*); Mankrang For. Res., nr Akomodan (*R. Belshaw*). **Cameroun**: Mkoemvon (*D. Jackson*). **Gabon**: Prov. Ogooue-Maritime, Res. Monts Doudou (*B.L. Fisher*); Prov. Woleu-Ntem, Minvoul (*B.L. Fisher*). **Central African Republic**: P.N. Dzanga-Ndoki (*B.L. Fisher*); P.N. Dzanga-Ndoki (*S. van Noort*); Res. Dzanga-Sangha (*S. van Noort*). **Democratic Republic of Congo**: Luebo, Macaco (*H. Schouteden*). **Angola**: Loanda (*Silvestri*); Sangave (*Monard*). **Ethiopia**: Ilubador Region, Buno Bedele, nr Bedele (*Sforzi & Bartolozzi*). **Somalia**: Kisimaio (*Bartolozzi*); Boramo (*E.F. Peck*). **Sudan**: Equatoria, Imatong Mts (*N.A. Weber*); Kouloubu (*Andrieu*). **Kenya**: Narok, Loita Hills (*Mahnert & Perret*); Naivasha (*Alluaud & Jeannel*); Laikipia Distr., Mpala Res. Centre (*R.R. Snelling*); nr Mpala Res. Centre, Ewaso Ng'iro Riv. (*R.R. Snelling*); Mpala Res. Centre (*S. Kamande*); Mpala Ranch, Hippo Pool (*R.R. Snelling*); Nyeri Distr., Mweiga (*C.C. Hogue*); Shirati (*Katona*); Kiambu (*R.H. Le Pelley*). **Uganda**: Bulucbebe (*H. Hargreaves*); Bushenyi Distr., Kalinzu Forest (*S. Yamane*). **Tanzania**: Maramba (*A.M. Varela*); Zanzibar, Selem (*M.J. Way*); Mkomazi Game Res., Kisima Mt. (*H.G. Robertson*); Mkomazi Game Res., Dindera Dam (*A. Russell-Smith*); Mkomazi Game Res., Ibaya Camp (*S. van Noort*); Chambezi (*Löhr*); Kanga (*Löhr*). **Zambia**: Lusaka (*R.A. Beaver*). **Mozambique**: Vila Manica (*Ross & Leech*); **Zimbabwe**: Bulawayo (*G. Arnold*); Bulawayo, Bunthorne Mine (*G. Arnold*); Matopos (*G. Arnold*); Chirinda For. (*G. Arnold*); Springvale (*G. Arnold*); Harare, Highlands (*M. Cumming*); Harare (*A. Watsham*); Zambesi Valley, 7km SE Angwa Bridge (*J. Weyrich*); Kanyati Wildlife Area (*A.J. Gardiner*); Cecil Kop, nr Umtali (*W.L.Brown*). **Botswana**: Serowe (*P. Forchhammer*); Okavango Delta, Shorobe (*A. Russell-Smith*); Maxwee (*A. Russell-Smith*). **South Africa**: Cape Prov., Suurberg (*A.C. Wild*); Koeberg (*H.G. Robertson*); Fort Beaufort (*J.C. Faure*); Pretoria (*J.C. Faure*); Salique (*J.C. Faure*); C.P., Fish Hoek (*T. Ferreira*); Kenilworth (*M. Raven*); C.P., Tsitsikamma N.P. (*R.B. Kimsey*); Grahamstown Bot. Gadns (*C. Zachariades*); Potberg (*H.G. Robertson*); Fernkloof Nat. Res. (*H.G. Robertson*); Cape of Good Hope Nat. Res. (*H.G. Robertson*); Cape of Good Hope Nat. *Res. (M.H. Troskie);* Cape of Good Hope Nat. Res. *(F. Parker)*; Cape Pen. N.P. *(F.* Parker); W Cape, Le Roux's Farm (*L.L. Chaane*); S Cape, Wisboomskraal (*W. Breytenbach*); De Hoop Nat. Res. (*T. Smulian*); Wuppertal, Cedarberg (*H.G. Robertson*); W Cape, Rondevlei Nat. Res. (*S. Lake*); Jansenville (*H. Adie*); Kromrivier (*H.G. Robertson*); Prince Albert (*Dean*); Mosslands Farm (*A. Bownes*); Grootvadersbusch (*D. Larsen*); Cape Town (*Philby*); Kraaifontein (*A.J. Prins*); Natal, Illovo (*P. Atkinson*); Natal, Mt Edgecombe (*G. Leslie*); Natal, Pinetown (*M. Samways*); Natal, Umtamvuna Riv., Port Edward (*C. Zachariades*); Port Edward (*C.H. Stirton*); N of Richard's Bay (*de Kock & Majer*); Pietermaritzburg (*F. Carliell*); Natal, Vernon Crookes Nat. Res. (*P. Caldwell*); Durban, Virginia Bush (*P. Caldwell*); Durban, Ridgeview (*P. Caldwell*); KwaZulu-Natal, Karkloof (*S.S. Lu*); Wahroonga Farm (*S.S. Lu*); Mapelane Game Res. (*H.G. Robertson*); Jozini (*H.G. Robertson*); Kdumu Game Res. (*H.G. Robertson*); Orange Free State, Tussen Die Riviere (*H.G. Robertson*); Transvaal, Giyani, S. Letaba Riv. (*H.G. Robertson*); Tvl., Nelspruit (*M. Samways*); Tvl., Nyalele Valley (*Vernay-Lang*); Tvl., Klipriviersberg (*H.G. Robertson*); Kruger Nat. Pk (*A.J. Prins*); Tvl., Weltevreden Farm (*H.G. Robertson*); Tvl, Blyderivierspoort (*R.B. Kimsey*); NW Prov., Pilansberg Nat. Pk (*C.L. Parr*). Vryburg (*E. Simon*); Bloemfontein (*E. Simon*). **Swaziland**: Forbes Reef (*P.S. Ward*). **Lesotho**: Maqalito (*R. Tiali*); Molomo (*R. Tiali*). **Namibia**: Namib Naukluft Pk, Gobabeb (*H.G. Robertson*); Waterberg Rest Camp (*H.G. Robertson*). **Madagascar**: Prov. Antsiranana, N Joffreville (*Schlinger et al.*); Antsiranana, P.N. Montagne d'Ambre (*R. Harin'Hala*); P.N. Montagne d'Ambre (*Schlinger et al.*); Antsiranana, Ambondrobe, Vohemar (*B.L. Fisher*); Antsiranana, Res. Analamerana, Anivorano-Nord (*B.L. Fisher*); Prov. Fianarantsoa, P.N. Isalo, Ambovo Springs (*B.L. Fisher*); nr Isalo P.N. (*R. Harin'Hala*); Fianarantsoa, SSW Ambositra, Ankazomivady (*B.L. Fisher*); Fianarantsoa, P.N. Andringitra, For. Ravaro (*S. Razafimandimby*); Fianarantsoa, For. Analalava, W. Ranohira (*Fisher et al.*); Fianarantsoa, P.N. Ranomafana (*R. Harin'Hala*); Fianaranrsoa, For. Ambalagoavy Nord (*R. Harin'Hala*); Prov. Mahajanga, For. Ambohimanga, Mampikony

(*Fisher et al.*); Prov. Toamasina, Andrasibe P.N. (*R. Harin'Hala*); Ankazomivady, SSW Ambositra (*H.G. Robertson*); Toamasina, W Morarano-Chrome (*A. Pauly*); Prov. Toliara, Res. Cap. Sainte Marie, W. Marovato (*B.L. Fisher*); Toliara, Ranobe (no collector's name); Toliara, P.N. Andohahela, ENE Tsimelahy (*Fisher et al.*); P.N. Andohahela, Manantalinjo (*Fisher et al.*); Toliara, For. Mite, WNW Tongobory (*Fisher at al.*); Toliara, Res. Berenty, For. Bealoka, NNW Ambosary (*Fisher et al*); Toliara, P.N. Zombitse, E Sakaraha (*Fisher et al*); Toliara, P.N. Tsimanampetsotsa, Bemanateza (*Fisher et al.*); Toliara, Res Berenty, For. Malaza, NW Amboasary (*Fisher et al.*); Toliara, Mahafaly, nr Eloeste (*V. & B. Roth*); Toliara, Sept Lacs (*M.G.F.*); Toliara, Res. Ambohijanahary, NW Ambaravaranala (*Fisher et al.*); Nossi-Bé (*Voeltzkow*); Tamatavé (no collector's name); Antananarivo (*P.S.Ward*); 3 km. W Ranomafana, nr Ifanadiana (*P.S. Ward*); Res. Ankarana, 7 km. SE Matsaborimanga (*P.S. Ward*). **Rodriguez I.** (no collector's name). **Mauritius**: Le Pouce Mt. (*R. Mamet*); Corps de Garde Mt. (*R. Mamet*); Round I. (*C. Duck*); no loc. (*J.E.M. Brown*). **Réunion I.**: Bretagne (*J.R. Williams*). **Madeira**: Funchal (*Silva & Wetterer*). **Cape Verde Is**: Sal, Sta Maria (*J. Wetterer*); Santiago, Porto Formosa (*J. Wetterer*); Santiago, INIDA (*J. Wetterer*); Fogo, Ponta Verde (*J. Wetterer*). **Italy**: Milano (in flat) (*F. Rigato*). **United Kingdom**: London, Kew Gdns (*H. Donisthorpe*); Aberdeen (*M. Shaw*).

CHECKLIST OF EAST PALAEARCTIC, ORIENTAL, MALESIAN AND POLYNESIAN *TECHNOMYRMEX* SPECIES

***albipes* group**
- ***albicoxis*** Donisthorpe, 1945 **stat. n.**
- ***albipes*** (F Smith, 1861)
  - = *detorquens* (Walker, 1859)
  - = *forticulus* (Walker, 1859)
  - = *nigrum* (Mayr, 1862)
  - = *albitarse* (Motschoulsky, 1863)
  - = *albipes* v. *bruneipes* Forel, 1895 **syn. n.**
  - = *albipes* r. *wedda* Forel, 1913 **syn. n.**
- ***brunneus*** Forel, 1895 **stat. rev.**
  - = *modiglianii* var. *angustior* Forel, 1912 **syn. n.**
- ***butteli*** Forel, 1913
- ***certus*** Bolton **sp. n.**
- ***cheesmanae*** Donisthorpe, 1945
- ***difficilis*** Forel, 1892 **stat. n.**
  - = *mayri* st. *nitidulans* Santschi, 1930 **syn. n.**
- ***elatior*** Forel, 1902
  - = *albipes* var. *cordiformis* Viehmeyer, 1916 **syn. n.**
- ***fornax*** Bolton **sp. n.**
- ***hades*** Bolton **sp. n.**
- ***indicus*** Bolton **sp. n.**
- ***mixtus*** Bolton **sp. n.**
- ***modiglianii*** Emery, 1900
  - = *modiglianii* r. *javanus* Forel, 1905 **syn. n.**
- ***myops*** Bolton **sp. n.**
- ***pluto*** Bolton **sp. n.**
- ***prevaricus*** Bolton **sp. n.**
- ***rotundiceps*** Karavaiev, 1926 **stat. n.**
- ***subgracilis*** Bolton **sp. n.**
- ***tonsuratus*** Bolton **sp. n.**
- ***vitiensis*** Mann, 1921 **stat. rev., stat. n.**
  - = *albipes* st. *rufescens* Santschi, 1928 **syn. n.**
- ***yamanei*** Bolton **sp. n.**

***bicolor* group**
antennus Zhou, 2001
bicolor Emery, 1893
gaudens Bolton **sp. n.**
horni Forel, 1912
horrens Bolton **sp. n.**
impressus Bolton **sp. n.**
kraepelini Forel, 1905
lisae Forel, 1913
obscurior Wheeler, 1928 **stat. n.**
rector Bolton **sp. n.**
schimmeri Viehmeyer, 1916
sundaicus (Emery, 1900)

***gibbosus* group**
gibbosus Wheeler, W.M. 1906

***grandis* group**
grandis Emery, 1887
= *grandis* var. *bandarensis* Forel, 1913 **syn. n.**
wheeleri (Emery, 1913)
= *smithi* (Wheeler, 1909) (homonym)
= *niasensis* Menozzi, 1932 **syn. n.**

***pratensis* group**
pratensis (F. Smith, 1860)
= *setiferum* (Emery, 1900) **syn. n.**
= *setiferum* var. *javanum* (Forel, 1905) **syn. n.**

***reductus* group**
reductus Bolton **sp. n.**

***strenuus* group**
convexifrons Karavaiev, 1926
mandibularis Bolton **sp. n.**
strenuus Mayr, 1872
tatius Bolton **sp. n.**

***textor* group**
dubius Bolton **sp. n.**
gilvus Donisthorpe, 1941
textor Forel, 1909 **stat. n.**

Species inquirendae

incisus (Mukerjee, 1930)
transiens Forel, 1913

KEY TO EAST PALAEARCTIC, ORIENTAL, MALESIAN AND POLYNESIAN *TECHNOMYRMEX* INCLUDING TRAMP SPECIES (workers)

NOTE. The locations and relative lengths of various setae are critical in the determination of many species. Abraded, or old and damaged, specimens may be difficult or impossible to identify correctly.

1 With head in profile the dorsal surface of the frontal carina, or the dorsum immediately mesad of the frontal carina, with setae present; at least with one seta present somewhere along the length of the frontal carina, or more usually with a row of 2 – 4.....2
- With head in profile the dorsal surface of the frontal carina and the dorsum immediately mesad of the frontal carina, entirely without setae.....31

2 Either dorsal (outer) surfaces of middle and hind tibiae, or antennal scapes, or both with suberect to erect projecting setae present.....3
- Both dorsal (outer) surfaces of middle and hind tibiae and antennal scapes without suberect to erect projecting setae.....7

3 Maxillary palp with 5 segments, labial palp with 3 segments. Anterior clypeal margin with a long, narrow median incision, the length of the incision at least equal to its maximum width or longer than its maximum width; inner margin of incision meets anterior clypeal margin in a sharp angle on each side (Fig. 66). (India, China, Vietnam, Thailand, Malaysia (West Malaysia, Sarawak, Sabah), Indonesia (Sumatra, Java, Batjan, Sulawesi)).....***pratensis*** (part) (p. 95)
- Maxillary palp with 6 segments, labial palp with 4 segments. Anterior clypeal margin almost transverse or at most with a very shallow, weak median impression or feeble concavity that is much broader than long; if a weak concavity present it curves evenly into the more lateral portion of the anterior clypeal margin.....4

4 With head in full-face view the dorsum glassy smooth and shining, unsculptured except for small pits from which setae arise. Scape shorter, SI 81 – 89. Promesonotum relatively short and stout, DTI < 125.....5
- With head in full-face view the dorsum covered with fine sculpture. Scape longer, SI 123 – 140. Promesonotum relatively long and narrow, DTI > 130.....6

5 Dorsal surface of mandible with a longitudinal groove near its outer margin, the groove flanked by a cuticular rim on each side; groove extends from base almost the entire length of the mandible (Fig. 74). Eyes located more posteriorly, EPI 96 - 100. (Malaysia (West Malaysia, Sabah)) .....***mandibularis*** (p. 90)
- Dorsal surface of mandible without a longitudinal groove anywhere. Eyes located more anteriorly, EPI *ca* 72. (Indonesia (Sumatra)).....***convexifrons*** (p. 77)

6 Longest setae on first gastral tergite longer than maximum diameter of eye (Fig. 54). Eye located at or slightly behind midlength of head, EPI 100 – 120. Setae abundant everywhere, very dense, long and luxuriant on all body surfaces. Propodeum in profile with a long, shallowly convex dorsum. Larger species, HL 0.85 – 1.05. (Malaysia (West Malaysia), Indonesia (Kalimantan, Sumatra, Sulawesi), Philippines (Leyte, Mindanao, Negros, Bohol)).....***grandis*** (p. 83)
- Longest setae on first gastral tergite shorter than maximum diameter of eye (Fig. 55). Eye located slightly in front of midlength of head, EPI 80 – 86. Setae present on all dorsal surfaces but short and sparse everywhere. Propodeum in profile with a short, humped dorsum. Smaller species, HL 0.70 – 0.79. (Malaysia (West Malaysia, Sarawak, Sabah), Brunei, Philippines (Luzon, Leyte, Romblon)).....***wheeleri*** (p. 106)

7 With head in full-face view the dorsum glassy smooth and shining, unsculptured except for small pits from which setae arise.....8
- With head in full-face view the dorsum covered with fine sculpture, usually either reticulate-shagreenate or microreticulate everywhere; sometimes this sculpture reduced and superficial but surface never glassy smooth.....9

8 Anterior clypeal margin with a distinct near-semicircular median impression. Dorsum of mesonotum mostly smooth, with only faint traces of superficial sculpture; propodeal dorsum slightly more strongly sculptured than mesonotum. Eye slightly larger, OI 24 – 27. (Malaysia (Sabah))..... ***tatius*** (p. 102)

- Anterior clypeal margin transverse or nearly so, at most with an extremely weak median indentation, without a near-semicircular impression. Dorsum of mesonotum very densely finely reticulate-punctate; propodeal dorsum as densely sculptured as mesonotum. Eye slightly smaller, OI 20 – 24. (Malaysia (West Malaysia, Sarawak), Brunei, Singapore)..... ***strenuus*** (p. 100)

9 With head in profile the dorsum behind the level of the posterior margin of the eye entirely lacks setae (*i.e.* setae on the dorsum of the head are restricted to the frontal carinae)..... 10

- With head in profile the dorsum behind the level of the posterior margin of the eye with one or more pairs of setae present (*i.e.* setae on the dorsum of the head are not restricted to the frontal carinae)..... 16

10 Entire petiole not the same colour as the gaster; at least the anterior three-quarters of the petiole is yellow and much lighter than the dark brown to black gaster..... 11

- Entire petiole the same colour (or very nearly) as the gaster, uniformly brown or black..... 12

11 Tibiae of all legs yellow, contrasting strongly with the brown femora. Propodeum marked with yellow at least dorsally, sometimes entirely yellow. Scape somewhat longer, SI 120 – 121. (Indonesia (Sulawesi))..... ***pluto*** (p. 94)

- Tibiae of all legs dark brown, the same colour as the femora. Propodeum entirely dark brown to black, without yellow markings. Scape somewhat shorter, SI 112 – 115. (Indonesia (Sulawesi))..... ***hades*** (p. 84)

12 Basal half of mandible with a longitudinal groove dorsally, close to its outer margin; the groove extends about half the length of the mandible and is bounded laterally by sharp longitudinal edges. In full-face view the eyes are located distinctly more posteriorly on the head, at or slightly behind the midlength, EPI > 110. (Sri Lanka, India, Vietnam, China, Taiwan, North Korea, Japan, Brunei)..... ***brunneus*** (p. 73)

- Basal half of mandible evenly transversely convex dorsally, without a longitudinal groove anywhere. In full-face view the eyes are located distinctly more anteriorly on the head, in front of the midlength, EPI 55 – 92..... 13

13 In full-face view the posterior margin of the head is broadly emarginate across its width. Anterior clypeal margin with a small but sharply defined semicircular median notch (Fig. 69). Head broader, CI 95 – 106. (India, Nepal, Vietnam, Thailand, Malaysia (West Malaysia, Sabah, Sarawak), Singapore, Brunei, Indonesia (Kalimantan), Philippines (Luzon))..... ***elatior*** (p. 79)

- In full-face view the posterior margin of the head has a small, shallow median indentation only. Anterior clypeal margin with at most a weak and very shallow median concavity. Head narrower, CI 85 – 95..... 14

14 Propodeum in profile with dorsum convex and curving broadly into the declivity (Fig. 39). Setae on first gastral tergite distinctly longer than maximum diameter of eye. Pronotum, mesonotum and propodeum all inflated and with a swollen appearance. Pronotum broader, PW 0.45 – 0.48. Scape relatively longer, SI 114 – 124. (Malaysia (West Malaysia, Sarawak, Sabah), Indonesia (Sumatra, Sulawesi))..... ***butteli*** (p. 75)

- Propodeum in profile with dorsum flat or nearly flat and meeting the declivity in a blunt or sharply defined angle (Figs 1, 2). Setae on first gastral tergite usually shorter than maximum diameter of eye, at most about equal to maximum

diameter of eye. Pronotum, mesonotum and propodeum not inflated, without a swollen appearance. Pronotum narrower, PW 0.35 – 0.44. Scape relatively shorter, SI 91 - 115.....15

15 Scape relatively short and promesonotum relatively short and broad, SI 91 – 102, DTI 110 – 124. Eye somewhat smaller, OI 24 – 27. With mesosoma in absolute profile the mesonotal dorsal outline convex, more or less evenly rounded (Fig. 1). In same view the junction of the propodeal dorsum and declivity is blunt. (*Tramp species*: Sri Lanka, India, Vietnam, Malaysia (West Malaysia, Sabah, Sarawak), Singapore. Indonesia (Java, Bali, Lombok, Ambon, Sulawesi, Seram, Irian Jaya), Philippines (Mindoro, Luzon), Papua New Guinea, Solomon Is, Palau Is, Micronesia. Hawaii).....***albipes*** (p. 68)

- Scape relatively long and promesonotum relatively long and narrow, SI 104 – 115, DTI 128 – 141. Eye somewhat larger, OI 29 – 32. With mesosoma in absolute profile the mesonotal dorsal outline with a more or less flat anterior section that passes through an obtuse angle to a distinctly more strongly sloped posterior declivity (Fig. 2). In same view the junction of the propodeal dorsum and declivity is sharply angular. (*Tramp species*: India, Bangladesh, Myanmar, Thailand, Malaysia (West Malaysia), Indonesia (Sulawesi), Philippines (Palawan), Niue I., Vanuata, Samoa, Fiji Is, French Polynesia, Hawaii, Christmas I.).....***vitiensis*** (p. 104)

16 Anterior clypeal margin with a sharply defined deep and very conspicuous median notch or incision that is semicircular to deeply U-shaped (Figs 66, 67, 68).....17

- Anterior clypeal margin at most with a poorly defined feeble median indentation or very shallow median concavity.....19

17 Maxillary palp with 5 segments, labial palp with 3 segments. With head in profile a long dorsal seta present at level of both anterior and posterior margins of eye (Fig. 51). Setae on first gastral tergite distinctly much longer than maximum diameter of eye. Dorsum of head with weak superficial sculpture only, not blanketed with dense reticulate-shagreenate sculpture. (India, China, Vietnam, Thailand, Malaysia (West Malaysia, Sarawak, Sabah), Indonesia (Sumatra, Java, Sulawesi, Batjan)).....***pratensis*** (part) (p. 95)

- Maxillary palp with 6 segments, labial palp with 4 segments. With head in profile a long dorsal seta present at level of anterior margin of eye but without one at level of posterior margin of eye (Figs 44, 47). Setae on first gastral tergite at most equal to maximum diameter of eye. Dorsum of head blanketed with dense reticulate-shagreenate sculpture.....18

18 Dorsum of head in profile with setae present at the posterior margin. Inner margin of clypeal notch meets the anterior clypeal margin in a sharp angle on each side (Fig. 67). Setae on gastral tergites 1 – 2 sparse and minute, the longest less then 0.50 × the maximum diameter of the eye. Setae on gastral tergite 4 about twice as long as those on gastral tergites 1 – 2. (Thailand, Vietnam) .....***yamanei*** (p. 107)

- Dorsum of head in profile without setae at the posterior margin. Inner margin of clypeal notch curves bluntly into the anterior clypeal margin on each side (Fig. 68). Setae on gastral tergites 1 – 2 numerous and conspicuous, the longest about equal to the maximum diameter of the eye or only fractionally shorter. Setae on gastral tergite 4 not twice as long as those on gastral tergites 1 – 2. (Laos, Thailand, Malaysia (West Malaysia, Sarawak), Indonesia (Sumatra, Java, Sulawesi)).....***modiglianii*** (p. 92)

19 With head in profile the dorsum without a pair of setae at, or extremely close to, the level of the posterior margin of the eye (Figs 3, 4, 41, 42, 43). Dorsum of head behind the level of the posterior margin of the eye usually with one, more rarely

with two, pairs of setae present.....20
- With head in profile the dorsum with a pair of setae at, or extremely close to, the level of the posterior margin of the eye (Figs 45, 46, 48, 49, 50). Dorsum of head behind the level of the posterior margin of the eye with one or more pairs of setae present.....26

20 With head in profile the dorsum behind the level of the posterior margin of the eye with two pairs of inconspicuous short setae (Fig. 4). (*Tramp species*: not yet recorded from these regions).....***pallipes*** (p. 56)
- With head in profile the dorsum behind the level of the posterior margin of the eye conspicuously with only a single pair of setae (Figs 3, 41, 42, 43).....21

21 With propodeum in absolute profile the dorsum meets the declivity in a marked angle (Figs 3, 41).....22
- With propodeum in absolute profile the dorsum meets the declivity through a rounded curve (Figs 42, 43).....24

22 Eyes located relatively posteriorly on the head, EPI 100 or more. Basal two-thirds or more of hind basitarsus black, the same colour as the hind tibia. (Malaysia (West Malaysia, Sarawak), Indonesia (Java)).....***rotundiceps*** (p. 99)
- Eyes located relatively anteriorly on the head, EPI < 90. Entire hind basitarsus distinctly paler than the hind tibia.....23

23 Setae on first gastral tergite very long, about 1.50 × longer than the maximum diameter of the eye (Fig. 41). Scape shorter, SI 88. Eye smaller, OI 21. Mesosoma relatively short and stocky, DTI 112 – 119. (Malaysia (West Malaysia)).....***myops*** (p. 93)
- Setae on first gastral tergite short, the longest about equal to the maximum diameter of the eye (Fig. 3). Scape longer, SI 95 - 107. Eye larger, OI 25 - 30. Mesosoma relatively more elongate, DTI 127 – 135. (*Tramp species*: Vietnam, Thailand, Singapore, Malaysia (West Malaysia, Sabah), Indonesia (Flores, Krakatau Is), Philippines (Luzon, Bayagnan), Papua New Guinea, Marianas Is, Micronesia).....***difficilis*** (p. 47)

24 Pronotum, mesonotum and propodeal declivity without setae (Fig. 42). Posteriormost setae on dorsum of head and longest setae on first gastral tergite very short, only about 0.35 × the maximum diameter of the eye. (Papua New Guinea).....***tonsuratus*** (p. 103)
- Pronotum, mesonotum and propodeal declivity with setae present. Posteriormost setae on dorsum of head and longest setae on first gastral tergite much longer, > 0.60 × the maximum diameter of the eye.....25

25 Middle and hind coxae dark brown to black, the same colour as the mesosoma or very nearly so. Dorsum of head with coarse microreticulate-punctulate sculpture. Larger species, HW 0.71 – 0.73; scape relatively slightly shorter, eyes smaller and located somewhat more posteriorly, SI 108 – 117, OI 24 – 25, EPI 85 – 90. (Papua New Guinea).....***mixtus*** (p. 91)
- Middle and hind coxae yellow, strongly contrasting with the blackish brown mesosoma. Dorsum of head with fine superficial microreticulate sculpture only. Smaller species, HW 0.56 – 0.58; scape relatively slightly longer, eyes larger and located somewhat more anteriorly, SI 117 – 121, OI 27 – 29, EPI 77 – 81. (Indonesia (Irian Jaya), Papua New Guinea).....***albicoxis*** (p. 67)

26 Posterior margin of head with a transverse row of 6 - 10 setae across its width, 3 - 5 on each side of the midline.....27
- Posterior margin of head without a transverse row of setae across its width (margin may be crossed by 2 setae but these arise well in front of the margin).....29

27 Head, mesosoma, petiole, gaster and middle and hind coxae uniformly black. Small species with small eyes; HW 0.51, OI 23. (Brunei).....***certus*** (p. 76)
- Head, mesosoma, petiole, gaster and middle and hind coxae not uniformly black. Larger species with larger eyes; HW 0.62 - 0.64, OI 26 - 28.....28

28 Petiole and middle and hind coxae yellow, lighter in colour than the mesosoma. Longest hairs on first gastral tergite shorter than the maximum diameter of the eye. (India).....***indicus*** (p. 87)
- Petiole and middle and hind coxae light brown, the same colour as the mesosoma. Longest hairs on first gastral tergite longer than the maximum diameter of the eye. (Indonesia (Irian Jaya)).....***prevaricus*** (p. 97)

29 Longest setae on first gastral tergite short and stubbly, only about 0.50 × the maximum diameter of the eye. Pair of setae on the dorsum of the head closest to posterior margin very short, only about 0.45 × maximum diameter of eye (Fig. 45). With head in full-face view the eyes strongly convex, their outer margins conspicuously break the outlines of the sides. (Malaysia (Sabah)).....***fornax*** (p. 80)
- Longest setae on first gastral tergite at least equal to the maximum diameter of the eye. Pair of setae on the dorsum of the head closest to posterior margin longer, at least 0.70 × maximum diameter of eye or usually more. With head in full-face view the eyes more weakly convex, their outer margins at most just touch the outlines of the sides.....30

30 In profile the propodeal dorsum and declivity meet in a distinct sharp angle (Fig. 46). Eyes located at midlength of head in full-face view, EPI 98; eye relatively larger, OI 30. Frontal carinae each with 2 setae present; mesonotum with 1 pair of setae. Larger species with narrower head, HW 0.71, SL 0.84, CI 87. (Malaysia (Sabah)).....***subgracilis*** (p. 101)
- In profile the propodeal dorsum and declivity meet in a bluntly rounded angle or curve (Fig. 50). Eyes located in front of midlength of head in full-face view, EPI 78 – 85; eye relatively smaller, OI 25 - 27. Frontal carinae each with 3 – 4 setae present; mesonotum with 2 - 3 pairs of setae. Smaller species with broader head, HW 0.56 – 0.62, SL 0.56 – 0.72, CI 92 - 95. (Indonesia (Irian Jaya), Papua New Guinea; also in Australia (Queensland)).....***cheesmanae*** (p. 76)

31 Second gastral tergite without setae.....32
- Second gastral tergite with at least one pair of setae.....37

32 Third gastral tergite with a transverse row of 6 – 8 setae present. Anterior clypeal margin in full-face view with a conspicuous long, U-shaped median incision. Strongly polymorphic species. (Malaysia (West Malaysia, Sarawak, Sabah), Brunei, Indonesia (Kalimantan, Sumatra)).....***lisae*** (p. 89)
- Third gastral tergite without setae. Anterior clypeal margin in full-face view at most with a small, shallow median impression or a weak indentation of the margin.....33

33 Leading edges of scapes and lateral margins of head in full-face view with dense, conspicuously elevated short pubescence. Metathoracic spiracles borne on strongly projecting tubercles. Polymorphic species. (Malaysia (Sabah)) .....***horrens*** (p. 86)
- Leading edges of scapes and lateral margins of head in full-face view with minute appressed pubescence only. Metathoracic spiracles not borne on strongly projecting tubercles. Monomorphic species.....34

34 Scape longer, SI 120 – 126. Eyes loctated more posteriorly, EPI 60 – 70. (Papua New Guinea).....***gilvus*** (p. 82)
- Scape shorter, SI 85 – 100. Eyes located more anteriorly, EPI 44 – 58.....35

35 Eye relatively small, OI 23 – 25. In full-face view the outer margin of the eye far inset from the outline of the side of the head, the distance separating them almost equal to the basal width of the scape. (Malaysia (Sabah), Indonesia (Sulawesi), Papua New Guinea).....***dubius*** (p. 78)
- Eye relatively large, OI 27 – 30. In full-face view the outer margin of the eye close to or even interrupting the outline of the side of the head, at maximum the distance separating them only a fraction of the basal width of the scape.....36

36 With mesosoma in profile the outline of the mesonotal dorsum with a long, more or less flat anterior section; the dorsum then passes through a distinct angle or step into a much more steeply descending declivitous posterior face. Scape averaging slightly longer, SI 93 – 100. (Malaysia (West Malaysia), Indonesia (Java), Philippines (Palawan)).....***textor*** (p. 103)
- With mesosoma in profile the outline of the mesonotal dorsum consists of a single convex surface, not divided into a flat anterior section and a posterior declivity that are separated by a step or angle. Scape averaging slightly shorter, SI 85 – 93. (Japan, North Korea).....***gibbosus*** (p. 81)

37 Maxillary palp with 4 segments, labial palp with 3 segments. Setae on gastral tergites 2 - 3 extremely short and inconspicuous, only about 0.20 × the maximum diameter of the eye. (Malaysia (Sarawak), Brunei). .....***reductus*** (p. 98)
- Maxillary palp with 6 segments, labial palp with 4 segments. Setae on gastral tergites 2 - 3 conspicuous, at least 0.50 × the maximum diameter of the eye.....38

38 With propodeum in absolute profile the dorsal surface with a conspicuous abrupt indentation or notch in its outline, close to or at its midlength; in dorsal view this indentation appears as a transverse groove.....39
- With propodeum in absolute profile the dorsal surface without an indentation or notch in its outline; in dorsal view without a transverse groove.....40

39 Head, mesosoma and gaster dark brown to black; dorsal surfaces of head and pronotum matt and dull, blanketed with dense reticulate-punctulate sculpture everywhere. Mesopleuron entirely reticulate-punctulate. Middle and hind tarsi yellow, much lighter than the dark brown to black tibiae, the two strongly contrasting. (Malaysia (Sabah)).....***impressus*** (p. 86)
- Head, mesosoma and gaster light brown; dorsal surfaces of head and pronotum superficially sculptured. Mesopleuron smooth, or at most with faint superficial reticulation. Middle and hind tarsi dull yellow, approximately the same colour as the tibiae, the two not strongly contrasting. (Malaysia (Sarawak)) .....***gaudens*** (p. 81)

40 Head capsule and gaster very dark brown, almost black, very strongly contrasting to the mandibles, antennae, mesosoma, petiole and legs which are all the same shade of yellow. (Sri Lanka).....***bicolor*** (p. 72)
- Head capsule and mesosoma unicolourous or nearly so; colours variable but head and body not strikingly bicoloured as described above.....41

41 In profile the full adult colour of the head, mesosoma and gaster brown to black, all three the same shade or very nearly so.....42
- In profile either the full adult colour of the head, mesosoma and gaster all yellow to light yellowish brown, or the head or gaster, or often both, slightly darker in shade than the mesosoma. (Sri Lanka, China (Hong Kong), Taiwan, Thailand, Malaysia (West Malaysia, Sabah), Brunei, Singapore, Indonesia (Krakatau Is).....***horni*** and ***schimmeri*** (p. 84)

42 Propodeum in profile with a relatively long, flat dorsal surface: length of dorsum almost twice the depth of the declivity to the spiracle, or more. (Myanmar, Thailand, Vietnam, Nepal, China).....***obscurior*** (p. 94)
- Propodeum in profile with a relatively short, convex to almost flat dorsal surface: length of dorsum at most is equal to the depth of the declivity to the spiracle, often less.....43

43 Scape relatively very long, SI 130 – 135. (China (Guilin)).....***antennus*** (p. 72)
- Scape relatively shorter, SI 88 – 125.....44

44 Middle and hind tibiae yellow, the same colour as the tarsi. Median clypeal notch broad and shallow, less than semicircular; in full-face view the maximum depth of the notch only about 0.25 × the distance from the posterior margin of the notch to the clypeal suture. Second and third gastral tergites each apparently with one pair of long setae. (India).....***rector*** (p. 97)
- Middle and hind tibiae brown to blackish brown, darker than the off-white to dull yellow tarsi. Median clypeal notch longer; in full-face view the maximum length of the notch about 0.45 × the distance from the posterior margin of the notch to the clypeal suture, or more. Second gastral tergite with 2 pairs of long setae; third gastral tergite with 3 pairs.....45

45 Middle and hind coxae off-white to yellow, distinctly much lighter in colour than the femora and the mesosoma and strongly contrasting with them. (Thailand, Malaysia (West Malaysia, Sarawak, Sabah), Singapore, Brunei, Indonesia (Java, Sulawesi), Palau Is, Micronesia).....***kraepelini*** (p. 88)
- Middle and hind coxae light to dark brown, about the same colour as the femora and mesosoma, not strongly contrasting. (Malaysia (Sarawak), Indonesia (Sumatra), Philippines (Luzon, Romblon)).....***sundaicus*** (p. 101)

EAST PALAEARCTIC, ORIENTAL, MALESIAN AND POLYNESIAN SPECIES OF *TECHNOMYRMEX*

These regions contain 45 species, of which 41 are endemic, 3 are tramp species and 1 also occurs in northern Queensland, Australia. The species of these regions have never been monographed previously.

Technomyrmex albicoxis Donisthorpe **stat. n.**

Technomyrmex cheesmanae var. *albicoxis* Donisthorpe, 1945: 58. Holotype and paratype workers, INDONESIA: Irian Jaya ("North Dutch New Guinea"), Waigeu Island, Camp Nok, 2500 ft, v.1938 (*L.E. Cheesman*) (BMNH) [examined].

WORKER. *Measurements*: TL 2.6 – 2.8, HL 0.62 – 0.64, HW 0.56 – 0.58, SL 0.66 – 0.68, PW 0.39 – 0.43, WL 0.82 – 0.90 (4 measured). *Indices*: CI 90 – 91, SI 117 – 121, OI 27 – 29, EPI 77 – 81, DTI 135 – 138.
Frontal carina with 2 setae: in profile the posterior at the level of the anterior margin of the eye. Dorsum of head behind this with 1 - 2 pairs of shorter setae above the eye and more posteriorly, about half-way between level of posterior margin of eye and posterior margin of head, is a final pair of setae, located well in front of the posterior margin; posterior margin itself without setae. All dorsal setae on the head are shorter than the maximum diameter of the eye. With head in full-face view the anterior clypeal margin with a feeble shallow median indentation; sides of head shallowly convex and the posterior margin shallowly indented medially. Eyes located in front of midlength (EPI above) and their outer margins just break the outline of the sides of the head in full-face view. With mesosoma in profile the mesonotal outline forms a more or less flat shallow slope but has a short declivitous face posteriorly. Number of setal pairs on mesosoma:

pronotum 2 – 3; mesonotum 1 - 2, located posteriorly just before the short declivity; propodeal dorsum 0; lateral margin of propodeal declivity 2 - 3. Propodeum in profile with the dorsum shallowly convex and rounding into the declivity through a curve. Straight-line length of propodeal dorsum in profile is slightly greater than depth of declivity to the spiracle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite about equal to the maximum diameter of the eye. Head, mesosoma and gaster blackish brown. Middle and hind coxae, trochanters and tarsi yellow. Femora brown except basally, close to trochanters, where they are yellow. Tibiae variable within series: often basal one-quarter to one-third yellow, remainder brown, but sometimes with almost all of tibiae yellow.

Originally described as a variety of *cheesmanae*, but *albicoxis* has fewer setae on the head and all of them are shorter than the maximum diameter of the eye. It also has fewer setae on the mesosoma and a propodeum whose dorsal length is greater than the depth of the declivity to the spiracle. *T. albicoxis* keys out with *mixtus*, a member of the same species complex. The two are easily separated by colour of the middle and hind coxae and the other characters given in the key.

The single specimen from Lakekamu Basin, below, has the propodeum more angular than the type-series but the difference currently seems insignificant for consideration as a species-rank character.

MATERIAL EXAMINED
Indonesia: Irian Jaya, Waigeu I. (*L.E. Cheesman*). **Papua New Guinea**: Gulf Prov., Ivimka camp, Lakekamu Basin (*R.R. Snelling*); N. Dist., Eiwo..(illegible) (*B.B. Lowery*); Chimbu Prov., Crater Mt. Station, 6 mi. E Haia (*D. Wright*).

Technomyrmex albipes (F.Smith)

(Fig. 1)

Formica (Tapinoma) albipes Smith, F. 1861: 38. Syntype workers, INDONESIA: Sulawesi, "Tond" (= Tondano) (*A.R. Wallace*) (OXUM) [examined]. [Combination in *Technomyrmex* by Emery, 1888: 392.] (See note 1.)

Formica detorquens Walker, 1859: 372. Syntype queen (alate), SRI LANKA: no loc. (BMNH) [examined]. [Combination in *Technomyrmex* and synonymy with *albipes* by Donisthorpe, 1932a: 575; here confirmed.] *Nomen oblitum.* (See notes 1 and 2.)

Crematogaster forticulus Walker, 1859: 372. Holotype queen (dealate queen, not worker), SRI LANKA: no loc. (BMNH) [examined]. [Combination in *Technomyrmex* and synonymy with *albipes* by Donisthorpe, 1932a: 576; here confirmed.] *Nomen oblitum.* (See note 1.)

Tapinoma nigrum Mayr, 1862: 703. Syntype workers, SRI LANKA: no loc. (NHMW) [examined]. [Synonymy by Mayr, 1876: 83; here confirmed.]

Tapinoma albitarse Motschoulsky, 1863: 14. Syntype worker and queen, SRI LANKA: no loc. (Type-depository not known; no types known to exist). [Synonymy by Emery, 1893: 249.]

Technomyrmex albipes var. *bruneipes* Forel, 1895: 466. Syntype workers, queen and males, SRI LANKA: no loc., III.94 (*Yerbury*) (MHNG) [examined]. **Syn. n.** (See note 3.) [Raised to species by Collingwood & Agosti, 1996: 361.]

Technomyrmex albipes r. wedda Forel, 1913a: 663. Syntype workers, SRI LANKA: Bandarawella, 1899 (*W. Horn*) and Nalanda, 1899 (*W. Horn*) (MHNG) [examined]. **Syn. n.** (See note 4).

NOTES
1. *T. albipes* (F. Smith) is regarded as the valid name for this species despite the temporal priority of the two Walker names, which are treated here as *nomina oblita* so as to preserve prevailing usage, as recommended in the latest edition of the International Code of Zoological Nomenclature (1999, Article 23.9). This course of action was suggested earlier, but for somewhat different reasons, by Wilson & Taylor

(1967: 84). Justification for this decision comes from the fact that both Walker names (*detorquens* and *forticulus*) occur only in their original descriptions and in a few later lists and catalogues (*e.g.* Donisthorpe, 1932; Chapman & Capco, 1951; Bolton, 1995b). The name *T. albipes*, on the other hand, occurs commonly in the literature because of its abundance and huge range, its tramping ability, its propensity for colonising plantations of tree crops in the Old World Tropics, and also because if its historical confusion with other taxa; it is the name used for the species in all other references noted in this paper. Conspecificity of the worker-based *albipes* with the queen-based *detorquens* and *forticulus* has been confirmed by comparison of all the type-material with more recent series that contain both castes.

2. Donisthorpe (1932) stated that the type-series of *detorquens* consisted of two alate queens. Walker material of this taxon in BMNH consists of one alate queen and one male, the former with type-labels applied by Donisthorpe, the latter without them. This implies that one of the original syntype queens has been lost and that probably Donisthorpe never saw the male, or that he did and discounted it as it was not mentioned by Walker. To select the remaining syntype queen as a lectotype is redundant as the identity of the taxon is assured by its surviving certain syntype.

3. Forel (1895: 467) listed nine localities under *T. albipes* but did not state which was the type-locality for his var. *bruneipes*, which was merely mentioned in passing in the text of *albipes*. The series noted in the taxonomic synopsis above bears red "*bruneipes* typus" labels in Forel's collection and is accepted as the type-series; other series mentioned by him are not so labeled but are conspecific. The name was misspelled as *bruniceps* by Chapman & Capco (1951: 194).

4. Surviving syntypes of *wedda* consist of two workers. Both are abraded, badly damaged (the Nalanda specimen lacks its gaster) and are pale in colour, probably tenerals as they correspond to such forms from elsewhere.

WORKER. *Measurements*: TL 2.4 – 2.9, HL 0.56 – 0.63, HW 0.52 – 0.58, SL 0.48 – 0.58, PW 0.35 – 0.42, WL 0.66 – 0.78 (50 measured). *Indices*: CI 87 – 95, SI 91 – 102, OI 24 – 27, EPI 70 – 88, DTI 110 – 124.

Frontal carina with 2 (very rarely 3) setae: in profile the anteriormost seta at the torulus, the posteriormost seta approximately at the level of the anterior margin of the eye. Dorsum of head posterior to this entirely lacks setae. With head in full-face view the anterior clypeal margin with a very weak, shallow median indentation; sides of head shallowly convex and the posterior margin with a small shallow indentation medially. Eyes located in front of midlength, EPI < 90; outer margin of eye usually just fails to break, or sometimes just touches, the outline of the side. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Number of setal pairs on mesosoma: pronotum 1 – 3; mesonotum 0 – 1 (usually 0); propodeal dorsum 0; lateral margins of propodeal declivity 1 – 2 (very rarely 3), usually with one just above the spiracle, another higher up. With the propodeum in profile its dorsum and declivity meet in a short, blunt, but very narrowly rounded curve, not a distinct sharp angle. Straight-line length of propodeal dorsum in profile is less than depth of declivity to spiracle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is usually slightly less than the maximum diameter of the eye but sometimes the two are subequal. Head, mesosoma, petiole and gaster blackish brown to black; in profile the gaster is often slightly lighter than the mesosoma. Coxae, femora and tibiae uniformly blackish brown to black, same colour as the mesosoma or gaster; never with strongly contrasting lighter coxae. Tarsi of middle and hind legs white to dull yellowish, paler than the tibiae.

Colour of the mandibles and antennae is variable in *albipes*. The mandible varies from the same dark colour as the head capsule to yellowish, with all intermediate shades present. The scape is usually about the same shade as the head capsule; the funiculus may be the same colour or entirely lighter, or the apical few segments alone may be lighter. These variations are gradient and are not considered taxonomically significant.

Distinct morphological intercastes between workers and queens, such as are

relatively common in *vitiensis, moerens, brunneus, pallipes* and other species of the *albipes* group, where ocelli are present and the mesoscutellum and metanotum are developed as separate or semi-separate sclerites in otherwise worker-like forms, appear absent from material examined of genuine *albipes*. Only a few basically very worker-like forms with slightly posteriorly expanded mesonota have been seen. This observation may be merely a sampling artifact indicating that most *albipes* material examined has been of foragers, not from nest samples, as in other species where intercastes have been confirmed they are confined to reproductive behaviour within colonies and do not undertake foraging activities. However, 24 samples provided in alcohol by Martin Pfeiffer (Universität Ulm), collected at Banting, West Malaysia and Tawau, Sabah, East Malaysia, failed to produce a single obvious intercaste, although many of the samples included brood and fragments of nest material; one had brood and ergatoid males in it and another contained a dealate queen.

In the past many samples of small, darkly coloured *Technomyrmex* in which the gaster is setose and the tarsi are white or yellow have been misidentified as *T. albipes*, but in particular *albipes* has been confused with *vitiensis, difficilis, pallipes, brunneus, jocosus* and *moerens*. The first three of these are also common tramp species and *vitiensis* was for a while considered a junior synonyn of *albipes*. *T. vitiensis*, along with its Afrotropical relative *moerens*, closely resembles *albipes*, but both have larger eyes, longer scapes and a longer promesonotum than in *albipes*. Also, the mesonotal profile in *albipes* workers is evenly curved, whereas in both other species there tends to be an angle or step in the outline, resulting in differently sloped dorsal and declivitous mesonotal faces; see also the notes under *vitiensis*. As for *difficilis*, the presence in that species of a pair of setae on the dorsal head behind the level of the posterior margin of the eye easily distinguishes them. However, workers of *difficilis* in which the head is abraded are difficult to distinguish from *albipes*; see notes under *difficilis*. *T. pallipes* should not be confused with *albipes* as it always has two pairs of short stubbly setae on the dorsal head behind the level of the posterior margin of the eye. *T. brunneus* has mandibular grooves not seen in *albipes*, as well as other different characters, and *jocosus* has a very different arrangement of setae: neither should be confused with *albipes*.

Of all the numerous names formerly included as synonyms and infraspecific taxa of *albipes*, as catalogued in Bolton (1995b), only those in the taxonomic synopsis above are retained as conspecific. The others have been dispersed to a number of separate valid species, or are synonyms of other species, as indicated in the synonymic list of species. Reasons for the separation of these species from *albipes* are given under their individual entries.

The correct identities of some species referred to as *albipes* in relatively recent publications can be ascertained with some degree of certainty, but those of earlier studies (*e.g.* Stärcke, 1940), and even some more recent ones (*e.g.* Brophy, 1994) in the absence of the relevant specimens, must remain equivocal. Material mentioned as introductions in British hothouses by Donisthorpe (1927) consists of series of *albipes, vitiensis* and *pallipes*. References to *albipes* in recent Chinese and Japanese works such as Imai, Hikara, Kondoh, *et al.* (2003), Zhou (2001), Wu & Wang (1995) and the intensive studies by Tsuji, Furukawa, *et al.* (1991), Yamauchi, Furukawa, *et al.* (1991), Tsuji & Yamauchi (1994) and Ogata, Murai, *et al.* (1996), are all *brunneus*. Also referable to *brunneus* is Radchenko's (2005) record of "*albipes*" from North Korea. The discussions of *albipes* in Bourke & Franks (1995), based on these Japanese publications, should also be referred to *brunneus*. Recent Australian references to *albipes* in Shattuck (1999), and Andersen's (2000) unnamed fig. 29 are probably all *difficilis*, and this is also the species which has recently colonised Florida so successfully (Deyrup, 1991; Vail, Davis, *et al.*, 1994; Deyrup, Davis & Cover, 2000; Warner, 2003). The species referred to as *albipes* by Brown (1958) in New Zealand is probably *jocosus*. The short discussion of *albipes* by Shattuck (1992b) appears to be a fusion of several species; it certainly includes *vitiensis* as that is the only species known to occur in conservatories in Golden Gate Park, California. The vast amount of Pacific Islands material listed in Wilson & Taylor (1967) certainly includes both *albipes* and *vitiensis*, and probably also *difficilis*; a critical re-assessment of the entire collection

would be needed to resolve the identities. Terron (1972) presented some notes on alate and ergatoid males of a species close to *albipes*, which may refer to *moerens* or perhaps even *pallipes*.

T. albipes is an extremely successful tramp species that nests and forages both terrestrially and arboreally, and may enter houses. Workers may be found under stones, in and under fallen wood and in tree stumps, on the forest floor and in the leaf litter, on low vegetation and in twigs, on tree trunks and up into the canopy. A single record is known from internodes of the myrmecophyte *Humboldtia laurifolia*, from Gilimale in Sri Lanka. They also colonise more restricted spaces such as plant spathes and rot holes in wood and they attend a wide range of homopterous insects for honeydew. Although usually regarded as a pest or invasive species, for instance Sulaiman (1997) observes that it tends the mealybug responsible for pineapple wilt disease in Sri Lanka, *albipes* also has value as an important predator of the eggs of destructive insect species on coconuts in Sri Lanka (Way, Cammell, *et al.* (1989).

MATERIAL EXAMINED

Sri Lanka: Palliyagedera (*B. Bolton*); Sitrakala (*B. Bolton*); Kandy Distr., Hantana (*M.&J. Wasbaur*); Katalu Oya Estate (*M.&J. Wasbaur*); Nuwara Eliya, Horton Plains N.P. (*M.&J. Wasbaur*); Anuradhapura Dist., Maha Illupullansa Res. Farm (*T.F. Halstead*); Prov. Uva, Egodapitiya Nilgala (*Karunaratne & Halstead*); Rat. Dist., Induruwa Jungle, Gilimale (*Krombein, Karunaratne, Norden & Norden*); Colombo (*Biró*); nr Kandy (*E.S. Brown*); no loc. (*Yerbury*); no loc. (*Walker*); Bandarawella (*W. Horn*); Nalanda (*W. Horn*). **India**: Karnataka, Mysore (*H. Bharti*); Anamalai Hills, Topslip (*Ross & Cavagnaro*); Jowalapur, Saharanpur (*C. Chatterjee*); Assam, Tocklai Exp. Stn (*G.M. Das*); Coimbatore (*J. Noyes*); Mudigere (*J. Noyes*); Valapai (*J. Noyes*). **Vietnam**: Can Tho, Phong Dien (*M. Barzman*); Can Tho, Can Tho (*M. Barzman*); Dong Hoi (*A.G. Radchenko*). **Singapore**: no loc (*Biró*). **Malaysia**: West Malaysia, Banting (*M. Pfeiffer*); Selangor, Klang (*B. Fiala*); Kuala Lumpur (*M.J. Way*); Bukit Fraser (*M. Casiraghi*); Sarawak, 2 km N Santubong (*Heydon & Fung*); Sarawak, 4th Div., Gn. Mulu N.P. (*M. Collins*); Sabah, Danum Valley (no collector's name); Sabah, Crocker Range, Mahua Waterfall (*Z. Flavio*); Sabah, Tawau (*M. Pfeiffer*). **Philippines**: Mindoro, San Jose (*E.S. Ross*); Luzon, Laguna, Los Banos, Mt Makiling (*S. Schödl*). **Indonesia**: Java, Bogor (=Buitenzorg) (*Karavaiev*); Lombok, Sesaot (*Imai, Kubota & Iskandar*); Lombok, Sapit (*H. Fruhstorfer*); Bali, Ubud (*J.E. Tobler*); Ambon (*Karavaiev*); Makassar (*Karavaiev*); Sulawesi (*A.R. Wallace*); Sulawesi Utara, Dumoga-Bone N.P. (*P. Hammond*); Dumoga-Bone N.P. (*N. Stork*); Seram, Manusela N.P. (*M. Brendell*); Irian Jaya, PT, Freeport Concession, Wapoga camp (*R.R. Snelling*); Freeport Concession, Siewa camp (*R.R. Snelling*); Maffin Bay (*E.S. Ross*); Biak I. (*G.E. Bohart*). **Papua New Guinea**: Northern Dist., Managalase Area (*R. Pullen*); 40 km. W Madang (*P.S. Ward*); 24 km N Madang (*P.S. Ward*); 9 km. NW Madang (*P.S. Ward*); 40 km N Madang (*R.C. Buckley*); 25 km SSW Madang (*Gullan & Buckley*); Madang Prov., Baitabag (*V. Novotny*); Madang Prov., Nobonob Hill (*M. Wasbauer*); Madang Prov., Baiteta For. (*D.W. Davidson*); Morobe, Wau (*R.S. Anderson*); Wau (*J.H. Martin*); Baiteta (*M. Wasbauer*); Gulf Prov., Kikori Delta, SE of Veiru (*J. Morrison*); Gulf, Ivimka Res. Station, Lakekamu Basin (*Heydon, Schiff & Sears*); Ivimka Camp, Lakekamu Basin (*R.R. Snelling*); Bayer Riv. Sanctuary (*MacKay & Whalen*); Huon Pen., Mongi Watershed, Butala (*E.O. Wilson*); Erima, Astrolabe Bay (*Biró*); Stephansort, Astrolabe Bay (*Biró*); Huon Gulf, Simbang (*Biró*); Huon Gulf, Sattelberg (*Biró*); Huon Gulf, Gingala (*Biró*); Lae, Timber Track (*R.W. Taylor*); Lae, Oomsis Creek (*T. Schoener*); Lae, Markham R. (*P.S. Ward*); Lae, Botanical Gardens (*P.S.Ward*); Kairiru I., nr Wewak (*O.W. Barrell*); Ambunti (*P.S. Ward*); Western Prov., Nomad (*I.M. Redmond*); S. Highlands Prov., Pungia, Tagaru (*B.M. Thistleton*); W. Highlands Prov., Mt Hagen (*B.M. Thistleton*); New Britain (*B.A. O'Connor*); New Britain, Cape Hoskins (*J. Stibick*); New Britain, Rabaul (*R.W. Paine*); Rabaul (*J.L. Froggatt*); Umboi (Rooke) I. (*R.W. Paine*). **Solomon Is**: Guadalcanal, Honiara (*N.L.H. Krauss*); Honiara Dist. (*E.S. Brown*); Guadalcanal (*R.A. Lever*); New Georgia (*H.T. Pagden*); Sta Isabel, Vittora (*R.A. Lever*); Malaita, Su'u (*R.A. Lever*). **Australia**: n.e. Queensland, WNW Cape Tribulation (*Monteith, Yeates & Thompson*); Qld, Cairns (*R.W. Taylor*). **Palau Is**: Babeldaob, Ngarard-Ngarasumao (*T. Esaki*); Palau Is, Koror, Rock Is (*J.E. Tobler*). **Micronesia**: Yap Is (*R.J. Goss*); Yap Is (*N.L.H. Krauss*); Yap I. (*J.E. Tobler*). **Hawaii Is**: Oahu, Honolulu, Aloha Stadium (*N.D. Tsutsui*). **Tanzania**: Mombasa (*Ferrari*). **South Africa**: Witwatersrand, on goods imported from Mauritius (*M. Bolton*). **Madagascar**: Prov. Toamasina, S.F. Tampolo, NNE Fenoarivo Atn. (*B.L. Fisher*); Toamasina, For. Tampolo, NE Fenerive-Est (*Fisher et al.*); Toamasina, Mont Akirindro, NNW Ambinanitelo (*Fisher et al.*); Toamasina, Ambohidena (*Fisher et al.*); Toamasina, Mahavelona, For. d'Ambodariamy (*A. Pauly*); Toamasina, Vavatenina (*A. Pauly*); Prov. Toliara, Beza-

Mahafaly, E Betioky (*B.L. Fisher*); Nosi Mangabe (*P.S. Ward*); 11 km SE Ampasimanolotra (= Brickaville) (*P.S. Ward*); 19 km ESE Maroantsetra (*P.S. Ward*); Ambanizana (*B.L. Fisher*); Ambanizana, Andranobe (*B.L. Fisher*); Tampolo, N Fenoarivo (*L.A. Nilsson*); Rantabe (*Pettersson & Nilsson*). **Mauritius**: Port Louis (*R. Mamet*); head of Port Louis valley (*H. Robertson*); Le Pouce Mt (*W.L. Brown*); Le Pouce (*P.S. Ward*); Magenta (*P.S. Ward*); Macchabee For. (*P.S. Ward*); Bassin Blanc (*P.S. Ward*); Reduit (*R. Mamet*). **Seychelles Is**: Mahé (no collector's name); Mahé, Anse Les Pins (*W. Middlekauff*); Mahé (*Sladen Trust Expd*); no loc. (*E.E. Green*); Cousin I. (*G.M. Bathe*); Praslin I. (*U. Müller*); Big Sister I. (*U. Müller*); Little Sister I. (*U. Müller*). **Réunion I.**: Etang de St Paul (*S. Zoia*); **Rodrigues I.** (*J.R. Williams*). **Chagos Archipelago**: Diego Garcia (*A.M. Hutson*). **United Kingdom**: England, Cornwall, Eden Project, in hothouse (no collector's name); Eden Project, in hothouse (*K. Jackson*); Surbiton, orchid house (*W.J. Kaje*); Guildford, Longdown, orchid house (no collector's name). **Italy**: Milan, Malpensa airport (no collector's name).

Technomyrmex antennus Zhou

(Fig. 72)

Technomyrmex antennus Zhou, 2001: 159, 241, figs. 317, 318. Holotype worker, CHINA: Guangxi, Huaping Natural Reserve, 25°40′N, 109°′W, 9.vii.1995 (*S. Zhou*); paratype workers, Guangxi, Rongan County, 21.ix.1995 (*S.Zhou*), Guangxi, Lingui County, 7.vii.1996 (*S. Zhou*) (GNUC) [not seen]. (See note.)

NOTE
I have not examined type-material of this species but have seen a series collected and identified by Dr Shanyi Zhou; see material examined, below.

WORKER. *Measurements*: TL 3.7 – 3.9, HL 0.79 – 0.85, HW 0.70 – 0.74, SL 0.92 – 0.96, PW 0.51 – 0.53, WL 1.20 - 1.26 (7 measured). *Indices*: CI 85 – 89, SI 130 – 135, OI 28 – 30, EPI 69 – 82, DTI 157 – 163.
Head behind clypeus, dorsum of mesosoma, declivity of propodeum and first gastral tergite all entirely lack setae. Gastral tergites 2 – 4 with long stout setae present that are slightly longer than the maximum diameter of the eye: second gastral tergite with 2 – 3 pairs, third and fourth tergites each with 3 – 4 pairs. Anterior clypeal margin with an approximately semicircular median notch. The margins of the notch meet the lateral portions of the anterior margin through rounded curves, not sharp angles. Posterior margin of head evenly shallowly concave. With head in full-face view the outer margins of the eyes fail to touch the outline of the convex sides of the head. Scape index 130 or more. In dorsal view the metathoracic spiracles are separated from the metanotal groove by a distance slightly more than one spiracle diameter. Mesosoma relatively long, DTI 157 – 163. In profile the propodeal dorsum shallowly convex, its straight-line length less than the depth of the declivity to the spiracle. In profile the head, mesosoma, petiole and gaster all the same shade of brown, or very nearly so. Anterior coxa brown; middle and hind coxae dull yellow and lighter than the mesosoma. All trochanters yellow. Middle and hind femora and tibiae the same dull yellow colour as their coxae or very nearly so (femora may be slightly infuscated medially). Tarsi somewhat lighter than the femora and tibiae.
Closely resembling *obscurior* but with a shorter propodeum that has a weakly convex dorsum, and with middle and hind coxae that are about the same colour as the femora.

MATERIAL EXAMINED
China: Guangxi, Guilin, Yaoshan (*P. Hammond*); Guangxi, Guilin, Mao Er Mt. Nat. Res. (*S. Zhou*).

Technomyrmex bicolor Emery

Technomyrmex bicolor Emery, 1893: 249. Syntype worker, SRI LANKA: Kandy (*E. Simon*) (MCSN) [examined].

WORKER. *Measurements*: TL 2.9, HL 0.62, HW 0.55, SL 0.70, PW 0.40, WL 0.82. *Indices*: CI 89, SI 127, OI 27, EPI 62, DTI 135.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a semicircular median notch which is conspicuous and has sharply defined margins; inner margin of notch rounds into lateral portion of anterior clypeal margin. Posterior margin of head shallowly indented medially in full-face view and outer margins of eyes just fail to break the outline of the sides. Dorsum of mesosoma and declivity of propodeum without setae. Metathoracic spiracles very close to metanotal groove. In profile the length of the propodeal dorsum is slightly greater than the depth of the declivity to the spiracle. First gastral tergite without setae; second gastral tergite with 1 pair of setae (the sclerite is abraded, it is possible that 2 pairs were originally present); third gastral tergite with 2 – 3 pairs; tergite 4 is embedded in glue but 2 – 3 pairs of setae should probably be present. Strikingly bicoloured species: head capsule and gaster very dark brown, almost black; mandibles, antennae, mesosoma, petiole and all leg segments the same shade of clear yellow.

The colour pattern of *bicolor*, with head and gaster uniformly very dark brown and the mesosoma, petiole and all the appendages a strongly contrasting uniform yellow, is unique in the genus. Some species in the *bicolor* group have the head and mesosoma lighter than the gaster but no other has the above arrangement.

Only a single syntype of *bicolor* was available for examination and apparently no other collections of the species have ever been made. That is very surprising, given the striking colour pattern of the species and its well-known locality.

MATERIAL EXAMINED
Sri Lanka: Kandy (*E. Simon*).

Technomyrmex brunneus Forel **stat. rev.**

(Fig. 38)

Technomyrmex albipes r. *brunneus* Forel, 1895: 467. Holotype worker, INDIA: Poona, II/9, 1901 (*Wroughton*) (MHNG) [examined]. [Raised to species by Bingham, 1903: 302; later reduced again to subspecies of *albipes* by Emery, 1913: 43 and maintained as such by subsequent authors to Bolton, 1995b: 402.]
Technomyrmex modiglianii var. *angustior* Forel, 1912: 71. Syntype workers, TAIWAN: Akau, xii, (*H. Sauter*) (MHNG) [examined]. **Syn. n.**

WORKER. *Measurements*: TL 2.4 – 2.8, HL 0.62 – 0.72, HW 0.59 – 0.69, SL 0.50 – 0.64, PW 0.43 – 0.47, WL 0.75 – 0.86 (30 measured). *Indices*: CI 90 – 97, SI 91 – 98, OI 23 – 27, EPI 112 – 136, DTI 109 – 119.
Basal half of mandible with a longitudinal groove on the dorsal surface close to the outer margin. Frontal carina with 2 (very rarely 3) setae: in profile the posteriormost seta close to or at the level of the anterior margin of the eye. Dorsum of head posterior to this entirely lacks setae. With head in full-face view the anterior clypeal margin with a minute median indentation. Sides of head convex. Eyes located at or just behind the midlength, EPI > 100; outer margin of eye touches, or usually just breaks, the outline of the side. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Propodeal dorsum and declivity meet in an angle; straight-line length of propodeal dorsum in profile is less than depth of declivity to the spiracle. Number of setal pairs on mesosoma: pronotum 1 – 3 (usually 2); mesonotum 1; propodeal dorsum 0; lateral margin of propodeal declivity 1. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is usually slightly less than the maximum diameter of the eye but sometimes the two are subequal. Head, mesosoma, petiole and gaster blackish brown to black. Coxae, femora and tibiae uniformly blackish brown to black, same colour as the mesosoma or gaster; never with strongly contrasting lighter coxae. Tarsi of middle and hind legs

yellowish white to dull yellow, much paler than the tibiae.

T. brunneus is easily distinguished from *albipes*, and all other former infraspecific taxa and synonyms that were attached to *albipes*, by its possession of a longitudinal groove on the mandible and relatively posteriorly located eyes. The presence of a mandibular groove is shared only with *mandibularis* of Malaysia, which also has the eyes located posteriorly, but *mandibularis* has an unsculptured, highly polished head capsule, a row of short erect setae on the dorsal surface of the scape and numerous setae on the dorsum of the head behind the level of the posterior margin of eyes, all of which are absent from *brunneus*.

The holotype of *brunneus*, as well as being the most westerly individual seen of this species, is also the palest in colour, with a medium brown head and mesosoma and a blackish brown mottled gaster. I strongly suspect that the specimen had not attained full adult colour when captured as it matches some immature workers included in a sample from Kyushu.

This species is widely distributed in the Oriental region proper and is quite common in parts of China, Taiwan and Japan. It is certainly the species described and illustrated as *albipes* by Imai, Kihara, Kondoh, *et al.* (2003) and Zhou (2001), and is probably the species included as *albipes* by Wu & Wang (1995), although the latter's sketch is quite crude. It is certainly the species intensively studied in Japan by Tsuji, Furukawa, *et al.* (1991), Yamauchi, Furukawa, *et al.* (1991), Tsuji & Yamauchi (1994) and Ogata, Murai *et al.* (1996).

Yamauchi, Furukawa, *et al.* (1991) say that this species in Japan forms huge polydomous colonies that may contain millions of adults. It often nests in dead standing trees and has a complex reproductive system. New nests are begun by recently dealate queens, following a nuptial flight with alate males, as is usual in ants. The newly established fecund queen produces large numbers of workers and about an equal number of fertile apterous intercastes that are morphologically intermediate, in varying degree, between workers and queens. She also produces wingless (ergatoid) males, which mate with the intercastes and produce offspring of both sexes and all castes. Eventually the foundress queen dies and reproductive behaviour is continued only by the intercaste females and the ergatoid males. Intercaste females do not conduct foraging activities and are not found outside nests, and nests in this condition may undergo fission and bud off new colonies. In the fullness of time the intercaste females and ergatoid males produce new generations of alate queens and alate males, to complete the cycle.

An interesting point which the authors make is that there appears to be no trophallaxis in this species and nutrient transfer is achieved entirely by the distribution of trophic eggs, which are produced by all the female castes including the workers. This does not correspond to the situation in *difficilis*, where trophallaxis appears to be present (Warner, 2003).

Tsuji, Furukawa, *et al.* (1991) analysed the female intercastes and found that all had spermathecae, which were absent from genuine workers. They were able to distinguish three distinct morphological intercastes (major, medium and minor) between fully developed queens and true workers, based on number of ocelli present and the degree of development of the mesosoma. Most intercastes were inseminated and had developed ovaries, and the number of ovarioles increased with body size from minor to major. Alate queens had a larger body size, far more ovarioles and larger spermathecae than the largest of the apterous intercastes.

The distribution of *brunneus* is Oriental. Its distribution in Japan is illustrated in Imai, Kihara, Kondoh, *et al.* (2003). The discovery of a single specimen from Brunei, apparently without the species being present in intervening states, is anomalous and the record probably represents an introduction or perhaps a mislabeling of the specimen.

MATERIAL EXAMINED

Sri Lanka: Kandy (*Bingham*). **India**: Bandra (*Jayakar*); Poona (*Wroughton*). **Vietnam**: Ha Tay Prov., Ba Vi Dist., Ba Vi (*D.N. Cuong*); Ba Be N.P., Bac Kan (*Bui & Eguchi*). **China**: Guangxi, Shiwandashan Nat. Res. (*J. Huang*); Canton (*W.E. Hoffman*). **Taiwan**: Taipei (no collector's

name); Akau (*Sauter*). **Japan**: Okinawa, Naha (*H. Nagasa*); Okinawa, Kadena (*S.M. Fullerton*); Okinawa: Nakijin, Uebaru (*M. Hayashi*); Kagoshima Pref., Yakushima I, Onoaida trail (*K. Ogata*); Kyushu, Miyazaki Pref., Aoshima Is (*K. Ogata*); Kyushu, Kagoshima Pref., Cape Sata (*K. Ogata*); Ryukyu Is, Iriomote I, Shirahama (*H. Kojima*). **Brunei**: Bukit Sulang, nr Lamunin (*N. Stork*).

Technomyrmex butteli Forel

(Fig. 39)

Technomyrmex butteli Forel, 1913d: 97, fig. C. Syntype workers and males, MALAYSIA: Malacca, Taiping, Maxwell's Hill, No. 79a (v. *Buttel-Reepen*) (MHNG) [examined].

WORKER. *Measurements*: TL 3.0 – 3.4, HL 0.64 – 0.69, HW 0.58 – 0.61, SL 0.68 – 0.72, PW 0.45 – 0.48, WL 0.92 – 1.00 (12 measured). *Indices*: CI 85 – 92, SI 114 – 124, OI 25 – 28, EPI 80 – 92, DTI 123 – 136.
Frontal carina with 2 setae: in profile the anterior seta above the torulus, the posterior seta approximately at the level of the anterior margin of the eye. Dorsum of head posterior to this entirely lacks setae. With head in full-face view the anterior clypeal margin at most with a slight median indentation or small shallow concavity (approximately transverse in the most worker-like intercastes); posterior margin of head approximately transverse or with a slight median indentation. Eyes located just in front of midlength; outer margin of eye just touches or very slightly interrupts the outline of the side in full-face view. With mesosoma in profile the mesonotum appears somewhat swollen and its dorsal outline is strongly convex. Number of setal pairs on mesosoma: pronotum 3 – 4 (usually 3); mesonotum 1, located on the posterior half of the strongly curved surface; propodeal dorsum 0; lateral margins of propodeal declivity 2 - 3. Propodeum in profile appears swollen and somewhat hypertrophied, the shallowly convex and quite short dorsum curves broadly into the declivity, the two surfaces not separated by an angle. Dorsum of mesosoma is usually uniformly blanketed by very fine and very dense reticulate-punctulation; in some samples this sculpture is weaker on the pronotal dorsum than elsewhere. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is greater than the maximum diameter of the eye. Head, mesosoma, petiole and gaster dark brown to blackish brown. Coxae, femora and tibiae uniformly dark brown to blackish brown, approximately the same colour as the mesosoma or gaster; never with strongly contrasting lighter coxae. Tarsi of middle and hind legs dull yellowish to pale brown, lighter than the tibiae.

Morphological intercastes between workers and queens are present in which one or three ocelli are developed and in which the mesoscutellum occurs as a projecting separate or semi-separate sclerite in otherwise worker-like forms.

At first glance workers of this species resemble *albipes* specimens in which the mesosomal sclerites have become bloated, swollen and more rounded, and the two species are certainly closely related. However, workers of *butteli* tend to be somewhat larger than those of *albipes* (HW 0.58 – 0.61 in the former, as opposed to HW 0.52 – 0.58 in the latter) and always have longer scapes, with SI 114 – 124 in *butteli* and SI 91 – 102 in *albipes*. Also, in *butteli* the longest setae on the first gastral tergite are longer than the maximum diameter of the eye and the propodeal dorsum in profile rounds broadly into the declivity. The pronotum of *butteli* is relatively broader than that of *albipes*, so that in the former PW is 0.77 – 0.80 × HW, while in the latter PW is 0.69 – 0.74 × HW.

All *butteli* material examined was collected on vegetation, usually tree trunks or low canopy.

MATERIAL EXAMINED
Malaysia: Neg. Sembilan, Pasoh For. Res. (*Brendell, Jackson & Lewis*); Pasoh For. Res. (*Brendell, Jackson & Ficken*); Pahang, Cameron Highlands, Tanah Rata (*P. Cechovsky*);

Malacca, Taiping, Maxwell's Hill (*v. Buttel-Reepen*); Sarawak, Semengoh For. Res., SW Kuching (*R.W. Taylor*); Sabah, Kinabalu Park (*F. Yamane*); Sabah, Sayap Kinabalu (*S. Yamane*); Sabah, Poring (*F. Yamane*); Sabah, Gn. Silam (*R. Leakey*); Sabah, Crocker Range, Mahua Waterfall (*Z. Flavio*); Sabah, For. Camp N of Kalabakan (*Y. Hirashima*). **Indonesia**: N. Sumatra, Parapat, Danau Toba (*S. Yamane*); N. Sumatra, G. Leuser N.P., Bt Lawang (*S. Yamane*); Sulawesi Utara, Dumoga-Bone N.P. (*N. Stork*).

Technomyrmex certus Bolton **sp. n.**

(Fig. 49)

HOLOTYPE WORKER. *Measurements*: TL 2.1, HL 0.54, HW 0.51, SL 0.52, PW 0.32, WL 0.68. *Indices*: CI 94, SI 102, OI 23, EPI 70, DTI 137.
Frontal carina with 3 setae: in profile the posteriormost of these at the level of the anterior margin of the eye. Dorsum of head behind this with 3 pairs of short setae and the posterior margin with a transverse row of 6 – 8 setae across its width. All dorsal setae on the head are shorter than the maximum diameter of the eye. With head in full-face view the anterior clypeal margin with a small shallow median impression; sides of head shallowly convex and the posterior margin with a slight median impression. Eyes small, located in front of midlength and their outer margins just fail to touch the outline of the sides of the head in full-face view. With mesosoma in profile the mesonotal outline evenly shallowly convex. Number of setal pairs on dorsal mesosoma: pronotum 4; mesonotum 3; propodeal dorsum 0; lateral margin of propodeal declivity 2; all setae shorter than maximum diameter of eye. Propodeum in profile with the dorsum flat, meeting the declivity in an angle. Straight-line length of propodeal dorsum in profile is much less than depth of declivity to the spiracle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite less than the maximum diameter of the eye. Head, mesosoma, petiole and gaster black. Middle and hind coxae, femora and tibiae blackish brown to black; basitarsi infuscated, slightly lighter than tibiae but not distinctly much paler.

Holotype worker, **Brunei**: K. Belalong, E115° 7', N4° 34', viii. 1991, mixed dipt. for., *Dryobalanops beccarri*, site 2, fog 10, 300 m. alt. (*N. Mawdsley*) (BMNH).

A small-eyed, uniformly darkly coloured arboreal species that superficially resembles the much commoner *albipes* but is strikingly more densely setose on the head.

Technomyrmex cheesmanae Donisthorpe

(Fig. 50)

Technomyrmex cheesmanae Donisthorpe, 1945: 57. Holotype and paratype workers, INDONESIA: Irian Jaya ("Dutch New Guinea"), Mt Nomo, S of Mt Bougainville, 600-1500 ft, xi.1936 (*L.E. Cheesman*); paratype workers, Irian Jaya ("E. Dutch New Guinea"), Humboldt Bay, Hollandia, iv.1936 (*L.E. Cheesman*) (BMNH) [examined].

WORKER. *Measurements*: TL 2.8 – 2.9, HL 0.59 – 0.66, HW 0.56 – 0.62, SL 0.56 – 0.72, PW 0.38 – 0.47, WL 0.80 – 0.88 (9 measured). *Indices*: CI 92 – 95, SI 100 – 122, OI 25 – 27, EPI 78 – 85, DTI 131 – 135.
Frontal carina with 3 - 4 setae: in profile the posteriormost at the level of the anterior margin of the eye. Dorsum of head behind this with 3 - 4 pairs of setae, terminating posteriorly in the longest pair, which is located well in front of the posterior margin of the head; these setae usually longer than the maximum diameter of the eye. A pair of very short setae may sometimes be present behind the longest pair, at the posterior margin itself. With head in full-face view the anterior clypeal margin with a slight to moderate median indentation; sides of head shallowly convex and the posterior margin shallowly concave; eyes located in front of midlength (EPI above) and their outer

margins just touch the outline of the sides of the head. With mesosoma in profile the mesonotal outline is a shallowly convex slope. Number of setal pairs on mesosoma: pronotum with 2 longer (exceeding maximum diameter of eye) and 2 – 3 shorter; mesonotum 2, one located anteriorly and the other posteriorly; propodeal dorsum 0; lateral margin of propodeal declivity 2 - 3. With propodeum in profile the dorsum rounds into the declivity, the two surfaces never meet in a distictly defined angle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite greater than the maximum diameter of the eye. Head, mesosoma, petiole and gaster uniformly blackish brown to black. Femora and tibiae of middle and hind legs dark brown; tarsi of middle and hind legs dull yellow, paler than the femora and tibiae. Middle and hind coxae varying from dull yellow, lighter than the femora, to brown, about the same shade as the femora.

The Australian series from Bellenden Ker mentioned below has the anterior clypeal margin more deeply indented medially than does the type-series. Colour of the middle and hind coxae is variable within series, ranging from as brown as the femora to dull yellow. The specimens from Ivimka Research Station, Papua New Guinea (UCDC), have longer scapes (SI 119 – 122) than the other material (SI 100 – 104) and have the posterior pair of setae on the dorsum of the head shorter, slightly less than the maximum diameter of the eye, whereas in other series these setae tend to be longer than the maximum diameter of the eye. Among all series there is variation in the degree of curvature between propodeal dorsum and declivity, but the junction is always rounded, never a distinct angle. These variations may imply that *cheesmanae*, as defined here, may be a complex of sibling species, but further analysis will have to await the amassing of more material.

A few other species share with *cheesmanae* the characters of rounded propodeum and a pair of long setae located anterior to the posterior margin of the head. Australian species with these features (*quadricolor, sophiae, nitens, furens*) all have the head capsule glassy smooth, whereas *cheesmanae* has the usual blanketing fine microreticulate-shagreenate sculpture present. *T. albicoxis*, originally described as a variety of *cheesmanae*, has only 4 - 5 pairs of setae in total on the dorsal head and does not have setae at the level of the posterior margin of the eye. Other species in the *albipes* group that have a more rounded propodeum, such as *prevaricus, indicus, pluto* and *hades*, have very different arrangements of cephalic setae.

MATERIAL EXAMINED
Indonesia: Irian Jaya, Mt Nomo, S of Mt Bougainville (*L.E. Cheesman*); Humboldt Bay, Hollandia (*L.E. Cheesman*). **Papua New Guinea**: Ivimka Res. Station, Lakekamu Basin (*S.L. Haydon*); Ivimka Res. Station (*Binatung Brigade*). **Australia**: Queensland, Bellenden Ker (no collector's name); Qld, Lake Eacham Nat. Pk (*P.S. Ward*).

Technomyrmex convexifrons Karavaiev

Technomyrmex convexifrons Karavaiev, 1926: 443. Syntype workers, INDONESIA: Sumatra, Tapung kiri, no. 2756 (*O. John*) (UASK) [examined]. (See note.)

NOTE
Only a single card triangle, on a pin originally of three syntypes, retains a complete specimen. Of the upper syntype only the gaster remains. The middle specimen is complete but has the head severly crushed. The lower mount has no specimen.

WORKER. *Measurements*: TL 2.6, HL 0.60, HW 0.57, SL 0.51, PW 0.37, WL 0.68. *Indices*: CI 95, SI 89, OI 26, EPI 72, DTI 119.
Frontal carina with 2 – 3 setae to the level of the anterior margin of the eye. Posterior to this with 4 – 5 pairs on the dorsum itself and with an additional 4 - 6 setae across the posterior margin. Longest setae on head at least equal to maximum diameter of eye, usually somewhat longer. Scapes without setae. Dorsum of head glassy smooth,

unsculptured except for pits from which setae arise, and with sparse pubescence that does not conceal the surface. In full-face view the anterior clypeal margin is almost transverse, the posterior margin of the head very feebly concave medially; eyes break the outline of the sides of the head. Pronotal dorsum mostly smooth, with only vestiges of sculpture; dorsal mesonotum weakly microreticulate; propodeal dorsum more densely microreticulate to minutely reticulate-punctulate. All dorsal surfaces of mesosoma, including propodeum, with numerous setae; propodeal declivity with at least 1 marginal pair. With propodeum in profile the dorsum rounds into the declivity. Dorsal (outer) surfaces of middle and hind tibiae each with at least one elevated long seta present, in the apical half; length of the setae slightly less than the tibial width. Gastral tergites 1 – 4 each with numerous setae, the longest of them longer than the maximum diameter of the eye. Gastral tergites 1 – 2 unsculptured, smooth and polished; pubescence on these sclerites sparse. Head and gaster dark brown; most of mesosoma slightly lighter, the pronotum slightly lighter than the remainder and the propodeum about the same colour as the gaster.

Most closely related to *strenuus* but that species does not have elevated setae on the tibiae. The eyes of *convexifrons* appear to be slightly larger than in *strenuus* and set slightly further forward, compare OI and EPI above with *strenuus* OI 20 – 24, EPI 80 – 95, though these results may not be trustworthy because of the paucity of material. The mesonotal and propodeal dorsa of *strenuus* are more strongly and intensely sculptured than in *convexifrons* and in profile the propodeal dorsum rounds into the declivity in *convexifrons*, whereas the two surfaces meet in a blunt angle in *strenuus*; see notes under *strenuus* (p. 100).

MATERIAL EXAMINED
Indonesia: Sumatra, Tapung kiri, no. 2756 (*O. John*).

Technomyrmex dubius Bolton sp. n.

HOLOTYPE WORKER. *Measurements*: TL 2.3, HL 0.52, HW 0.45, SL 0.42, PW 0.31, WL 0.65. *Indices*: CI 87, SI 93, OI 24, EPI 48, DTI 142.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a broad but very shallow median impression. Posterior margin of head in full-face view with a median indentation. Eyes small and located very far forward on the head (EPI 48); in full-face view the outer margins of the eyes are conspicuously inset from the outline of the sides, a distance almost equal to the basal width of the scape. Dorsal surfaces of mesosoma, and declivity of propodeum, entirely lack setae. In profile the mesonotal dorsal outline with a horizontally flat, or nearly flat, anterior section and a shorter, much more steeply sloped declivitous surface posteriorly, the two separated by a distinct angle or step in the outline. Propodeal dorsum convex in profile and meeting the declivity through a blunt angle; straight-line length of dorsum distinctly less than depth of declivity to the spiracle. Gastral tergites 1 – 3 without setae, gastral tergite 4 with two pairs of setae present. Head, mesosoma, petiole, legs and gaster a more or less uniform dull yellow.

PARATYPE WORKERS. *Measurements*: TL 2.0 – 2.2, HL 0.49 – 0.51, HW 0.44 – 0.45, SL 0.40 – 0.42, PW 0.31, WL 0.63 – 0.64 (2 measured). *Indices*: CI 88 – 90, SI 91 – 93, OI 24 – 25, EPI 46 – 48, DTI 132 – 138. As holotype.

Holotype worker (top specimen of 3 on pin), **Indonesia**: Sulawesi Utara, Dumoga-Bone N.P., ii.1985 (*N. Stork*) (BMNH).
Paratypes. 2 workers (middle and bottom specimens on same pin), with same data (BMNH).

This small species is closely related to *textor* and mostly matches the description of that species. However, *dubius* has smaller eyes (*textor* OI 27 – 30) and the outer margins of

the eyes are conspicuously further from the sides of the head than in *textor*. In the latter species the outer margins of the eyes in full-face view usually just touch the outline of the sides. In some they just fail to touch, but in these the separation of eye margin from outline of side of head is only a tiny fraction of the basal width of the scape.

Two collections from Sabah, each of a single specimen (details below) are currently referred to this species but with some doubt. The first, from Mahua Waterfall (KUIC), matches the *dubius* types in most respects but is slightly larger (HW 0.48), has somewhat longer scapes (SI 98), and has a relatively long propodeal dorsum, the straight-line dorsal length being greater than the depth of the declivity to the spiracle. The second, from Kalabakan (ANIC) has very slightly longer scapes (SI 96) and eyes that are located somewhat more posteriorly (EPI 60). Both specimens are being included in *dubius* for the present, until more material becomes available for analysis.

NON-PARATYPIC MATERIAL EXAMINED
Malaysia: Sabah, Crocker Range N.P., Mahua Waterfall (*H. Okido*); Sabah, For. Camp N of Kalabakan (*Y. Hirashima*). **Papua New Guinea**: 2 km. E Maprik (*P.S. Ward*).

Technomyrmex elatior Forel

(Figs 40, 69)

Technomyrmex modiglianii r. *elatior* Forel, 1902b: 293. Syntype workers, INDIA: Assam, LXXIX/16 (*Long*) (MHNG) [examined]. [Raised to species by Bingham, 1903: 302; reduced to race of *modiglianii* by Forel, 1905b: 23 and Wheeler, W.M. 1921: 541; again raised to species by Mukerjee, 1930: 155.]
Technomyrmex albipes var. *cordiformis* Viehmeyer, 1916: 143. Syntype workers, SINGAPORE (*H. Overbeck*) (ZMHB) [examined]. **Syn. n.**

WORKER. *Measurements*: TL 2.9 – 3.7, HL 0.65 – 0.88, HW 0.62 – 0.93, SL 0.59 – 0.78, PW 0.41 – 0.56, WL 0.78 – 1.00 (20 measured). *Indices*: CI 95 – 106, SI 84 – 98, OI 20 – 26, EPI 50 – 73, DTI 112 – 128.
Frontal carina with 2 (rarely 3) setae. Dorsum of head behind level of eye entirely lacks setae. Anterior clypeal margin with a small but incised and sharply defined shallow semicircular median notch; inner margin of notch does not meet the anterior clypeal margin in an acute angle or tooth. Posterior margin of head in full-face view is broadly emarginate across its width, not merely with a median impression; depth and intensity of emargination increases with size, being most pronounced in the largest individuals. Sides of head convex and the outer margins of the eyes are set well in from the outline of the sides in full-face view. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Propodeal dorsum short, in profile the straight-line length of the dorsum less than the depth of the declivity to the spiracle; dorsum and declivity meet in an angle. Number of setal pairs on mesosoma: pronotum 2 - 3; mesonotum usually 1, located quite close to the metathoracic spiracle, but rarely a more anterior pair may also be present; propodeal dorsum 0; lateral margins of propodeal declivity 2 – 3. Gastral tergites 1 – 4 each with numerous setae all over the sclerites; these setae relatively short, the longest on the first gastral tergite only about 0.50 × the maximum diameter of the eye. Head, mesosoma, petiole and gaster dark brown to black; leg segments approximately the same colour as head and body except for the tarsi, which are yellowish.

Superficially similar to *albipes* and *vitiensis* but with a broader head that is much more extensively and deeply emarginate posteriorly, more like the shape of *modiglianii*. The anterior clypeal margin has a small but distinct shallow semicircular notch and the eyes are farther removed from the outline of the sides of the head in full-face view. The metathoracic spiracle, usually on a small but prominent tubercle, projects more dorsally than in either *albipes* or *vitiensis* and is conspicuous in profile in most samples.

T. elatior is probably most closely related to, and has also been confused with,

modiglianii because of its head shape and median clypeal notch, but *elatior* always lacks setae on the dorsum of the head behind the level of the posterior margin of the eye and has the main setae on the first gastral tergite distinctly much shorter than the maximum diameter of the eye..

This widely distributed taxon is size-variable as thus defined and may contain more than one species. In particular the specimens from Sarawak tend to be the largest (HL 0.84 – 0.88, HW 0.84 – 0.93), have the shortest scapes (SI 84 – 86) and have the eyes located more anteriorly (EPI 50 – 57) than the other populations. The last ratio is particularly striking as the other material in combination has EPI 63 – 73. However, because of shortage of examples and their otherwise similar morphology all are currently being retained as a single species. It is found on trees and nests in rotten parts of the trunk.

MATERIAL EXAMINED

India: Assam, Misamari (*A.C. Cole*); Assam (*Long*). **Nepal**: Pokhara (*P.S. Ward*); **Vietnam**: Tam Dao, Tam Duong Distr., Vinh Phuc Prov. (*K. Ogata*); Tam Dao N.P. (*K. Eguchi*). Thailand: Khao Yai N.P., Nakonratchasima (*S. Yamane*). **Malaysia**: West Malaysia, Banting (*M. Pfeiffer*); Pahang, Cameron Highlands, Tanah Rata (*P. Cechovsky*); Sabah, Kinabalu Nat. Pk, Binondiraan Ridge (*C.C. Davis*); Sarawak, 4th Division, Gn. Mulu Nat. Pk, Long Pala (*B. Bolton*); Gn. Mulu N.P. (*M. Collins*). **Singapore**: no loc. (*H. Overbeck*). **Brunei**: Bukit Sulong nr Lamunin (*N. Stork*). **Indonesia**: Kalimantan, Barito Ulu (*Syaukani*). **Philippines**: Luzon, Baguio City Bot. Gardens (*S. Schödl*). **Italy**: Milan, Malpensa airport, casual introduction (no collector's name).

Technomyrmex fornax Bolton sp. n.

(Fig. 45)

HOLOTYPE WORKER. *Measurements*: TL 2.7, HL 0.64, HW 0.60, SL 0.66, PW 0.42, WL 0.84. *Indices*: CI 94, SI 110, OI 30, EPI 77, DTI 129.

Frontal carina with 2 setae that are shorter than the maximum diameter of the eye: in profile the first above the torulus, the second at the level of the anterior margin of the eye. A much shorter pair of setae, about half the length of those on the frontal carina, is present close to the level of the posterior margin of the eye. Dorsum of head posterior to this with a single pair of short setae, in profile located just over half way between level of posterior margin of eye and posterior margin of head, this pair of setae only about 0.45 × the maximum diameter of the eye. Anterior clypeal margin with an extremely shallow median concavity. With head in full-face view the sides convex and the posterior margin with a shallow median concavity. Eyes located well in front of midlength, EPI 77; outer margin of eye conspicuously breaks the outline of the side in full-face view. Number of setal pairs on mesosoma: pronotum 1; mesonotum 2, very short, one anterior the other posterior; propodeal dorsum 0; lateral margins of propodeal declivity 2, above the level of the spiracle. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Dorsum of propodeum in profile meets the declivity in a bluntly rounded curve; length of dorsum is about equal to depth of declivity to spiracle. In dorsal view the metathoracic spiracles are very close to the metanotal groove. Gastral tergites 1 – 4 each with numerous short, stubbly setae, distributed everywhere on the sclerites; all setae on first gastral tergite are distinctly shorter than the maximum diameter of the eye, at maximum only about 0.50 × the maximum eye diameter. Head, mesosoma, petiole and gaster blackish brown to black. Coxae, femora and tibiae the same colour as the mesosoma or slightly lighter. Tarsi of middle and hind legs yellowish white to yellow, distinctly paler than the tibiae.

PARATYPE WORKER. *Measurements*: TL 2.6, HL 0.62, HW 0.58, SL 0.64, PW 0.38, WL 0.84. *Indices*: CI 94, SI 110, OI 29, EPI 80, DTI 135. As holotype.

Holotype worker (upper of 2 specimens on pin), **Malaysia**: Sabah, Crocker Ra., 17.v.1987, 1350 m., 28d (*Burckhardt & Löbl*) (BMNH).

Paratype, 1 worker (lower of 2 on pin), with same data (BMNH).

This species superficially resembles the widespread *difficilis* but differs by the presence of an extra pair of short setae on the dorsum of the head, close to the level of the posterior margin of the eye, and in the proportions of the propodeum. In *difficilis* the length of the propodeal dorsum in profile is always distinctly shorter than the depth of the declivity to the spiracle and the dorsum meets the declivity in an angle. In *fornax* the length of propodeal dorsum in profile is about equal to the depth of the declivity to the spiracle and the dorsum meets the declivity in a bluntly rounded curve.

Technomyrmex gaudens Bolton **sp. n.**

HOLOTYPE WORKER. *Measurements*: TL 4.1, HL 0.91, HW 0.80, SL 1.10, PW 0.54, WL 1.34. *Indices*: CI 88, SI 138, OI 28, EPI 79, DTI 163.
Matching the description of *impressus* but differing in colour and sculpture.
Head, mesosoma and petiole light brown, the gaster very slightly darker than the mesosoma. (In *impressus* all are dark brown to black.)
Middle and hind coxae yellow, somewhat lighter than the mesosoma but not strongly contrasting. (In *impressus* the middle and hind coxae contrast very strongly with the mesosoma.)
Middle and hind tarsi dull yellow, approximately the same colour as the tibiae. (In *impressus* the middle and hind tarsi are much lighter than the tibiae and contrast strongly.)
Mesopleuron mostly smooth, at most with faint patches of superficial reticulation. (Mesopleuron entirely reticulate-punctulate in *impressus*.)
Dorsal surfaces of head and pronotum superficially sculptured. (In *impressus* the head and pronotum are densely reticulate-punctulate.)
Shagreenate sculpture of first gastral tergite weak and superficial. (Shagreenate sculpture of first gastral tergite is coarse and intense in *impressus*.)

PARATYPE WORKERS. *Measurements*: TL 4.0 – 4.1, HL 0.92 – 0.94, HW 0.80 – 0.81, SL 1.10, PW 0.55 – 0.57, WL 1.34 – 1.37 (2 measured). *Indices*: CI 86 – 87, SI 136 – 138, OI 28 – 29, EPI 75 – 79, DTI 160 – 164. As holotype.

Holotype worker (top specimen of 3 on pin), **Malaysia**: Sarawak, 4th Division, Gn. Mulu N.P., 1310 m., v-viii.1978, B.M. 1978-49 (*P.M. Hammond & J.E. Marshall*) (BMNH).
Paratypes. 2 workers (middle and bottom specimens on same pin), with same data (BMNH).

This species is very similar to *impressus*. It is possible that further collections may obviate the differences between them that are shown by the admittedly sparse samples currently available.

Technomyrmex gibbosus W.M. Wheeler

(Fig. 57)

Technomyrmex gibbosus Wheeler, W.M. 1906: 319, pl. 41, fig. 4. Syntype workers, JAPAN: Yamanaka (Suruga), 1100 ft, 22.iii.1905, no. 2951 (*H. Sauter*) (MCZC) [examined].

NOTE
16 worker syntypes of *gibbosus* are mounted on three pins. Two of these pins hold 15 of the workers (on three cards) and they bear only the data: Japan (*H. Sauter*). The third pin has only one specimen but carries the fuller data recorded above.

WORKER. *Measurements*: TL 2.4 – 3.0, HL 0.63 – 0.68, HW 0.54 – 0.61, SL 0.50 – 0.54, PW 0.38 – 0.42, WL 0.76 – 0.84 (10 measured). *Indices*: CI 86 – 91, SI 85 – 93, OI 27 – 29, EPI 50 – 58, DTI 124 – 130.

Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with an insignificant median indentation in the apron. In full-face view the posterior margin of the head with a median indentation and the sides shallowly convex. Eyes of moderate size, located well in front of the midlength and their outer margins usually just break the outline of the sides in full-face view. Dorsum of mesosoma, and declivity of propodeum, entirely lack setae. With mesosoma in profile the mesonotal dorsal outline convex, consisting of a shallowly convex anterior section that curves broadly and evenly into a more sloping shallow convexity that descends to the metanotal groove. Propodeum in profile with a short convex dorsal surface that rounds into the declivity; the two surfaces not separated by a sharp angle. Gastral tergites 1 – 3 without setae; gastral tergite 4 with 1 - 2 pairs present. Scapes and tibiae without setae. Head and mesosoma medium to dark brown, often with a reddish tint; gaster about the same colour to dark brown. Legs dull yellow to yellowish brown.

Widely distributed in Japan (Imai, Kihara, Kondoh, *et al.*, 2003), *gibbosus* nests in dead twigs and dead bamboo stems. Its closest relative appears to be *vexatus*, the current known distribution of which is restricted to Morocco. The two are easily separated as in *gibbosus* the eyes are larger and located distinctly farther forward on the head capsule than in *vexatus* (OI 22 – 25, EPI 68 – 76); also the posterior margin of the head in *vexatus* is shallowly impressed in full-face view, without a median indentation such as occurs in *gibbosus*. Finely microreticulate sculpture is well developed and conspicuous on the dorsal head of *gibbosus*, but in *vexatus* this cephalic sculpture is semi-effaced, very weak and superficial.

These two species are separated by an enormous distance and it is interesting to speculate if they shared an immediate common ancestor, or if they are the remnants of a fairly distinctive species group that once extended across the width of the southern Palaearctic, or if their shared characters have been acquired convergently.

This species has also been recorded from North Korea (Radchenko, 2005) but to the best of my knowledge has not yet been found in China, where its presence should be expected.

MATERIAL EXAMINED

Japan: Hyogo Pref., Takarazuka (*M. Tanaka*); Kanagawa Pref., Monazuru (no collector's name); Yamanaka (*H. Sauter*).

Technomyrmex gilvus Donisthorpe

(Fig. 60)

Technomyrmex gilvus Donisthorpe, 1941: 205. Holotype and paratype workers, PAPUA NEW GUINEA: Kokoda, iv.1933, 1200 ft (*L.E. Cheesman*) (BMNH) [examined].

WORKER. *Measurements*: TL 2.7 – 2.8, HL 0.62 - 0.64, HW 0.52 – 0.55, SL 0.64 – 0.68, PW 0.37 – 0.38, WL 0.86 – 0.88 (4 measured). *Indices*: CI 84 – 86, SI 120 – 126, OI 30 – 31, EPI 60 – 70, DTI 145 – 151.

Very closely related to *textor* and matching the description of that species except for its dimensions, as follows. Scape of *gilvus* both absolutely and relatively longer than in *textor* (SL 0.45 – 0.54, SI 93 - 100). Eyes of *gilvus* located more posteriorly on the head than in *textor* (EPI 44 – 52). The head is slightly narrower in *gilvus* than in *textor* (CI 87 – 92).

This small yellow species is known only from Papua New Guinea while the known distribution of *textor* lies far to the west, in Java, Palawan and the Malay Peninsula.

MATERIAL EXAMINED
Papua New Guinea: N. Dist., Popondetta (*P.M. Room*); Kokoda (*L.E. Cheesman*).

Technomyrmex grandis Emery

(Fig. 54)

Technomyrmex grandis Emery, 1887: 248. Syntype workers, INDONESIA: Sumatra, Kaju-Tanam, viii-ix. 1878 (*O. Beccari*) (MCSN) [examined].
Technomyrmex grandis var. *bandarensis* Forel, 1913d: 96. Syntype workers, INDONESIA: Sumatra, Bandar Baroe (*v. Buttel-Reepen*) (MHNG) [examined]. **Syn. n.**

WORKER. *Measurements*: TL 3.8 – 4.8, HL 0.85 – 1.05, HW 0.74 – 0.96, SL 0.98 – 1.18, PW 0.54 – 0.72, WL 1.26 – 1.58 (20 measured). *Indices*: CI 85 – 91, SI 123 – 134, OI 28 – 31, EPI 100 – 120, DTI 132 – 145.
Large, conspicuous and very densely setose species. Dorsum of head in profile with abundant setae of varying lengths everywhere; longest pair, which is usually at least equal to the maximum diameter of the eye, located about half-way between level of posterior margin of eye and posterior margin of head. Ventral surface of head with short setae present. With head in full-face view the posterior margin and sides with numerous outstanding short setae, those on the sides inclined anteriorly. Anterior clypeal margin almost transverse, at most with a hint of a shallow median concavity; posterior margin of head impressed. Eyes located relatively far back on head (EPI 100 or more), their outer margins strongly convex and breaking the outline of the sides of the head. Scapes with abundant setae on all surfaces, the longest slightly longer than the width of the scape. All dorsal surfaces of mesosoma with numerous setae of varying length. Propodeum in profile with the dorsum long and convex, rounding broadly and evenly into the declivity. Gastral tergites 1 – 4 each with an abundant mixture of long and short setae, and also with dense long pubescence; longest setae are distinctly longer than the maximum diameter of the eye. Middle and hind tibiae with numerous suberect projecting setae, the longest about equal to the maximum tibial width. Setae also present on dorsal surfaces of middle and hind femora. Colour medium brown to black, sometimes with the gaster slightly darker than the mesosoma. Legs usually slightly lighter than mesosoma.

This spectacularly setose, large species is one of the most easily recognised in the region. Its extremely dense long setae, coupled with its large posteriorly located eyes, long scapes and the presence of elevated setae on the scapes and tibiae, render it unmistakable. The only other species of the same group in this region is *wheeleri*, but this is smaller, has more anteriorly located eyes and a much shorter and more narrowly rounded propodeum. The setae of *wheeleri* are much sparser and shorter than those of *grandis*. For example the outstanding setae on the scapes and tibiae are shorter than the width of the segment from which they arise in *wheeleri*, longer in *grandis*; the longest setae on the first gastral tergite are always much longer than the maximum diameter of the eye in *grandis*, usually shorter than the maximum diameter of the eye in *wheeleri*.

MATERIAL EXAMINED
Malaysia: Bukit Fraser, The Gap (*M. Casiraghi*); Selangor, Ulu Gombak (*S. Yamane*); Gn. Jerai (no collector's name). **Indonesia**: Kalimantan, Barito Ulu (*Syaukani*); Sumatra, Kaju-Tanam (*O. Beccari*); Balighe (*E. Modigliani*); Pangherang-Pisang (*E. Modigliani*); Si-Rambé (*E. Modigliani*); Bandar Baroe (*v. Buttel-Reepen*); W. Sumatra, Pinang-Pinang, Ulu Gadut nr Padang (*E. Suzuki*); Sulawesi Utara, Dumoga-Bone N.P. (*N. Stork*); Danau Mooat (no collector's name). **Philippines**: Leyte, V.I.S.C.A., Baybay (*C.K. Starr*); Baybay (*Starr & Godoy*); Leyte, Tongonan, Ormoc (*C.K. Starr*); S. Leyte, N. Maasin, Lonoy (*Zettel & Pangantihon*); Mindanao, Bukidnon Pr., Malaybalay Kaamulan Site (*H. Zettel*); Bohol, Bilar, Camp Magsaysay (*C.K. Starr*); Negros Oriental, Apolong, Valencia nr Dumaguete (*S. Yamane*); Valencia, Chapman's Gard. (*S. Yamane*).

Technomyrmex hades Bolton sp. n.

HOLOTYPE WORKER. *Measurements*: TL 2.6, HL 0.61, HW 0.56, SL 0.64, PW 0.39, WL 0.80. *Indices*: CI 92, SI 114, OI 27, EPI 73, DTI 138.
Frontal carina with 2 setae: in profile the posterior seta approximately at the level of the anterior margin of the eye. Dorsum of head posterior to this entirely lacks setae. With head in full-face view the anterior clypeal margin with an extremely shallow median concavity; sides of head shallowly convex and the posterior margin transverse, without a median indentation. Eyes located in front of midlength; outer margin of eye touches the outline of the side in full-face view. With mesosoma in profile the mesonotal outline is mostly more or less flat but curves posteriorly into a short oblique declivitous face. Number of setal pairs on mesosoma: pronotum 2; mesonotum 0; propodeal dorsum 0; lateral margins of propodeal declivity 1, just above the spiracle. With the propodeum in profile its dorsum and declivity meet in a blunt angle. Straight-line length of propodeal dorsum in profile less than depth of declivity to spiracle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is slightly less than the maximum diameter of the eye. Head, mesosoma and gaster dark brown to black; petiole yellow and strongly contrasting. Middle and hind coxae, trochanters and tarsi yellow; femora and tibiae brown, the latter slightly paler than the former.

PARATYPE WORKERS. *Measurements*: TL 2.4 - 2.6, HL 0.60 – 0.63, HW 0.54 – 0.58, SL 0.62 – 0.65, PW 0.38 – 0.40, WL 0.82 – 0.86 (2 measured). *Indices*: CI 90 - 92, SI 112 - 115, OI 26, EPI 69 - 70, DTI 135 - 137. As holotype but pronotum with 2 – 3 pairs of setae; lateral margins of propodeal declivity with 1 – 2 pairs, but if 2 then one of the pairs is very short.

Holotype worker (top specimen of 3 on pin), **Indonesia**: Sulawesi Utara, Dumoga-Bone N.P., Fog 5, 400 m., 11.ii.1985, BMNH Plot C (*V. Stork*) (BMNH).
Paratypes. 2 workers (middle and bottom specimens of 3 on pin), and 1 queen, 11 workers with same data (BMNH).

The yellow petiole of this arboreal species is very distinctive. It is the same colour as the middle and hind coxae and contrasts strongly with the dark mesosoma and gaster.
T. hades is closely related to *pluto*, another arboreal species from Sulawesi that has a yellow petiole, but *pluto* tends to be larger and has the propodeal dorsum and declivity yellow, has longer scapes (SI 120 – 121) and has yellow tibiae that are the same colour as the tarsi.

Technomyrmex horni Forel

Technomyrmex horni Forel, 1912: 71. Syntype workers and queen, TAIWAN: Pilam (*H. Sauter*) (MHNG) [examined].

WORKER. *Measurements*: TL 2.9 – 4.3, HL 0.70 – 1.06, HW 0.61 – 0.95, SL 0.74 – 1.20, PW 0.41 – 0.61, WL 0.90 - 1.46 (26 measured). *Indices*: CI 82 – 97, SI 107 – 134, OI 23 – 30, EPI 65 – 80, DTI 130 – 160.
Head behind clypeus, dorsum of mesosoma, declivity of propodeum and first gastral tergite all entirely lack setae. Gastral tergites 2 – 4 with long stout setae present: second gastral tergite with 2 – 3 pairs, third and fourth tergites each with 3 – 4 pairs. Anterior clypeal margin with a distinct median notch that is semicircular to U-shaped, the margins of the notch meet the lateral portions of the anterior margin through rounded curves, not sharp angles. Posterior margin of head concave, more deeply so in larger workers; sides of head convex and convergent anteriorly. With head in full-face view the outer margins of the eyes fail to touch the outline of the sides of the head. Scape index 107 – 134. Clypeal sculpture fine to reticulate-punctulate between posterior margin of notch and clypeal suture. Mesosoma with DTI 130 – 160. In profile the

straight-line length of the propodeal dorsum variable but without a conspicuous notch or indentation at its midlength. In profile the head, mesosoma, petiole and gaster yellow to light brownish yellow; usually the head and gaster slightly infuscated with respect to the mesosoma but sometimes the colour uniform. Anterior coxa yellow to light yellowish brown, the same colour as the mesosoma or slightly lighter. Middle and hind coxae off-white to yellow, the same colour as the mesosoma or slightly lighter. All trochanters off-white to yellow. Middle and hind femora and tibiae yellow to very light brown. Tarsi yellow, the same colour as the femora and tibiae or lighter. Sometimes all leg segments are uniformly coloured, the same shade as the mesosoma.

It is certain that more than one real species is concealed within this compound description, which effectively covers all lightly coloured samples of the *bicolor* group of the southern Oriental and Malesian regions, under the single name of *horni*. Material is so sparse, samples are so small and variation within even the small samples is so obvious that more detailed resolution has proved impossible at this time.

There is variation in SI, with some evidence that it increases as HW decreases within single series, and that CI increases as HW increases. Also, the shape of the head seems to become more cordate with increased size. The shape of the clypeal notch is variable. It is frequently quite long and broadly U-shaped but it is shallower and broader in some. Density and intensity of clypeal sculpture varies considerably, as does distance of the metathoracic spiracles from the metanotal groove. The propodeal dorsum may be flat to shallowly convex, with variation within single short series, and the length of the propodeal dorsum also varies. In syntypes of *horni* it is much longer than the depth of the declivity to the spiracle but variants with the two about equal, to some with the dorsum shorter than the declivity depth to the spiracle, are also encountered. The junction of propodeal dorsum and declivity varies from angular to rounded. Colour variation is as noted above.

Of course, it is possible that all this variation is contained within a single plastic species, but I strongly suspect that further resolution will be possible when more material and lengthier series are available. For the present the following notes on the two already-named forms in this complex are included here.

T. horni syntype workers: *Measurements*: TL 3.4 – 3.9, HL 0.88 – 0.98, HW 0.80 – 0.95, SL 0.95 – 1.02, PW 0.52 – 0.59, WL 1.18 - 1.30 (4 measured). *Indices*: CI 90 – 97, SI 107 – 119, OI 23 – 25, EPI 65 – 73, DTI 150 – 159. With the general characters noted above. Median clypeal notch deeper than semicircular. Clypeus immediately posterior to notch punctulate. Metathoracic spiracle far in front of metanotal groove (about 3 spiracle diameters). Length of propodeal dorsum in profile about twice the depth of the declivity to the spiracle, the dorsum flat to shallowly convex; junction of dorsum and declivity angular. Head, mesosoma and petiole brownish yellow, gaster somewhat darker brown. Middle and hind femora and tibiae the same colour as the mesosoma; middle and hind coxae lighter. Middle and hind tarsi yellow, much lighter than femora and tibiae.

T. schimmeri syntype workers: *Measurements*: TL 2.9 – 3.2, HL 0.70 – 0.74, HW 0.62 – 0.66, SL 0.74 – 0.76, PW 0.41 – 0.42, WL 0.96 - 1.03 (4 measured). *Indices*: CI 86 – 89, SI 115 – 120, OI 27 – 29, EPI 70 – 79, DTI 152 – 161. With the general characters noted above. Median clypeal notch broad and shallow. Metathoracic spiracle closer than 3 spiracle diameters from metanotal groove. Length of propodeal dorsum in profile about equal to or slightly greater than the depth of the declivity to the spiracle, the dorsum flat; junction of dorsum and declivity angular. Head, mesosoma and petiole yellow to dirty yellow, gaster usually slightly darker in shade. Either all leg segments dull yellow, the same colour as the mesosoma, or the middle and hind coxae alone slightly lighter.

MATERIAL EXAMINED

Sri Lanka: Western Prov., Gampaha Dist., Pilikuttuwa (*S. Yamane*). **India**: Panjab, Chandigarh (*H. Imai*). **China**: Hong Kong (*Silvestri*). **Thailand**: Chacheongao Prov., Khao Ang Reu Nai WS (*S. Yamane*). **Malaysia**: Negeri Sembilan, Pasoh For. Res. (*Lewis & Jackson*); Pasoh (*P.J.*

Greenslade); Kuala Lumpur (*M.J. Way*); Pahang, Cameron Highlands, Tanah Rata (*P. Cechovsky*); Sabah, Gn. Silam (*R. Leakey*). **Brunei**: Temburong Distr., Kuala Belalong Field Centre (*D.W. Davidson*). **Singapore**: no loc. (*H. Overbeck*); no loc. (*Biró*); Bukit Timah (*P.S. Ward*). **Indonesia**: Krakatau Is, Pulau Rakata (*S. Yamane*).

Technomyrmex horrens Bolton **sp. n.**

(Figs 61, 70)

HOLOTYPE WORKER. *Measurements*: TL 3.4, HL 0.81, HW 0.79, SL 0.78, PW 0.49, WL 1.05. *Indices*: CI 98, SI 99, OI 23, EPI 55, DTI 143.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a smoothly arched shallow median concavity that is much broader than long. Posterior margin of head evenly shallowly concave across its width. Eyes relatively small (OI < 25) and located far in front of the midlength; in full-face view the outer margins of the eyes far from the outline of the sides of the head, the latter strongly convex and with elevated projecting short pubescence present. Scapes without setae but with dense short pubescence that is slightly elevated. Dorsum of mesosoma and declivity of propodeum entirely lack setae. Dorsal outline of mesonotum in profile with a short, very shallowly convex anterior section that rounds broadly into a longer, more steeply sloped and shallowly convex declivitous face. In profile the propodeal dorsum rounds into the declivity; straight-line length of dorsum greater than depth of declivity to the spiracle. Gastral tergites 1 – 3 without setae; gastral tergite 4 with setae present. Tibiae without setae. Colour of head, mesosoma, petiole and gaster a uniform dull yellow. Legs the same shade of yellow, the tarsi not noticably lighter than the tibiae and femora.

PARATYPE WORKER. *Measurements*: TL 2.5, HL 0.64, HW 0.56, SL 0.62, PW 0.39, WL 0.84. *Indices*: CI 88, SI 111, OI 24, EPI 63, DTI 135. As holotype but smaller, the head narrower, with less strongly convex sides and less concave posterior margin. Scape relatively longer than in holotype. Mesonotum in profile with declivitous face about equal in length to the anterior, more or less transverse section.

Holotype worker (upper specimen of two on pin), **Malaysia**: Sabah, Kinabalu, 28.iv.1987, 1540 m. (*Löbl & Burckhardt*) (BMNH).
Paratype (lower specimen of two on pin), 1 worker with same data (BMNH).

A polymorphic species superficially similar to *lisae*, but *horrens* is smaller, with a much shallower median clypeal impression, less deeply impressed posterior margin on the head, and a lack of setae on the third gastral tergite.

Technomyrmex impressus Bolton **sp. n.**

(Fig. 59)

HOLOTYPE WORKER. *Measurements*: TL 3.7, HL 0.91, HW 0.81, SL 1.08, PW 0.55, WL 1.30. *Indices*: CI 89, SI 133, OI 28, EPI 75, DTI 164.
Head behind clypeus, dorsum of mesosoma, declivity of propodeum and first gastral tergite all entirely lack setae. Gastral tergites 2 – 4 with long stout setae present that are slightly longer than the maximum diameter of the eye: second gastral tergite with 1 pair, third and fourth tergites each with 2 or 3 pairs. Anterior clypeal margin with a distinct median notch that is broader than long, the margins of which meet the lateral portions of the anterior margin through rounded curves, not sharp angles. Posterior margin of head concave, not deeply indented medially. With head in full-face view the outer margins of the eyes fail to touch the outline of the sides of the head; the latter convex, more strongly so in larger workers. Scape relatively long, SI 133 (SI range in all material examined 129 – 144). Clypeus finely and densely reticulate-punctulate

everywhere. In dorsal view the metathoracic spiracles separated from the metanotal groove by distance of one spiracle diameter or slightly more. Mesosoma with DTI 164 (DTI range in all material examined 162 – 169). In profile the dorsal margin of the propodeum with a distinct indentation or notch at its midlength. Straight-line length of the propodeal dorsum more than twice the depth of the declivity to the spiracle In profile the head, mesosoma, petiole and gaster all the same shade of dark brown to blackish brown, or very nearly so. Anterior coxa brown; middle and hind coxae off-white to yellow and strongly contrasting with the mesosoma and femora. All trochanters yellow. Femora and tibiae brown, slightly lighter than the mesosoma. Tarsi off-white to yellow, lighter than the femora and tibiae.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 3.2 – 4.0, HL 0.84 – 0.94, HW 0.68 – 0.84, SL 0.98 – 1.08, PW 0.40 – 0.56, WL 1.14 – 1.38 (9 measured). *Indices*: CI 81 – 89, SI 129 – 144, OI 29 – 31, EPI 74 – 79, DTI 162 – 169. As holotype but second gastral tergite with 1 – 2 pairs of setae.

Holotype worker (top specimen of 3 on pin), **Malaysia**: Sabah, Mt Kinabalu, Liwagu Trail, 1500 m., 21.v.1987, no. 43a (*Löbl & Burckhardt*) (BMNH).
Paratypes. 2 workers (middle and bottom specimens on same pin), with same data (BMNH).

Known only from Kinabalu, *impressus* is closest related to *gaudens*. The relatively minor differences between them are noted under the latter name. *T. impressus* also resembles the Oriental *obscurior*, but the latter lacks a notch in the dorsal outline of the propodeum and tends to have metathoracic spiracles that are more widely separated from the metanotal groove.

Among the admittedly sparse material examined the scape index decreases as overall size increases.

NON-PARATYPIC MATERIAL EXAMINED
Malaysia: Sabah, Kinabalu Park, 1500 m. (*F. & S. Yamane*); Sabah, Taman Kinabalu, 1500 m. (*S. Yamane*).

Technomyrmex indicus Bolton **sp. n.**

(Fig. 48)

HOLOTYPE WORKER. *Measurements*: TL 2.8, HL 0.62, HW 0.60, SL 0.62, PW 0.39, WL 0.81. *Indices*: CI 97, SI 103, OI 28, EPI 73, DTI 138.
Frontal carina with 3 setae: in profile the anterior of these is at the torulus and the posterior is at about the level of the anterior margin of the eye. Dorsum of head from this seta with 6 – 7 more pairs of shorter setae to the posterior margin; posterior margin itself with 6 – 8 setae that form a transverse row across its width. All dorsal setae are shorter than the maximum diameter of the eye. Anterior clypeal margin very shallowly concave medially. Posterior margin of head in full-face view with a shallow median indentation. Sides of head convex and the outer margins of the eyes just fail to touch the outline of the sides in full-face view. With mesosoma in profile the mesonotal outline forms a smooth even shallow curve, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Propodeal dorsum in profile forms a bluntly rounded narrow curve into the declivity; straight-line length of dorsum is less than the depth of the declivity to the spiracle. Number of setal pairs on mesosoma: pronotum 4; mesonotum 3; propodeal dorsum with 1 – 2, minute; lateral margins of propodeal declivity 2, longer than those on propodeal dorsum. Gastral tergites 1 – 4 each with numerous setae all over the sclerites, the longest on the first gastral tergite are shorter than the maximum diameter of the eye. Head and gaster dark brown, mesosoma lighter brown, petiole yellow. Middle and hind coxae and trochanters yellow; basal one-third of femora yellow, apical two-thirds brown; tibiae and tarsi yellow.

PARATYPE WORKER. *Measurements*: TL 2.8, HL 0.64, HW 0.62, SL 0.64, PW 0.40, WL 0.82. *Indices*: CI 97, SI 103, OI 26, EPI 78, DTI 140. As holotype.
PARATYPE INTERCASTE. *Measurements*: TL 3.1, HL 0.63, HW 0.61, SL 0.60, PW 0.40, WL 0.90. *Indices*: CI 97, SI 98, OI 28, EPI 70, DTI 138. An extreme worker-like intercaste. Very similar to holotype but with the mesoscutellum very slightly developed, the propodeum in profile with its dorsum rounding more broadly into the declivity and the scapes shorter.

Holotype worker (top specimen of 3 on pin), **India**: Karnataka, Makut Forest Reserve, 13 – 18 km. S. Virajpet, 12°12'N, 75°46'E, 28.iii.1997, in internode of *Humboldtia brunonis* (*K.V. Krombein*) (BMNH).
Paratypes. 1 worker (middle specimen) and 1 intercaste (bottom specimen) with same data (BMNH).

Known only from a single collection from a myrmecophyte, *indicus* is similar in structure and distribution of cephalic setae to the New Guinea species *prevaricus*, itself known only from a single specimen. The two separate easily as they have the gastral setae of different lengths and different colour patterns, as noted in the key.

Technomyrmex kraepelini Forel

Technomyrmex kraepelini Forel, 1905b: 23. Syntype workers, INDONESIA: Java, Tjompea, leg. 11.iii.1904, ded. 8.vi.1904 (*K. Kraepelin*) (MHNG) [examined].

WORKER. *Measurements*: TL 2.5 – 3.7, HL 0.67 – 1.04, HW 0.59 – 1.02, SL 0.68 – 0.92, PW 0.41 – 0.57, WL 0.88 - 1.10 (15 measured). *Indices*: CI 87 – 98, SI 90 – 125, OI 23 – 28, EPI 64 – 73, DTI 132 – 157.
Head behind clypeus, dorsum of mesosoma, declivity of propodeum and first gastral tergite all entirely lack setae. Gastral tergites 2 – 4 with long stout setae present that are longer than the maximum diameter of the eye: second gastral tergite with 2 – 3 pairs, third and fourth tergites each with 3 – 4 pairs. Anterior clypeal margin with a distinct median notch, the margins of which meet the lateral portions of the anterior margin through rounded curves, not sharp angles. Posterior margin of head concave medially, the extent of the indentation becomes more pronounced in larger workers and in full-face view the head becomes distincly more cordate with increased size. With head in full-face view the outer margins of the eyes fail to touch the outline of the sides of the head; the latter convex, more strongly so in larger workers. Scape index 125 or less. Clypeal sculpture fine between posterior margin of notch and clypeal suture. In dorsal view the metathoracic spiracles close to, or even abutting, the metanotal groove; distance separating them usually less than one spiracle diameter. Mesosoma with DTI 132 – 157. In profile the straight-line length of the propodeal dorsum at most equal to the depth of the declivity to the spiracle and usually somewhat less; dorsal outline of propodeum usually weakly convex, without a conspicuous notch or indentation at about its midlength. In profile the head, mesosoma, petiole and gaster all the same shade of dark brown to blackish brown, or very nearly so. Anterior coxa brown; middle and hind coxae off-white to yellow and strongly contrasting with the mesosoma and femora. All trochanters yellow. Femora and tibiae brown, same colour as the mesosoma or slightly lighter; often the extreme apex of each segment lighter. Tarsi off-white to yellow, lighter than the femora and tibiae.

T. kraepelini is closely related to *sundaicus* and *rector*, the three of which are, within the *bicolor* group, mainly darkly coloured, have relatively short scapes and a relatively shorter, broader, mesosoma. *T. sundaicus* is distinguished from *kraepelini* by its uniform drab brown colour, which includes all leg segments except for the trochanters and the middle and hind tarsi, which are dull yellow. The middle and hind coxae of *sundaicus* are the same colour as the mesosoma, whereas in *krapelini* the coxae are much lighter and contrast strongly with the mesosoma. *T. rector*, currenty known only

from a single worker from southern India, appears to have fewer gastral setae than *kraepelini* and has yellow middle and hind tibiae that are the same colour as the tarsi. The clypeal notch of *rector* is broader and more shallow than in *kraepelini*. Other relatives with darkly coloured heads and bodies, *obscurior* and *antennus*, generally have longer scapes and a narrower, more elongate mesosoma, that only overlap *kraepelini* at the lowest end of their scale: in *obscurior* and *antennus* SI is 122 – 143 and DTI is 156 - 168.

MATERIAL EXAMINED
Thailand: Pattani Prov., Sai Khao (*S. Yamane*); Khao Yai N.P. (*M.I. Wibawa*). **Malaysia**: Negeri Sembilan: Pasoh Forest Res. (*Brendell, Jackson & Lewis*); Selangor, Ulu Gombak (*S. Yamane*); Selangor, Kuala Lumpur, Univ. Malaya Bot. Gdn (*S.L. Haydon*); Pahang, Cameron Highlands, Tanah Rata (*P. Cechovsky*); Kedah, Gunong Jerai (*Taylor & Barrett*); Kedah, Pantai Kok (*Heydon & Fung*); Sarawak, Semengoh For. Res., SW Kuching (*R.W. Taylor*); Sabah, Sayap Kinabalu (*S. Yamane*); Sabah, Poring (*T. Kikuta*); Sabah, Tawau Hills N.P. (*S. Yamane*). **Singapore**: Bukit Timah (*D.H. Murphy*) **Brunei**: Temburong Dist., Kuala Belalong Field Centre (*D.W. Davidson*). **Indonesia**: Java, Tjompea (*K. Kraepelin*); Sulawesi Utara, Dumoga-Bone N.P. (*M. Horak*). **Palau Is**: Babelthuop, Ngaremskang (*J.L. Gressitt*). **Micronesia**: Yap Gp, Map I. and Rumung I. (*N.L.H. Krauss*).

Technomyrmex lisae Forel

Technomyrmex lisae Forel, 1913d: 94, fig. B. Syntype workers, MALAYSIA: Malacca, Taiping, Maxwell's Hill (*v. Buttel-Reepen*) and Perak, Tiefland, Feb. 1912 (no collector's name but presumably *v. Buttel-Reepen*); syntype queen, INDONESIA: Sumatra, Bandar Baroe (*v. Buttel-Reepen*) (MHNG) [examined].

WORKER. *Measurements*: TL 4.0 – 6.0, HL 0.92 – 1.68, HW 0.85 – 1.78, SL 0.88 – 1.34, PW 0.47 – 0.82, WL 1.16 – 1.80 (25 measured). *Indices*: CI 89 – 108, SI 75 – 106, OI 17 – 22, EPI 47 – 61, DTI 142 – 170.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a long U-shaped median cleft; inner margin of cleft meets the anterior clypeal margin in a sharp angle at each side. Posterior margin of head strongly concave in small workers; deeply cleft in large workers so that the head is cordate. Eyes relatively small (OI < 25) and located far in front of the midlength; in full-face view the outer margins of the eyes inset far from the outline of the sides of the head. Scapes without setae but with dense short pubescence that is slightly elevated. Dorsum of mesosoma and declivity of propodeum entirely lack setae. In profile the metathoracic spiracles well in front of the metanotal groove and the propodeal dorsum rounds into the declivity. Gastral tergites 1 – 2 without setae; gastral tergites 3 – 4 each with a transverse row of 6 – 8 stout stiff setae. Tibiae without setae but some elevated short pubescence may be present. Colour yellow to light brown or yellowish brown; usually the gaster, and frequently both the head and gaster, slightly darker than the mesosoma. Legs yellow to light brown, the tarsi about the same colour as the tibiae and femora.

Probably the most extremely polymorphic species in the genus. As worker size increases then CI also increases, but SI, OI and EPI all decrease, the SI markedly so. The change of head shape with increasing size is the most striking feature. In the smallest workers HL is greater than HW (*i.e.* CI < 100) but in the largest HW is greater than HL. As size increases the sides of the head become more strongly convex and the posterior margin more extensively and deeply cleft, so that the head shape of the smallest workers is markedly different from the strongly cordate heads of the largest workers.

T. horrens appears to be a related polymorphic species, but *horrens* is smaller, lacks setae on gastral tergite 3 and has only a shallow median concavity in the anterior clypeal margin.

MATERIAL EXAMINED
Malaysia: Malacca, Taiping, Maxwell's Hill (*v. Buttel-Reepen*); Perak, Tiefland (no collector's name); Negeri Sembilan, Pasoh For. Res. (*Brendell, Jackson & Lewis*); Pasoh For. Res. (*Brendell, Jackson & Ficken*); Sarawak, Lambir N.P (*S. Yamane*); Sarawak, 4th Div., Gn. Mulu N.P. (*Hammond & Marshall*); Gn. Mulu N.P. (*I. Hanski*); Gn. Mulu N.P. (*M. Collins*); Gn. Mulu N.P., Long Pala (*B. Bolton*); Sabah, Marak Parak (*Starr*); Sabah, Poring, Kinabalu (*S. Yamane*); Sabah, Poring Hot Springs (*Löbl & Burckhardt*); Sabah, Mt Penrissen (*Mjöberg*). **Brunei**: Bukit Sulang, nr Lamunin (*N. Stork*); Ulu Temborong (*M.C. Day*); K. Belalong (*N. Mawdsley*). **Indonesia**: Kalimantan, Barito Ulu (*Syaukani*); Sumatra, Bandar Baroe (*v. Buttel-Reepen*); W. Sumatra, Ulu Gadut nr Padang (*S. Yamane*); Sumatra, Liwa (no collector's name).

Technomyrmex mandibularis Bolton sp. n.

(Figs 52, 74)

HOLOTYPE WORKER. *Measurements*: TL 2.2, HL 0.56, HW 0.54, SL 0.44, PW 0.36, WL 0.68. *Indices*: CI 96, SI 81, OI 22, EPI 100, DTI 117.
Mandible with a conspicuous longitudinal groove on its dorsal surface. Dorsum of head in profile with numerous pairs of short setae, the longest are the 2 on each frontal carina; all others are distinctly shorter than the maximum diameter of the eye. Posterior margin of head with 3 – 4 pairs of setae across its width. Scapes with short setae present on the leading edge and dorsal surface that are shorter than the maximum width of the scape. Dorsum of head unsculptured but the surface partially masked by short dense pubescence. In full-face view the anterior clypeal margin almost transverse. Eyes small, located at or just behind the midlength and breaking the outline of the side of the head. Pronotal dorsum mostly smooth, with only vestiges of sculpture; dorsal mesonotum microreticulate to very finely reticulate-punctate; propodeal dorsum finely and very densely reticulate-punctulate. All dorsal surfaces of mesosoma, including propodeum, with numerous setae; propodeal declivity with 1 - 2 marginal pairs. With propodeum in profile the dorsum rounds into the declivity. Dorsal (outer) surfaces of middle and hind tibiae each with 1 - 2 very short elevated setae present, which appear to be easily lost by abrasion. Gastral tergites 1 – 4 each with numerous setae, most of them shorter than the maximum diameter of the eye but a few are about subequal. Gastral tergites 1 – 2 unsculptured, smooth and polished; pubescence on these sclerites sparse. Head and gaster black; mesosoma dark brown to black, the pronotum slightly lighter than the remainder and the propodeum about the same colour as the gaster.

PARATYPE WORKER. *Measurements*: TL 2.2, HL 0.56, HW 0.51, SL 0.42, PW 0.34, WL 0.64. *Indices*: CI 91, SI 82, OI 21, EPI 100, DTI 115. As holotype.

Holotype worker (upper specimen of two on pin), **Malaysia**: Neg. Sembilan, Pasoh Forest Reserve, xi.1994, fog sample (*Brendell, Jackson & Lewis*) (BMNH).
Paratype (lower specimen on same pin), 1 worker with same data as holotype (BMNH).

The most easily defined species of the *strenuus* complex because of its mandibular groove and the presence of erect setae on the scapes; see notes under *strenuus* (p. 100).

The mandibular groove is known in only one other *Technomyrmex* species, *brunneus*, which is mainly distributed in the Oriental region but has also been recorded from Brunei. The two should not be confused as *brunneus* lacks setae on the scapes, has no setae on the dorsum of the head behind the level of the posterior margin of the eye, and has the head finely and very densely microreticulate-shagreenate everywhere.

NON-PARATYPIC MATERIAL EXAMINED
Malaysia: Sabah, Danum Valley (*Widodo & Morimoto*).

Technomyrmex mixtus Bolton sp. n.

(Fig. 43)

HOLOTYPE WORKER. *Measurements*: TL 3.2, HL 0.79, HW 0.72, SL 0.82, PW 0.50, WL 1.08. *Indices*: CI 91, SI 114, OI 24, EPI 85, DTI 136.
Frontal carina with 2 setae: in profile the first above the torulus and the second at the level of the anterior margin of the eye. Dorsum of head behind this with only one other pair of setae, located about half-way between the level of the posterior margin of the eye and the posterior margin of the head, this pair slightly shorter than the maximum diameter of the eye; posterior margin itself without setae. With head in full-face view the anterior clypeal margin with an extremely feeble median indentation; sides of head convex and the posterior margin shallowly indented medially. Eyes located in front of midlength (EPI above) and their outer margins just fail to break the outline of the sides of the head in full-face view. With mesosoma in profile the mesonotal outline forms a more or less flat shallow slope to the metanotal groove, without a declivitous face posteriorly. Number of setal pairs on mesosoma: pronotum 2 – 3; mesonotum 2, only about half the length of the main pronotal setae and located posteriorly, just before the metathoracic spiracles; propodeal dorsum 0; lateral margin of propodeal declivity 2 - 3. Propodeum in profile with the dorsum rounding evenly into the declivity, the two surfaces not separated by an angle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite only slightly less than the maximum diameter of the eye. Head and mesosoma black, gaster blackish brown. All leg segments except tarsi dark brown to blackish brown, the tarsi dull yellow to brownish yellow. Microreticulate-punctulate sculpture of dorsal head dense and strongly developed.

PARATYPE WORKERS. *Measurements*: TL 3.2 – 3.3, HL 0.79 – 0.80, HW 0.72 – 0.73, SL 0.84, PW 0.50 – 0.51, WL 1.10 – 1.14 (2 measured). *Indices*: CI 91, SI 115 - 117, OI 25, EPI 85 - 88, DTI 135 - 140. As holotype.

Holotype worker (top specimen of three on pin), **Papua New Guinea**: 15 km. NW Mendi, 6.03S, 143.33E, 2200 m., 29.vii.1980, ground forager(s) montane rainfor. edge, roadside, #4632 (*P.S. Ward*) (ANIC).
Paratypes. Two workers (middle and bottom specimens on same pin) with same data as holotype (UCDC).

NON-PARATYPE WORKERS. *Measurements*: TL 3.2 – 3.3, HL 0.76 – 0.79, HW 0.71 – 0.73, SL 0.78 - 0.80, PW 0.46 – 0.50, WL 1.02 – 1.08 (3 measured). *Indices*: CI 92 - 93, SI 108 - 113, OI 24 - 25, EPI 87 - 90, DTI 136 - 139.

T. mixtus belongs to a small complex of New Guinea species of the *albipes* group that also includes *albicoxis*, *cheesmanae* and *prevaricus*. They are characterised by their relatively rounded, as opposed to distinctly angular, junction of propodeal dorsum and declivity.

The non-paratypic series mentioned below include a couple of alate males and a number of worker-queen intercastes in which at least the median ocellus is developed and the mesonotum is somewhat inflated and slightly projects posteriorly.

NON-PARATYPIC MATERIAL EXAMINED
Papua New Guinea: 7 km. SW Bundi (*P.S.Ward*); Bulldog Rd, 3 km. S Edie Creek (*P.S. Ward*); 11 km. E Baiyer R. Sanct. (*P.S. Ward*).

Technomyrmex modiglianii Emery

(Figs 44, 68)

Technomyrmex modiglianii Emery, 1900: 696, fig. 12. Syntype workers, INDONESIA, Sumatra, D. Tolong and Balighe (*E. Modigliani*) (MCSN) [examined].
Technomyrmex modiglianii r. *javanus* Forel, 1905b: 23. LECTOTYPE worker (by present designation; see note), INDONESIA: Java, Tjibodas, leg. 25-28.iii.1904, (ded. 8.vi.1904) (*K. Kraepelin*) (MHNG) [examined]. **Syn. n.** [Unresolved junior secondary homonym of *setiferum* var. *javanum* Forel, 1905b: 22.]

NOTE
The supposed syntypes of *javanus* Forel (1905b) consist of two worker specimens on a single card-triangle mount. The specimen closest to the pin is mounted upside-down and has its petiole and gaster missing. From what can be seen, this specimen appears to be a worker of *T. albipes*. The outer specimen consists only of a head (broken from the body, lacking antennae and mounted separate from the body), and a mesosoma; the petiole, gaster and legs of the left side are all missing. These fragments are so abraded that hardly any setae remain. However, they best match the original description of *javanus* and are thus designated as lectotype here.

WORKER. *Measurements*: TL 2.5 – 3.8, HL 0.67 – 0.96, HW 0.65 – 0.96, SL 0.60 – 0.74, PW 0.38 – 0.57, WL 0.82 – 1.08 (20 measured). *Indices*: CI 95 – 103, SI 77 – 95, OI 19 – 24, EPI 54 – 66, DTI 116 – 133.
Frontal carina with 2 (very rarely 3) setae: in profile the posteriormost at about the level of the anterior margin of the eye. Dorsum of head above the eye with 0 – 2 pairs of setae; if present (usually only in largest workers) these setae are much shorter than those on the frontal carinae. Behind level of posterior margin of eye a single pair of dorsal setae present, in profile located about two-thirds the distance to the posterior margin of the head. With head in full-face view the anterior clypeal margin with a conspicuous median notch; inner margin of notch rounds into the anterior clypeal margin without an acute angle or tooth. Posterior margin of head broadly and strongly emarginate. As worker size increases the sides of the head become more strongly convex, the clypeal notch becomes more pronounced and the posterior emargination becomes deeper and more extensive. Eyes small and located well in front of the midlength, the outer margins of the eyes are set well in from the outline of the sides in full-face view. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Propodeal dorsum short, in profile the straight-line length of the dorsum less than the depth of the declivity to the spiracle; dorsum and declivity meet in an angle. Number of setal pairs on mesosoma: pronotum 2 - 5; mesonotum 1 – 4; propodeal dorsum 0; lateral margins of propodeal declivity 2 – 3. Gastral tergites 1 – 4 each with numerous setae all over the sclerites, the longest of which on the first gastral tergite are equal to, or only fractionally shorter than, the maximum diameter of the eye. Head, mesosoma, petiole and gaster brown to dark brown; leg segments approximately the same shade of brown or slightly lighter, except for the trochanters and tarsi which are dull yellow to yellowish brown.

This size-variable species is close to *elatior* but in that species the dorsum of the head does not have any setae present between the level of the posterior margin of the eye and the posterior margin of the head. Also, the setae on the first gastral tergite are always much shorter than the maximum diameter of the eye in *elatior*. The series from Laos, listed below, has gastral setae that are shorter than usual for *modiglianii*, but even here they are distinctly longer than in *elatior*.

Another close relative is the poorly known *yamanei*, from North Thailand and Vietnam, but this is easily separted from both *modiglianii* and *elatior* by its presence of setae at the posterior margin of the head, deeply U-shaped median clypeal incision that meets the anterior clypeal margin in a sharp angle on each side and extremely short and

sparse gastral setae.

T. modiglianii is most frequently collected from tree trunks and canopy although some records of workers on rotten logs are known. Worker-queen intercastes have not been recorded in this species, as is also the case in *elatior*.

MATERIAL EXAMINED

Laos: Laksao (*H. Fukuda*). **Thailand**: Khao Yai N.P., Nakhonratchasima (*Thall & Yamane*). **Malaysia**: Perak, Cameron Highlands, Sungei Simei Falls (*Jaccoud & Marcuard*); Negeri Sembilan, Pasoh For. Res. (*Lewis & Jackson*); Pasoh For. Res. (*Brendell, Jackson & Ficken*); Selangor, Ulu Gombak (*S. Yamane*); Johor, NW Kota Tinggi Lombong, Muntahak Hill (*P. Cechovsky*); Gn. Jerai (no collector's name); Sarawak, 4th Div., Gn. Mulu N.P. (*I. Hanski*). **Indonesia**: Java, Tjibodas (*K. Kraepelin*); Sumatra, D. Tolong and Balighe (*E. Modigliani*); Sumatra, Parapat, Danau Toba (*S. Yamane*); Sulawesi Utara, Dumoga-Bone N.P. (*N. Stork*); Dumoga-Bone N.P. (*R.H.L. Disney*).

Technomyrmex myops Bolton **sp. n.**

(Fig. 41)

HOLOTYPE WORKER. *Measurements*: TL 2.5, HL 0.55, HW 0.52, SL 0.46, PW 0.36, WL 0.68. *Indices*: CI 95, SI 88, OI 21, EPI 83, DTI 119.

Frontal carina with 2 setae: in profile the anterior at the torulus, the posterior at the level of the anterior margin of the eye and slightly longer than the maximum diameter of the eye. Dorsum of head posterior to this with a single pair of setae, in profile located about two-thirds the distance between level of posterior margin of eye and posterior margin of head, not at the posterior margin; this pair of setae shorter than the posteriormost pair on the frontal carina. With head in full-face view the anterior clypeal margin extremely shallowly concave medially, almost transverse, without an impression or notch. Posterior margin of head with a small shallow indentation medially. Eyes small, located in front of the midlength; outer margin of eye just touches the outline of the side in full-face view. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Propodeal dorsum short, in profile the straight-line length of the dorsum about half the depth of the declivity to the spiracle; dorsum and declivity meet in a blunt angle. Number of setal pairs on mesosoma: pronotum 2, the longest longer than the maximum diameter of the eye; mesonotum 1, located on posterior one-third of sclerite; propodeal dorsum 0; lateral margins of propodeal declivity 2, the longest much longer than the maximum diameter of the eye. Scapes and tibiae without setae. Gastral tergites 1 – 4 each with numerous long curved setae, distributed everywhere on the sclerites (sternites with similar setae present); maximum length of setae on first gastral tergite is at least 1.50 × the maximum diameter of the eye. Head, mesosoma, petiole and gaster dark brown. Legs brown except for trochanters and tarsi, which are yellow.

PARATYPE WORKER. *Measurements*: TL 2.2, HL 0.50, HW 0.48, SL 0.42, PW 0.34, WL 0.60. *Indices*: CI 92, SI 88, OI 21, EPI 82, DTI 112. As holotype.

Holotype worker (upper of two specimens on pin), **Malaysia**: Negeri Sembilan, Pasoh For. Res., xi.1994 (*Lewis & Jackson*) (BMNH).
Paratype. 1 worker (lower of two on pin) with same data (BMNH).

This member of the *albipes* group is immediately characterised by its small size, small eyes and short scapes, and especially by the distribution and length of its setae. Those on the dorsal gaster are particularly striking as they are numerous and much longer than is usual in the group.

Technomyrmex obscurior W.M. Wheeler **stat. n.**

(Fig. 58)

Technomyrmex schimmeri var. *obscurior* Wheeler, W.M. 1928: 31. Syntype workers, CHINA: Yi Leang (= Yiliang, Kunming Prov.?), 27.ii.1925 (*F. Silvestri*) (MCZC) [examined].

WORKER. *Measurements*: TL 3.2 – 3.8, HL 0.71 – 0.96, HW 0.63 – 0.86, SL 0.90 – 1.05, PW 0.45 – 0.55, WL 0.95 - 1.35 (15 measured). *Indices*: CI 84 – 93, SI 122 – 143, OI 23 – 32, EPI 67 – 80, DTI 156 – 168.

Head behind clypeus, dorsum of mesosoma, declivity of propodeum and first gastral tergite all entirely lack setae. Gastral tergites 2 – 4 with long stout setae present that are slightly longer than the maximum diameter of the eye: second gastral tergite with 2 – 3 pairs, third and fourth tergites each with 3 – 4 pairs. Anterior clypeal margin with a distinct median notch that is semicircular to broadly U-shaped. The margins of the notch meet the lateral portions of the anterior margin through rounded curves, not sharp angles. Posterior margin of head indented medially. With head in full-face view the outer margins of the eyes fail to touch the outline of the convex sides of the head. Scape index > 120. Clypeal sculpture usually relatively coarse between posterior margin of notch and clypeal suture, usually shallowly reticulate-punctulate and generally more strongly developed than in the area between the frontal carinae. In dorsal view the metathoracic spiracles distinctly separated from the metanotal groove; distance separating them more than one spiracle diameter, usually obviously so. Mesosoma relatively long, DTI 156 – 168, usually > 160. In profile the propodeal dorsum long, flat or even slightly concave, its straight-line length greater than the depth of the declivity to the spiracle. In profile the head, mesosoma, petiole and gaster all the same shade of dark brown to blackish brown, or very nearly so. Anterior coxa brown; middle and hind coxae ivory-white to yellow and strongly contrasting with the mesosoma. All trochanters yellow. Femora and tibiae mostly brown, same colour as the mesosoma or slightly lighter but base and apex of each segment dull yellow. Tarsi off-white to yellow, lighter than the central portions of the femora and tibiae.

The few samples currently grouped under this name, although coming from a relatively restricted area, show considerable variation in scape length, eye size, development of clypeal sculpture, degree of separation of metathoracic spiracle from metanotal groove and length of propodeal dorsum. It seems probable that further collections will allow a better resolution of the taxonomy. However, it should be noted that some characters are known to show variation in other species of the group and so would not certainly have species-rank value here. For instance SI shows notable variation in single series of *impressus*, where the smallest workers have relatively much longer scapes than the largest.

The closest related species to *obscurior* is *antennus*, but the latter has a short, deep propodeum and differently coloured middle and hind coxae.

MATERIAL EXAMINED

Nepal: Pokhara (*P.S. Ward*). **China**: Hong Kong, New Territory, Taipo Kau (*S. Yamane*); Yi Leang (*F. Silvestri*). **Myanmar**: Rakhine State Elephant Sanctuary (*K.J. Ribardo*). **Vietnam**: M. Nghe An Pu Hoat (*B.T. Viet*); Ninh Binh Prov., Nho Quan Dist., Cuc Phuong N.P. (*S. Yamane*); Ha Tai, Ba Vi (*K. Eguchi*). Thailand: Khao Yai N.P. (*B.V. Brown*); Khao Yai N.P., Nakhonratchasima (*Thall & Yamane*); Chanthaburi Prov., Khao Soi Dao WS (*S. Yamane*).

Technomyrmex pluto Bolton **sp. n.**

HOLOTYPE WORKER. *Measurements*: TL 3.3, HL 0.70, HW 0.66, SL 0.80, PW 0.45, WL 1.02. *Indices*: CI 94, SI 121, OI 29, EPI 70, DTI 140.

Frontal carina with 2 setae: in profile the posterior seta approximately at the level of the anterior margin of the eye and shorter than the maximum diameter of the eye. Dorsum of head posterior to this entirely lacks setae. With head in full-face view the anterior

clypeal margin with an extremely shallow median concavity; sides of head shallowly convex and the posterior margin more or less transverse, without a median indentation. Eyes located in front of midlength; outer margin of eye just fails to touch the outline of the side in full-face view. With mesosoma in profile the mesonotal outline is mostly more or less flat but curves posteriorly into a short oblique declivitous face. Number of setal pairs on mesosoma: pronotum 1 (abraded away in holotype but present in paratypes); mesonotum 0; propodeal dorsum 0; lateral margins of propodeal declivity 1, just above the spiracle. With the propodeum in profile its dorsum and declivity meet through a rounded surface, not angular. Straight-line length of propodeal dorsum in profile less than depth of declivity to spiracle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is less than the maximum diameter of the eye. Head and gaster dark brown to blackish brown; pronotum and mesothorax brown; propodeum mostly brown on sides but dorsum and declivity dull yellow; petiole yellow anteriorly, brown posteriorly. Middle and hind coxae and trochanters yellow; base of femora adjacent to trochanters yellow but remainder brown; tibiae and tarsi pale yellow.

PARATYPE WORKERS. *Measurements*: TL 2.9 – 3.3, HL 0.66 – 0.72, HW 0.61 – 0.65, SL 0.74 – 0.78, PW 0.44 – 0.46, WL 0.94 – 0.98 (2 measured). *Indices*: CI 90 - 92, SI 120 - 121, OI 28 - 29, EPI 71, DTI 130 - 135. As holotype but one with almost all of the propodeum yellow, with a pale brown patch laterally anterior to the spiracle.

Holotype worker (top specimen of 3 on pin), **Indonesia**: Sulawesi Utara, Dumoga-Bone N.P., Fog 25, 1200 m., 31.vii.1985, G. Ambang F.R., nr Kotamobagu (*N. Stork*) (BMNH).
Paratypes. 2 workers (middle and bottom specimens of 3 on pin), and 1 queen, 8 workers, with same data (BMNH).

T. pluto has the same arrangement of setae on the head as *albipes* and a number of other species of this region, but the combination of this with its unique colour pattern, long scapes and relatively large eyes serve to characterise the species.

T. hades is another arboreal species from Sulawesi that is closely related to *pluto* and also has a yellow petiole, but *hades* is smaller, has no yellow on the propodeal dorsum and declivity, has shorter scapes (SI 112 – 115) and has middle and hind tibiae that are distinctly much darker than its yellow tarsi. Both have been collected only by pyrethrum fogging of forest trees.

Technomyrmex pratensis (F. Smith)

(Figs 51, 66)

Tapinoma pratensis Smith, F. 1860: 97. Syntype workers, INDONESIA: Batjan I, "Bac.20" (*A.R. Wallace*) (OXUM) [examined]. [Combination in *Iridomyrmex* by Donisthorpe, 1932b: 460; in *Technomyrmex* by Shattuck, 1992b: 161.]
Tapinoma setiferum Emery, 1900: 695, fig. 11. Syntype workers, INDONESIA: Sumatra, D. Tolong, xi.1890 (*E. Modigliani*), Pea Ragia, x.1890 (*E. Modigliani*) and Balighe, x.90 – iii.91 (*E. Modigliani*) (MCSN) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Wheeler, W.M. 1927: 99 (misspelled as *setiferus*).]
Tapinoma setiferum var. *javanum* Forel, 1905b: 22. Syntype workers, INDONESIA: Java, Buitenzorg, leg. 24.ii.-12.iii.1904 (ded. 8.vi.1904) (*K. Kraepelin*) MHNG) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

WORKER. *Measurements*: TL 2.6 – 3.5, HL 0.70 – 0.94, HW 0.63 – 0.92, SL 0.56 – 0.76, PW 0.45 – 0.56, WL 0.82 – 1.06 (25 measured). *Indices*: CI 90 – 102, SI 83 – 97, OI 20 – 25, EPI 78 – 85, DTI 105 – 120.
Palp formula 5,3. Dorsum of head behind clypeus with 5 pairs of long setae arranged in two parallel rows: in profile the first seta above the torulus; second and third setae along the frontal carina, the third at about the level of the posterior margin of the eye; fourth

seta dorsal, between posterior margin of eye and posterior margin of head; fifth seta at the posterior margin and much longer than the maximum diameter of the eye. Scape without erect setae but pubescence on scape and side of head usually denser and more elevated in larger individuals, sparser and more reclinate in smaller workers. Anterior clypeal margin with a deep and very conspicuous U-shaped median incision that is usually slightly longer than broad; inner margin of incision meets the anterior clypeal margin in an acute angle at each side. Posterior margin of head in full-face view with a distinct median impression. Eyes located in front of the midlength of the head and in full-face view set well in from the side, distinctly failing to break the outline of the side but closer to the sides in smaller than in larger workers. Mesosoma short and stout (DTI, above), in profile the mesonotum convex; the propodeal dorsum rounds into the declivity. Number of setal pairs on mesosoma: pronotum 1 – 4 (number tends to increase with size, but not always so); mesonotum 2 – 4 (in larger workers 1 – 3 pairs of much shorter secondary setae may also be present among the main setae); propodeal dorsum 0; lateral margin of propodeal declivity 1 – 3, always a strong pair at the level of the spiracle. Gastral tergites 1 – 4 each with numerous long strong setae, the longest on the first tergite much longer than the maximum diameter of the eye. Smaller workers and populations from the north of the species' range without erect setae on the dorsal (outer) surfaces of the middle and hind tibiae, but larger workers, particularly from the south of its range, with 1 – 3 erect tibial setae present; tibial pubescence elevated. Head, mesosoma and petiole brownish yellow to brown, the gaster the same colour to distinctly darker. Legs uniformly coloured, the same as the mesosoma to slightly lighter; tarsi the same colour as the tibiae.

T. pratensis is immediately diagnosed by its reduced palp formula, deeply cleft clypeal margin, characteristic cephalic setae, short stocky body and short scape. Its nearest relative appears to be the Afrotropical *lasiops* (p. 24), which closely resembles *pratensis* (including PF 5,3) but has a different arrangement of setae on the head.

All the samples listed below are treated as belonging to a single, size-variable, species, but because of variations in pilosity, particularly the presence in some samples of erect setae on the dorsal (outer) surfaces of the middle and hind tibiae, there may be more than one real species here. The possibility is currently doubted as the number of such setae varies from 0 – 3, does not appear consistent in single nest-samples, and may well be size-related as the larger the individual the more setae appear to develop. Similarly, larger workers have pubescence that is denser and more elevated than in smaller individuals. Other indications of allometric variation among the relatively few samples available include the observations that with increasing size (*i.e.* as HW increases) CI tends to increase while SI and OI tend to decrease. More material from all over the range is required before these hypotheses can be tested properly and conclusions reached concerning how many species are really here, but at the moment the evidence seems to show that there is only one.

MATERIAL EXAMINED

India: Sikkim, Tukvar (*Möller* coll., Bingham). **China**: Guangxi, Shiwandashan Nat. Res. (*J. Huang*); Guangxi, Noggang Nat. Res. (*Y. Pan*); Hunan, Jiangyong County (*J. Huang*). **Vietnam**: M. Nghe An, Pu Hoat, Ban Om (*B.T. Viet*); Pu Hoat, Lung Khung (*B.T. Viet*); My Yen Comm. Forest, Na Hau, Thai Nguyen (*S. Yamane*); Ba Vi Nat. Pk, Ha Tai Prov. (*H. Okido*); Ba Vi Nat. Pk (*K. Eguchi*); Tai Yen Tu, Bac Giang (*K. Eguchi*). **Thailand**: Nam Tok Phlio N.P., Chantaburi Prov. (*S. Yamane*); Khao Soi Dao WS, Chantaburi Prov. (*S. Yamane*); Kaeng Krachan (*Löbl & Burckhardt*); Khao Sabap (*Löbl & Burckhardt*); Chiang Mai (*Cerri*). **Malaysia**: nr Genting Highlands, Bunga Bush (*S. Yamane*); Negeri Sembilan, Pasoh (*P.J. Greenslade*); Sabah, Kibongol Valley, nr Tambunan (*Löbl & Burckhardt*); Sabah, Poring (*S. Yamane*); Sabah, Crocker Range N.P., Mahua Waterfall (*H. Okido*); Mahua Waterfall (*S. Yamane*); Sarawak, 4th Div., Gn. Mulu N.P. (*M. Collins*); Sarawak, Tower Region, Lambir N.P., Miri (*S. Yamane*). **Indonesia**: Sumatra, Ulu Gadut nr Padang (*S. Yamane*); Sumatra, Teluk Kabung nr Padang (*S. Yamane*); Java, Bogor (*K. Kraepelin*); Sulawesi Utara, Dumoga-Bone N.P. (*R.H.L. Disney*); Dumoga-Bone N.P. (*P.M. Hammond*); Sulawesi Tengah, Morowali, Ranu Riv. Area (*M.J.D. Brendell*); Batjan I. (*A.R. Wallace*).

Technomyrmex prevaricus Bolton sp. n.

HOLOTYPE WORKER. *Measurements*: TL 3.2, HL 0.69, HW 0.64, SL 0.65, PW 0.44, WL 0.92. *Indices*: CI 93, SI 102, OI 28, EPI 73, DTI 132.
Frontal carina with 2 setae that are the longest on the dorsum of the head: in profile the anterior of these is at the torulus and the posterior is at the level of the anterior margin of the eye and is slightly shorter than the maximum diameter of the eye. Dorsum of head from this seta with 6 – 7 pairs of shorter setae to the posterior margin; posterior margin itself with 6 – 8 setae across its width. Anterior clypeal margin almost transverse medially, with only a vestigial trace of concavity. Posterior margin of head in full-face view shallowly concave medially. Sides of head shallowly convex and the outer margins of the eyes just break the outline of the sides in full-face view. Sculpture of dorsal head reduced to small superficial punctulae or faint superficial reticulation, not the usual microreticulate-shagreenate sculpture characteristic of the group. With mesosoma in profile the mesonotal outline is curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Propodeal dorsum in profile convex and curves evenly into the declivity. Number of setal pairs on mesosoma: pronotum 4; mesonotum 3, one anterior, one median and one posterior; propodeal dorsum with a few minute setae where the dorsum curves into the declivity; lateral margins of propodeal declivity 1, long, only slightly shorter than the maximum diameter of the eye. Gastral tergites 1 – 4 each with numerous setae all over the sclerites, the longest on the first gastral tergite slightly longer than the maximum diameter of the eye. Sculpture on first gastral tergite reduced and superficial. Head dark brown, mesosoma light brown, gaster blackish brown. Coxae about the same colour as the mesosoma or slightly lighter, femora and tibiae brown, tarsi slightly lighter than tibiae.

Holotype worker, **Indonesia**: Irian Jaya, PT. Freeport Concession, Siewa camp, 03.04°S, 136.38°E, 200 ft, 18-30.iv.1998, Malaise trap, lowl. secondary rainforest (*R.R. Snelling*) (LACM).

T. prevaricus is related to two other New Guinea species that have numerous setae on the dorsum of the head, *cheesmanae* and *albicoxis*. However, both of these species lack setae across the posterior margin of the head and are very differently coloured. In addition, *cheesmanae* has its longest pair of cephalic setae just anterior to the posterior margin, and these are longer than the maximum diameter of the eye; and in *albicoxis* the scapes are considerably longer, SI 117 – 121.

Technomyrmex rector Bolton sp. n.

(Fig. 71)

HOLOTYPE WORKER. *Measurements*: TL 3.5, HL 0.81, HW 0.78, SL 0.80, PW 0.53, WL 1.08. *Indices*: CI 96, SI 103, OI 28, EPI 74, DTI 138.
Head behind clypeus, dorsum of mesosoma, declivity of propodeum and first gastral tergite all entirely lack setae. Gastral tergites 2 – 3 should each apparently have a single pair of stout setae present (see notes). Anterior clypeal margin with a broad, shallow median notch that is less than semicircular; the margins of the notch meet the lateral portions of the anterior margin through rounded curves, not sharp angles. In full-face view the maximum length of the notch is only about 0.25 times the distance from its posterior margin to the clypeal suture. Posterior margin of head broadly but shallowly indented. With head in full-face view the outer margins of the eyes fail to touch the outline of the sides of the head; the sides convex. Scape index 103. Clypeal sculpture fine between posterior margin of notch and clypeal suture. In dorsal view the metathoracic spiracles are close to the metanotal groove; distance separating them is slightly greater than one spiracle diameter. Mesosoma with DTI 138. In profile the straight-line length of the propodeal dorsum is much less than the depth of the declivity

to the spiracle. Dorsal outline of propodeum without a notch or indentation at about its midlength. In profile the head, mesosoma, petiole and gaster are uniformly brown. Anterior coxae brown but middle and hind coxae yellow and strongly contrasting with the mesosoma. All trochanters yellow. Middle and hind femora light brown for most of their length but yellow near apices. Middle and hind tibiae and tarsi all the same shade of yellow.

Holotype worker, **India**: Coimbatore, 25.ix.1977 (*J. Noyes*) (BMNH).

The posterior margin of the head in *rector* is more broadly, shallowly impressed in full-face view than in *kraepelini* or *sundaicus* workers of the same size. The median clypeal notch in *rector* is much more shallow than in those two species, where the maximum length of the notch in full-face view is usually at least 0.45 times the distance between the posterior margin of the notch and the clypeal suture, or obviously more. The right antenna of the *rector* holotype is missing and its gaster is abraded. No actual setae are present but the second and third tergites appear to have had only one pair of setae each. The fourth tergite is mostly telescoped within the third and no setae are visible on its surface, though they may have been lost. In workers of *kraepelini* and *sundaicus* with similar telescoping, flattened down setae remain obvious. The true setal pattern of the gaster in *rector* must await the dicovery of fresh workers. Finally, the uniform light colour of the middle and hind tibiae and tarsi of *rector* is not duplicated in either *kraepelini* or *sundaicus*, where the tibiae are always distinctly darker than the tarsi.

Technomyrmex reductus Bolton sp. n.

(Fig. 56)

HOLOTYPE WORKER. *Measurements*: TL 3.7, HL 0.77, HW 0.70, SL 0.68, PW 0.48, WL 1.01. *Indices*: CI 91, SI 97, OI 27, EPI 97, DTI 125.
Palp formula 4,3. Dorsum of head behind clypeus entirely lacks setae; dorsum covered with fine, dense minute pubescence that is slightly elevated, not appressed. With head in full-face view the anterior clypeal margin with a small, narrow median indentation; the posterior margin of the head shallowly concave. Eyes close to or at the midlength, their outer margins just fail to break the outline of the sides. Scape without setae but with dense minute pubescence that is somewhat elevated. Dorsum of mesosoma and propodeal declivity entirely lack setae. In profile dorsum of mesonotum slopes very shallowly and meets the propodeal dorsum in a very broadly obtuse angle. Metanotal groove present but not impressed, instead merely forming the angle between mesonotum and propodeum. Propodeum in profile with the dorsum extremely shallowly convex; straight-line length of dorsum much greater than the depth of the declivity to the spiracle, which itself is located high on the declivity. Gastral tergites 1 – 4 with sparse and extremely short, inconspicuous setae; those on the first tergite more or less restricted to close to the apex of the sclerite. Maximum length of setae on gastral tergites 1 – 2 only 0.30 × the maximum diameter of the eye, or even less. Tibiae of middle and hind legs without setae though some short, slightly elevated pubescence may be present. Head, mesosoma, petiole and gaster a more or less uniform rich dark brown; legs the same colour or slightly lighter.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 3.5 – 3.7, HL 0.75 – 0.80, HW 0.67 – 0.72, SL 0.67 – 0.71, PW 0.47 – 0.52, WL 0.98 – 1.03 (12 measured). *Indices*: CI 88 – 91, SI 97 – 104, OI 27 – 30, EPI 93 – 100, DTI 120 – 130. As holotype.

Holotype worker (upper of 2 specimens on pin), **Malaysia**: Sarawak, 4th Division, Gn. Mulu N.P., v.1978, limestone forest (*M. Collins*) (BMNH).
Paratype. 1 worker (lower of 2 on pin), with same data (BMNH).

T. reductus is immediately identified within the zoogeographical regions under consideration here by its reduced PF of 4,3. This palp formula is shared only with the otherwise unrelated *lujae* (p. 26) of the Afrotropical region. Also diagnostic are the minute setae that are restricted to the gastral tergites and the absence of setae elsewhere on the dorsal mesosoma and head behind the clypeus.

NON-PARATYPIC MATERIAL EXAMINED
Malaysia: Sarawak, Sabal (*S. Yamane*). **Brunei**: Temburong Dist., Kuala Belalong Field Center (*D.W. Davidson*).

Technomyrmex rotundiceps Karavaiev **stat. n.**

Technomyrmex albipes subsp. *rotundiceps* Karavaiev, 1926: 443. Syntype workers, INDONESIA: Java, Tjampea, no. 2390 (*Karavaiev*) (UASK) [examined].

WORKER. *Measurements*: TL 2.6 – 2.7, HL 0.62 – 0.68, HW 0.56 – 0.65, SL 0.54 – 0.66, PW 0.38 – 0.43, WL 0.76 – 0.86 (6 measured). *Indices*: CI 90 – 97, SI 92 – 102, OI 24 – 25, EPI 100 – 110, DTI 122 – 126.
Frontal carina with 2 setae. Dorsum of head posterior to this with a single pair of setae, in profile located just over half way between level of posterior margin of eye and the posterior margin of the head, not at the posterior margin; this pair of setae shorter than the posterior seta on the frontal carina. With head in full-face view the anterior clypeal margin with a very weak, shallow median indentation; sides distinctly convex, broadest across the eyes; posterior margin of head with a small shallow indentation medially. Eyes located at or behind the midlength, EPI 100 or more; outer margin of eye just fails to break the outline of the side in full-face view. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Dorsum and declivity of propodeum meet in an angle in profile. Number of setal pairs on mesosoma: pronotum 2 – 3; mesonotum 1 – 2 (usually 2, one pair anterior and the other posterior on the sclerite; when only one pair present it is the posterior pair); propodeal dorsum 0; lateral margins of propodeal declivity 2 – 3. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite is equal to or slightly greater than the maximum diameter of the eye. Head, mesosoma, petiole and gaster blackish brown to black. Coxae, femora and tibiae the same colour as the mesosoma or very nearly so; never with strongly contrasting lighter coxae. Basal two-thirds of hind basitarsus dark brown to black, the same colour as the tibia; apical third and tarsomeres 2 – 5 yellow.

This species is quite distinct from *albipes*, with which it was previously associated. Its eyes are located distinctly more posteriorly (EPI in *albipes* is 70 – 88), there is a pair of setae on the dorsum of the head behind the level of the eye and *rotundiceps* workers tend to average somewhat larger (*albipes* HL 0.56 – 0.63, HW 0.52 – 0.58). Also, the hind basitarsus is mostly dark brown to black in *rotundiceps*, the same colour as the tibia. This apparently trivial character appears consistent and has not been seen in genuine *albipes*, where the hind basitarsus is entirely yellow to white and contrasts with the dark brown to black tibia.

The relatively posteriorly placed eyes are duplicated in *brunneus* but that species has a conspicuous mandibular groove (absent in *rotundiceps*) and lacks setae on the dorsal head behind the level of the posterior margin of the eye. The tramp *difficilis* appears closely related but here the eyes are somewhat larger and located further forward (OI 25 – 30, EPI 72 – 86), the sides of the head are not so distinctly convex and the hind tarsal segments are uniformly pale.

The material from Pasoh Forest Reserve was collected by pyrethrum fogging of a forest tree.

MATERIAL EXAMINED
Malaysia: Negeri Sembilan, Pasoh For. Res.(*Brendell, Jackson & Ficken*); Sarawak, 4th Div., Gn. Mulu N.P. (*N.M. Collins*). **Indonesia**: Java, Tjampea (*Karavaiev*).

Technomyrmex schimmeri Viehmeyer

Technomyrmex schimmeri Viehmeyer, 1916: 143, fig. 8. Syntype workers and queen, SINGAPORE (*H. Overbeck*) (ZMHB) [examined].

See notes under *horni* (p. 85).

Technomyrmex strenuus Mayr

(Fig. 53)

Technomyrmex strenua Mayr, 1872: 147. Syntype workers and ergatoid queen, MALAYSIA: Sarawak, 1865 – 66 (*G. Doria*) (NHMW) [examined].

WORKER. *Measurements*: TL 2.3 – 3.1, HL 0.56 – 0.68, HW 0.55 – 0.70, SL 0.48 – 0.60, PW 0.36 – 0.46, WL 0.68 – 0.86 (5 measured). *Indices*: CI 95 – 102, SI 86 – 91, OI 20 – 24, EPI 80 – 95, DTI 110 – 120.
Frontal carina with 2 – 3 setae. Posterior to this the head with 5 – 6 pairs of varying length on the dorsum itself and with an additional 4 – 6 setae across the posterior margin; longest setae at least equal to maximum diameter of eye, usually somewhat longer. Scapes without setae. Dorsum of head glassy smooth, unsculptured except for pits from which setae arise, and with sparse minute pubescence that does not conceal the surface. In full-face view the anterior clypeal margin almost transverse, the posterior margin of the head very feebly concave medially; outer margins of eyes just break the outline of the sides of the head. Pronotal dorsum mostly smooth, with only vestiges of sculpture; dorsal surfaces of mesonotum and propodeum minutely and very densely reticulate-punctulate, the latter slightly more densely so than the former. Number of setal pairs on mesosoma: pronotum 3 – 4; mesonotum 4 – 6; propodeum 4 – 5; lateral margin of propodeal declivity 2 – 3. With propodeum in profile the junction of dorsum and declivity bluntly angular. Dorsal (outer) surfaces of middle and hind tibiae without setae. Gastral tergites 1 – 4 each with numerous setae, the longest of them longer than the maximum diameter of the eye. Gastral tergites 1 – 2 unsculptured, smooth and polished; pubescence on these sclerites very sparse. Head and gaster dark brown to black; most of mesosoma slightly lighter, the colour usually varying in intensity in different areas; pronotum slightly lighter than the remainder and the propodeum often the same colour as the gaster.

T. strenuus is a member of a complex of four closely related, small, arboreal species that together are characterised by dense pilosity all over the body (including the propodeal dorsum), strongly reduced sculpture so that the head capsule is glassy smooth and gastral tergites 1 – 2 are smooth and shining, and relatively short scapes (SI range of all four species 81 – 91). Of the four, *mandibularis* is immediately diagnosed by its possession of a mandibular groove, the presence of short setae on the scapes and the presence of dense cephalic pubescence. The other three species lack all these characters.

T. convexifrons has standing setae on the dorsal (outer) surfaces of the middle and hind tibiae, at least one on each tibia in the apical half. *T. strenuus* and *tatius* lack such tibial setae. These two are easily separated as the anterior clypeal margin of *strenuus* is almost transverse while that of *tatius* has a marked median indentation, the only member of the complex to display such a feature.

Material of all four species is very sparse and it is not known if they develop female intercastes. However, the syntype-series of *strenuus* contains an apparent queen, with fully developed mesosomal sclerites but which is apterous. This may represent a

genuine ergatoid queen or be the most morphologically queen-like of an otherwise unknown intercaste sequence.

All four species mentioned above are known only from the Malay Peninsula, Borneo and Sumatra, but there is also an unnamed species of this complex present in Sri Lanka. It is represented by a single specimen collected by Bingham (in BMNH) that has its head missing, so its identity can not be ascertained, but it does prove that the distribution of this complex is much wider than is implied by the few complete specimens that are currently available.

MATERIAL EXAMINED
Malaysia: Negeri Sembilan, Pasoh For. Res. (*Brendell, Jackson & Ficken*); Sarawak (*G. Doria*); Sarawak, 4th Div., Gn. Mulu N.P. (*M. Collins*). **Singapore**: no loc. (*H.N. Ridley*). **Brunei**: K. Belalong (*N. Mawdsley*).

Technomyrmex subgracilis Bolton **sp. n.**

(Figs 46, 73)

HOLOTYPE WORKER. *Measurements*: TL 3.9, HL 0.82, HW 0.71, SL 0.84, PW 0.51, WL 1.18. *Indices*: CI 87, SI 118, OI 30, EPI 98, DTI 137.
Frontal carina with 2 setae: in profile the posterior of these at the level of the anterior margin of the eye. Dorsum of head behind this with 1 pair of setae at the level of the posterior margin of the eye and behind this is a final pair, located well in front of the posterior margin. Posteriormost setae the longest, about equal to the maximum diameter of the eye. With head in full-face view the anterior clypeal margin without a median indentation. Sides of head feebly convex and converging anteriorly; corners of posterior margin of head very broadly rounded and in full-face view the posterior margin convex on each side of a small median indentation. Eyes located at midlength of head and their outer margins just fail to touch the outline of the sides of the head. With mesosoma in profile the mesonotal outline is a shallowly convex slope with a short, feeble declivity posteriorly. Number of setal pairs on mesosoma: pronotum with 2; mesonotum with 1, short and located posteriorly, at the point where slope of mesonotum changes; propodeal dorsum 0; lateral margin of propodeal declivity 1. Propodeum in profile with the dorsum flat and slightly longer than the depth of the declivity to the spiracle; propodeal dorsum and declivity meet in an angle. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite slightly greater than the maximum diameter of the eye. Head, mesosoma, petiole and gaster black. Coxae, femora and tibiae of middle and hind legs black. Basitarsi of hind legs infuscated basally, only slightly lighter than the tibia, becoming lighter towards the apex where they are the same dull yellowish brown colour as the remaining tarsal segments.

Holotype worker, **Malaysia**: Borneo, Sabah, Sayap Kinabalu, *ca* 1000 m. alt., 14.vii.1996 (*Sk. Yamane*) (KUIC).

Known from only a single worker, *subgracilis* is identified by its combination of the distribution of setae on the dorsal head, lack of indentation in the anterior clypeal margin, relatively large eyes that are at the midlength of the head, long scapes and angular propodeum.

Technomyrmex sundaicus (Emery)

Tapinoma sundaicum Emery, 1900: 695, fig. 10. Syntype workers, INDONESIA: Sumatra, Si Rambé, xii.90 – iii.91 (*E. Modigliani*) and D. Tolong, xi.1890 (*E. Modigliani*) (MCSN) [examined]. [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

WORKER. *Measurements*: TL 2.9 – 3.9, HL 0.74 – 1.01, HW 0.68 – 1.00, SL 0.74 –

0.88, PW 0.44 – 0.57, WL 0.95 - 1.16 (10 measured). *Indices*: CI 92 – 100, SI 88 – 108, OI 20 – 24, EPI 62 – 78, DTI 133 – 136.
Head behind clypeus, dorsum of mesosoma, declivity of propodeum and first gastral tergite all entirely lack setae. Gastral tergites 2 – 4 with stout setae present that are slightly longer than the maximum diameter of the eye: second gastral tergite with 2 – 3 pairs, third and fourth tergites each with 3 – 4 pairs. Anterior clypeal margin with a distinct median notch, the margins of which meet the lateral portions of the anterior margin through rounded curves, not sharp angles. Posterior margin of head deeply concave medially, the extent of the indentation becomes more pronounced in larger workers and in full-face view the head becomes distincly more cordate with increased size. With head in full-face view the outer margins of the eyes fail to touch the outline of the sides of the head; the latter convex, more strongly so in larger workers. Scape index 88 - 108. Clypeal sculpture fine between posterior margin of notch and clypeal suture. In dorsal view the metathoracic spiracles close to, or even abutting, the metanotal groove; distance separating them about one spiracle diameter at most. Mesosoma relatively stout, DTI 133 – 136. In profile the straight-line length of the propodeal dorsum distinctly less than the depth of the declivity to the spiracle; dorsal outline of propodeum without a conspicuous notch or indentation at about its midlength. In profile the head, mesosoma, petiole and gaster all a uniform shade of drab brown. All coxae, femora and tibiae brown, the same colour as the mesosoma or nearly so. All trochanters, and middle and hind tarsi lighter, dull yellow.

Very similar to *kraepelini*, but *sundaicus* is separated by its uniform drab brown colour and the fact that the middle and hind coxae are approximately the same colour as the mesosoma, rather than strongly contrasting as is the case in *kraepelini*.

MATERIAL EXAMINED
Malaysia: Sarawak, Kubah N.P. (*S. Yamane*). **Indonesia**: Sumatra, Si Rambé and D. Tolong (*E. Modigliani*). **Philippines**: Luzon, Lagunas, Mt Makiling (*Kodada*); Luzon, Quezon Atimonan, Quezon N.P. (*H. Zettel*); Surigao d.N., NE Dinagat, Bagumbayan (*H. Zettel*); Romblon Prov., Sibuyan, E. Magdiwang (*H. Zettel*).

Technomyrmex tatius Bolton **sp. n.**

HOLOTYPE WORKER. *Measurements*: TL 2.3, HL 0.56, HW 0.55, SL 0.46, PW 0.36, WL 0.62. *Indices*: CI 98, SI 84, OI 25, EPI 78, DTI 115.
Frontal carina with 2 – 3 setae. Posterior to this the head with 3 – 4 pairs on the dorsum itself and with an additional 6 – 8 setae across the posterior margin; longest setae obviously longer than the maximum diameter of the eye. Scapes without setae. Dorsum of head glassy smooth, unsculptured except for pits from which setae arise, and with sparse short pubescence that does not conceal the surface. In full-face view the anterior clypeal margin with a distinct median impression; the posterior margin of the head shallowly concave medially; outer margins of eyes just break the outline of the sides of the head. Dorsal surfaces of mesosoma almost smooth, with only weak remnants of sculpture that is weakest on the pronotum and mesonotum and slightly more strongly expressed on the propodeum; the latter is not strongly reticulate-punctulate. All dorsal surfaces of mesosoma, including propodeum, with setae; propodeal declivity with 1 – 2 marginal pairs. With propodeum in profile the dorsum rounds into the declivity. Dorsal (outer) surfaces of middle and hind tibiae without setae. Gastral tergites 1 – 4 each with numerous setae, the longest of them longer than the maximum diameter of the eye. Gastral tergites 1 – 2 unsculptured, smooth and shining. Head and gaster glossy dark brown; mesosoma slightly lighter.

PARATYPE WORKERS. *Measurements*: TL 2.1 – 2.4, HL 0.52 – 0.58, HW 0.50 – 0.56, SL 0.42 – 0.48, PW 0.32 – 0.37, WL 0.58 – 0.68 (6 measured). *Indices*: CI 96 – 98, SI 84 – 88, OI 24 – 27, EPI 78 – 85, DTI 115 – 128. As holotype.

Holotype worker, **Malaysia**: Sabah, Borneo, Danum Valley, 29.viii.1995 (*Sk. Yamane*) (KUIC).
Paratypes. 8 workers with same data as holotype (KUIC, BMNH).

Closely related to *strenuus* but with a distinct median impression in the anterior clypeal margin, less strongly sculptured mesonotum and propodeum and relatively slightly larger eyes. See also notes under *strenuus* (p. 100).

Technomyrmex textor Forel **stat. n.**

Technomyrmex bicolor subsp. *textor* Forel, 1909: 228. Syntype workers and queens, INDONESIA: Java, Semarang (*Jacobson*) (MHNG, MCSN) [examined].

WORKER. *Measurements*: TL 2.5 – 2.9, HL 0.52 – 0.64, HW 0.45 – 0.58, SL 0.45 - 0.54, PW 0.32 – 0.40, WL 0.68 – 0.86 (10 measured). *Indices*: CI 87 - 92, SI 93 - 100, OI 27 - 30, EPI 44 - 52, DTI 130 - 140.
Dorsum of head behind clypeus entirely lacks setae. Anterior clypeal margin with a shallow inconspicuous median impression. Posterior margin of head in full-face view with a median indentation. Eyes of moderate size and located far forward on the head (EPI < 60), well in front of the midlength; in full-face view their outer margins just touch, or just fail to touch, the outline of the sides. Dorsal surfaces of mesosoma and declivity of propodeum entirely lack setae. In profile the mesonotal dorsal outline with a horizontally flat, or nearly flat, anterior section and a shorter, much more steeply sloped declivitous surface posteriorly, the two separated by a distinct angle or step in the outline. Propodeal dorsum convex in profile and meeting the declivity through a blunt angle or narrow curve; straight-line length of dorsum distinctly less than depth of declivity to the spiracle. Gastral tergites 1 – 3 without setae, gastral tergite 4 with 1 – 2 pairs of setae present. Head, mesosoma, petiole and legs yellow. Gaster the same colour or slightly darker, a light yellowish brown.

Together with *gilvus* and *dubius, textor* forms a complex of closely related small monomorphic yellow species that share the same predominant absence of setae on the head capsule, mesosoma and gaster, and share a characteristic mesonotal shape in profile. They all also have a very weak and shallow median clypeal impression, indented posterior margin of the head and relatively anteriorly located eyes.

Of the three the New Guinea species *gilvus* has the longest scapes (SI 120 – 126) and has eyes that are located more posteriorly (EPI 60 – 65) than in the other two, where the combined ranges are SI 91 – 100 and EPI 44 – 54. *T. dubius* has eyes that are smaller (OI 23 – 25) than in *textor* (OI 27 – 30) and are distinctly more inset from the outer margins of the head in full-face view.

MATERIAL EXAMINED
Malaysia: Negeri Sembilan, Pasoh For. Res. (*Brendell, Jackson & Ficken*). **Indonesia**: Java, Semarang (*Jacobson*). **Phillipines**: Palawan, Aborlan (*Starr & Cañete*).

Technomyrmex tonsuratus Bolton **sp. n.**

(Fig. 42)

HOLOTYPE WORKER. *Measurements*: TL 3.0, HL 0.69, HW 0.62, SL 0.62, PW 0.43, WL 0.88. *Indices*: CI 90, SI 100, OI 27, EPI 72, DTI 132.
Frontal carina with 2 short setae: in profile the first above the torulus and the second at the level of the anterior margin of the eye. Dorsum of head behind this with only one other pair of setae, located about half-way between the level of the posterior margin of the eye and the posterior margin of the head, this pair very short, only about 0.35 × the maximum diameter of the eye; posterior margin itself without setae. With head in full-

face view the anterior clypeal margin almost transverse; sides of head convex and the posterior margin indented medially. Eyes located distinctly in front of midlength (EPI 72) and their outer margins just touch the outline of the sides of the head in full-face view. With mesosoma in profile the mesonotal outline forms a shallow slope to the metanotal groove, slightly more steeply inclined above the metathoracic spiracles. Number of setal pairs on mesosoma: pronotum 0; mesonotum 0; propodeal dorsum 0; lateral margin of propodeal declivity 0 (see notes below). Propodeum in profile with the dorsum rounding evenly into the declivity, the two surfaces not separated by an angle. Gastral tergites 1 – 4 each with scattered sparse setae. Longest setae on first gastral tergite very short, only about 0.35 × the maximum diameter of the eye and only about half as long as the setae on the first gastral sternite. Setae on succeeding tergites progressively slightly longer, those on tergite 4 about 0.60 × the maximum diameter of the eye. Head and mesosoma black, gaster blackish brown, only fractionally lighter than the mesosoma. All leg segments except tarsi blackish brown, the tarsi dull light brown.

Holotype worker, **Papua New Guinea**: 11 km. E Baiyer R. Sanct., 5.30S, 144.16E, 2000 m., 23.vi.1980, on low vegetation, montane rainforest, #4530B (*P.S. Ward*) (ANIC).

Described from a single specimen, *tonsuratus* falls into an endemic New Guinea complex that also includes *albicoxis*, *cheesmanae*, *mixtus* and *prevaricus*. *T. tonsuratus* easily separates from all of these by its possession of extremely short setae on its head and first gastral tergite. The holotype also entirely lacks setae on the dorsal mesosoma and the propodeal declivity. Setae in these places are universal in all other members of the complex, but a note of caution must be sounded. It is remotely possible that all setae have been abraded from the mesosoma of *tonsuratus*, and although setal pits have not been detected the discovery of further material is necessary to check the validity of this character.

Technomyrmex vitiensis Mann **stat. rev., stat. n.**

(Fig. 2)

Technomyrmex albipes var. *vitiensis* Mann, 1921: 473. Syntype workers, FIJI IS: Viti Levu, Nadarivatu (*W.M. Mann*) (USNM, MCZC) [examined]. [Synonymised with *albipes* by Wilson & Taylor, 1967: 82.] (See note 1.)

Technomyrmex albipes st. *rufescens* Santschi, 1928: 70, fig. 1. Syntype worker-queen intercastes (not workers), FIJI IS: Lau, Aiwa, 9-I-24 (*E.H. Bryan Jr*) (NHMB) [examined]. [Synonymised with *albipes* by Wilson & Taylor, 1967: 82.] **Syn. n.** (See note 2.)

NOTES

1.Only workers are mentioned in the original description but the series also contains a number of queens. One queen, on a pin with two *T. vitiensis* workers (USNM), is a formicine and has obviously been mounted with them by accident; all workers are *T. vitiensis*. Many specimens from Fiji Is in MCZC are labeled as "types" but come from localities noted by Mann (1921) other than the type-locality.

2. The syntypes are stated by Santschi to be "two workers in poor condition". Date of collection of the one examined (which bears a red "Type" label) is as above, the other is given by Santschi as 31.viii.24. Both, as indicated in Santschi's Fig. 1, are not true workers but rather are worker-queen intercastes in which a median ocellus is present and there is some development of the mesoscutellum.

WORKER. *Measurements*: TL 2.4 – 3.1, HL 0.59 – 0.66, HW 0.52 – 0.60, SL 0.58 – 0.64, PW 0.35 – 0.44, WL 0.76 – 0.92 (25 measured). *Indices*: CI 85 – 93, SI 104 – 115, OI 29 – 32, EPI 64 – 84, DTI 128 – 141.

Frontal carina with 2 (very rarely 3) setae. Dorsum of head posterior to this entirely lacks setae. With head in full-face view the anterior clypeal margin with a very weak,

shallow median indentation; sides of head shallowly convex and the posterior margin with a small shallow indentation medially. Eyes located in front of midlength, EPI above. With mesosoma in profile the mesonotal dorsal outline is usually distinctly stepped, with an obtuse angle in the outline that separates a relatively long, shallowly convex to approximately flat, anterior section from a shorter, much more steeply descending declivitous face. Number of setal pairs on mesosoma: pronotum 1, somewhat shorter than maximum diameter of eye (uncommonly a second shorter pair also present in weak intercaste forms); mesonotum 0 (in some worker-queen intercastes a short pair may occur on the emergent mesoscutellum); propodeal dorsum 0; lateral margin of propodeal declivity 1. With the propodeum in profile its dorsum and declivity meet in a distinct angle, not a short rounded curve. Gastral tergites 1 – 4 each with numerous setae, distributed everywhere on the sclerites; maximum length of setae on first gastral tergite less than the maximum diameter of the eye. Head, mesosoma, petiole and gaster usually uniformly medium to dark brown, but black in some populations; in some the gaster may be slightly darker than the mesosoma. Coxae, femora and tibiae of middle and hind legs sometimes all the same colour, usually about the same colour as the mesosoma or slightly lighter, but often the middle and hind coxae are slightly to much lighter than the mesosoma. Tarsi of middle and hind legs yellow, paler than the femora and usually also the tibiae, but in some the tibiae are paler than the femora and approach the colour of the tarsi.

Morphological worker-queen intercastes are common in this species but it is not known if they occur outside of nests; the description above relates to forms with basic worker morphology. The intercastes between worker and queen form a sequence in which ocelli gradually appear (first the median then the two laterals) and the mesosoma gradually acquires a more queen-like appearance and arrangement of sclerites, but without ever developing wings. The mesonotum becomes extended posteriorly and begins to overhang the metanotal groove. The mesonotum increases somewhat in size and becomes subdivided into a mesoscutum and smaller mesoscutellum, poorly differentiated at first but gradually becoming more obviously discrete sclerites. A pair of setae may appear on the mesoscutellum. The entire mesosoma begins to appear more swollen and the mesoscutellum begins to be separated from the pleuron, initially by a faint line then by a distinct impression. At the base of the metanotal groove a separate metanotum becomes distinguished, increasing gradually in size until it forms a small, separate, dorsally-projecting sclerite. Preliminary dissections indicate that spermathecae are present in intercastes.

Wilson & Taylor (1967) included the two then-infraspecific names *vitiensis* and *rufescens* as junior synonyms of *albipes*, and listed an enormous amount of material from throughout Polynesia. *T. vitiensis* (with *rufescens* now established as a junior synonym) has proved to be a species separate from *albipes*, so a re-appraisal of the Wilson & Taylor material will be necessary to show the respective distributions of the two through the island systems. It is expected that specimens of a third tramp species, *T. difficilis*, will also be present.

T. vitiensis workers are separated from *albipes* by the following characters. In *vitiensis* the mesonotum is angled as described above, the pronotum usually has 1 pair of setae, the mesonotum lacks setae and the propodeal dorsum and declivity meet in a distinct angle in profile. The scape in *vitiensis* is both absolutely and relatively longer (SL 0.58 – 0.64, SI 104 – 115), the eyes are larger (OI 29 – 32) and the promesonotum is longer (DTI 128 – 141). In *albipes* workers the mesonotum is evenly curved, the pronotum usually has 2 pairs of setae and the mesonotum none, although some individuals with only 1 pronotal pair and some with a pair of mesonotal setae are known; the propodeal dorsum and declivity meet in a short, narrowly rounded blunt curve in profile. The scape in *albipes* is both absolutely and relatively shorter (SL 0.48 – 0.58, SI 93 - 102), and the eyes are smaller (OI 24 – 27), the difference in eye size appears obvious when workers of the two species are directly compared; the promesonotum of *albipes* is shorter (DTI 110 – 124).

T. vitiensis is an accomplished tramp species although collections are not as numerous as they are for *albipes*. It nests in a wide variety of locations and has been

collected from leaf litter, under stones, in rotten wood and from vegetation where it may nest in twigs, rot holes and spathes. Foraging is carried out in all these places and the species, as well as avidly tending homopterous insects for honeydew, will also kill and consume small arthropods.

MATERIAL EXAMINED
India: Bangalore (*T.C. Lawrence*); Dehra Dun (*Ross & Cavagnaro*). **Bangladesh**: 30 km N Dhaka, Gazipur, IPSA Campus Salna (*K. Ogata*). **Myanmar**: Shan Hills, Maymyo (*K.C. Durrant*). **Thailand**: Kanchanburi Prov., Mekong Watershed Res. Sta. (*S. Yamane*). **Malaysia**: Kuala Lumpur (*M.J. Way*); Selangor, Ulu Gombak (*J.E. Tobler*); Negeri Sembilan, Pasoh For. Res. (*Lewis & Jackson*). **Philippines**: Palawan, Aborlan (*Starr & Cañete*); Aborlan (*C.K. Starr*). **Indonesia**: Sulawesi Utara, Dumoga-Bone N.P. (*N. Stork*). **New Caledonia**: Mt Panié (*P.S. Ward*). **Vanuatu**: Santo (*L.E. Cheesman*); Malekula (*L.E. Cheesman*); Erromanga (*L.E. Cheesman*); Aneityum (*L.E. Cheesman*); Vila, Efate (*L.E. Cheesman*); Vate, Riutapao (*P. Cochereau*). **Niue I.** (*A.E. Eyles*). **French Polynesia**: Tahiti, Tautira (*L.E. Cheesman*); Gambier Is, Mangareva I. (*P. Cochereau*); Gambier Is, Akamaru I. (*P. Cochereau*); Society Is, Raiatea (*L.E. Cheesman*); Marquesas Is, Hiva-oa (*L.E. Cheesman*); Moorea Is, Pt Vaipahu-Mt Rotui trail (*L. Morrison*).. **Fiji Is**: SomoSomo (*W.M. Mann*); Viti Levu, Nadarivatu (*W.M. Mann*); Lau, Aiwa (*E.H. Bryan Jr*); Kadavu, Lagalevu (*G.B. Monteith*); Nausovi (*R. Veitch*). **Samoa**: Tutila, Tafuna (*T.E. Woodward*). **Hawaii**: E of Kalela Gulch, N Kohala Distr. (*P.S. Ward*); Big Island, Lehia Park (*J.K. Wetterer*) **Christmas I.** (Indian Ocean: series by *A.N. Gillison, Jeffreys & Jaycock, Jeffreys & Chapellon, Jeffreys & Periera, Retallick & Pereira, Thomas & Alpisal*). **Seychelles Is**: Mahé (*C. Scardovelli*); Silhouette I. (*Sladen Trust Expd.*). **Réunion I.**: Bretagne (*J.R. Williams*); St Joseph, Riv. Langevin (*Zoia & Polese*); Vallée de la Riv. Des Galets, SE Dos d'Ane (*Zoia & Polese*). **U.S.A.**: California, San Francisco, Golden Gate Park Conservatory (*P.S. Ward*). **United Kingdom**: Edinburgh Bot. Gdns, hothouse (*Donisthorpe*). **Germany**: Bonn, Botanical Gdns, in greenhouse (*J. Oettler*); **Austria**: Vienna, Zool. Gdn Schönbrunn, in hothouse (*Schlick-Steiner & Steiner*).

Technomyrmex wheeleri (Emery)

(Fig. 55)

Iridomyrmex smithi Wheeler, W.M. 1909: 341. Syntype workers and queen, PHILIPPINES: Romblon I. (*H.M. Smith*) (MCZC) [examined]. [Junior secondary homonym of *Formica smithii* Lowne, 1865: 276 (now in *Iridomyrmex*).]
Iridomyrmex wheeleri Emery, 1913: 26. [Replacement name. Combination in *Technomyrmex* by Shattuck, 1992a: 15.]
Technomyrmex niasensis Menozzi, 1932: 8, fig. 3. Syntype workers, INDONESIA: Nias I., Hilisemaetano, 12.ix.1931. (IEGG) [not seen, see note]. **Syn. n.** (provisional).

NOTE
I have not been able to examine type-material of *niasensis* but the original description and figure match *wheeleri* satisfactorily. I am convinced that the synonymy will hold but enter it here as provisional until *niasensis* type-material can be examined.

WORKER. *Measurements*: TL 3.3 – 3.6, HL 0.70 – 0.79, HW 0.62 – 0.72, SL 0.86 – 0.98, PW 0.45 – 0.51, WL 1.06 – 1.12 (10 measured). *Indices*: CI 89 – 95, SI 129 – 140, OI 27 – 32, EPI 80 – 86, DTI 137 – 155.
Dorsum of head in profile with 4 – 6 pairs of setae in front of level of posterior margin of eye; usually with some much shorter setae among the longer pairs. The longest setal pair is located about half way between level of posterior margin of eye and posterior margin of the head and is followed by several shorter pairs before the posterior margin is reached. Ventral surface of head with a few short setae present. With head in full-face view the posterior margin and sides with outstanding short setae, those on the sides inclined anteriorly; anterior clypeal margin with a weak to moderate median impression; posterior margin of head impressed. Eyes located just in front of midlength of head (EPI 80 - 86), their outer margins usually just fail to break the outline of the sides of the head but in some individuals just break the outline. Scapes with sparse, short setae on all surfaces, the longest at most equal to the width of the scape but

usually slightly shorter. Pronotum with several pairs of short setae; mesonotum usually with a single short pair, located close to the metathoracic spiracle; rarely a more anterior pair may also be developed. Propodeum in profile with a short dorsum that rounds into the declivity. Propodeal dorsum without setae but some elevated pubescence may be present; declivity with 2 – 3 pairs of setae. Gastral tergites 1 – 4 each with setae; longest setae are usually shorter than the maximum diameter of the eye but may be subequal in some individuals. Middle and hind tibiae with short projecting setae, the longest distinctly shorter than the maximum tibial width. Colour medium brown to black.

Close to *grandis* but much less luxuriantly hairy. *T. grandis* is larger than *wheeleri*, has more posteriorly located eyes and a longer and more broadly rounded propodeum. The setae of *wheeleri* are much sparser and shorter than those of *grandis*: outstanding setae on the scapes and tibiae are shorter than the width of the segment from which they arise in *wheeleri*, longer in *grandis*; the longest setae on the first gastral tergite are always much longer than the maximum diameter of the eye in *grandis*, usually shorter than the maximum diameter of the eye in *wheeleri*.

MATERIAL EXAMINED
Malaysia: Negeri Sembilan, Pasoh For. Res. (*Brendell, Jackson & Lewis*); Sarawak, 4th Div., Gn. Mulu Nat. Pk (*M. Collins*); Sabah, Poring, Kinabalu (*S. Yamane*). **Brunei**: Bukit Sulong, nr Lamunin (*N. Stork*). **Philippines**: Luzon, Quezon Atimonan, Quezon N.P. (*H. Zettel*); Luzon, Camarines Sur, Carolina, Naga (*C.K. Starr*); Leyte. Balinsasayao, Abuyog (*Starr, Cañete & Godoy*); Leyte, V.I.S.C.A. Baybay (*Starr & Godoy*); Baybay (*C.K. Starr*); Romblon I. (*H.M. Smith*).

Technomyrmex yamanei Bolton sp. n.

(Figs 47, 67)

HOLOTYPE WORKER. *Measurements*: TL 4.0, HL 1.08, HW 1.01, SL 0.87, PW 0.64, WL 1.16. *Indices*: CI 94, SI 86, OI 20, EPI 83, DTI 118.
Frontal carina with 2 setae: in profile the anterior at the torulus, the posterior at about the level of the anterior margin of the eye; without a seta at level of posterior margin of eye. Behind level of posterior margin of eye there is a single pair of dorsal setae, in profile located about half the distance to the posterior margin of the head. Posterior margin itself has two pairs of setae close to the midline and a much shorter seta on each side, closer to the corners. All these cephalic setae are shorter than the maximum diameter of the eye. With head in full-face view the anterior clypeal margin with a long, U-shaped median incision; inner margin of incision meets the anterior clypeal margin in an acute angle on each side. Posterior margin of head broadly and strongly emarginate. Eyes small and located in front of the midlength, the outer margins of the eyes are set well in from the outline of the sides in full-face view. With mesosoma in profile the mesonotal outline is evenly curved, without a distinct step or angle in the outline that defines conspicuous dorsal and declivitous faces. Propodeal dorsum short in profile and convex, the straight-line length of the dorsum less than the depth of the declivity to the spiracle; the dorsum rounds narrowly but bluntly into the declivity. Number of setal pairs on mesosoma: pronotum 4 - 5; mesonotum 1; propodeal dorsum 0; lateral margins of propodeal declivity 0. Gastral tergite 1 with very sparse, minute inconspicuous setae that are only about 0.30 × the maximum diameter of the eye. Setae on gastral tergites 2 – 3 more numerous and slightly longer. Setae on gastral tergite 4 conspicuous and twice as long as those on tergites 1 – 2. Head, mesosoma, petiole and gaster black; leg segments blackish brown to black except for the tarsi which are dull yellow.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 3.4 – 3.9, HL 0.88 – 1.07, HW 0.83 – 1.02, SL 0.72 – 0.86, PW 0.50 – 0.63, WL 1.00 – 1.20 (4 measured). *Indices*: CI 94 – 100, SI 84 – 87, OI 19 – 22, EPI 81 – 93, DTI 120 – 124.

As holotype but one worker with a single short seta on the propodeal declivity. Colour varies from blackish brown to black.

Holotype worker, **Thailand**: Doi Chiang Dao, nr Chiang Mai, 700-800 m. alt., 3.iv.2005 (*Sk. Yamane*) (KUIC).
Paratypes. 2 workers with same data as holotype (KUIC, BMNH).

Closely related to *modiglianii* but *yamanei* is easily separated by the distribution of setae on the head, the much deeper clypeal incision which is sharply angled where the inner margins of the incision meet the anterior clypeal margin, and by its extremely sparse, very short setae on the first gastral tergite.

NON-PARATYPIC MATERIAL EXAMINED
Thailand: Chiang Mai (*Osella*). **Vietnam**: Dran, Dran Dist., Lam Dong Prov. (*K. Ogata*).

CHECKLIST OF AUSTRAL *TECHNOMYRMEX* SPECIES

***albipes* group**
albipes (F. Smith, 1861)
= *detorquens* (Walker, 1859)
= *forticulus* (Walker, 1859)
= *nigrum* (Mayr, 1862)
= *albitarse* (Motschoulsky, 1863)
= *albipes* v. *bruneipes* Forel, 1895 **syn. n.**
= *albipes* r. *wedda* Forel, 1913 **syn. n.**
antonii Forel, 1902 **stat. n.**
australops Bolton **sp. n.**
cedarensis Forel, 1915 **stat. n.**
cheesmanae Donisthorpe, 1945
difficilis Forel, 1892 **stat. n.**
= *mayri* st. *nitidulans* Santschi, 1930 **syn. n.**
furens Bolton **sp. n.**
jocosus Forel, 1910
nitens Bolton **sp. n.**
quadricolor (Wheeler, 1930)
sophiae Forel, 1902
vitiensis Mann, 1921 **stat. rev., stat. n.**
= *albipes* st. *rufescens* Santschi, 1928 **syn. n.**

***grandis* group**
shattucki Bolton **sp. n.**

KEY TO AUSTRAL *TECHNOMYRMEX* INCLUDING TRAMP SPECIES (workers)

NOTE. The locations and relative lengths of various setae are critical in the determination of some species. Abraded, or old and damaged, specimens may be difficult or impossible to identify correctly.

1 Dorsal (outer) surfaces of middle and hind tibiae with numerous projecting suberect setae that are very conspicuous. Scape also with conspicuous short projecting setae. (n. Queensland).....***shattucki*** (p. 116)
- Dorsal (outer) surfaces of middle and hind tibiae without projecting setae. Scape without projecting setae.....2

2 With the head in full-face view the dorsal longitudinal strip, from between the frontal carinae to the posterior margin, glassy smooth and highly polished, unsculptured except for pits from which setae arise; pubescence extremely sparse to absent, not at all masking the surface.....3
- With the head in full-face view the dorsal longitudinal strip, from between the frontal carinae to the posterior margin, finely and densely shagreenate, microreticulate, or punctulate, may be dully shining but not glassy smooth and highly polished; greyish pubescence usually conspicuous, at least partially masking the surface.....6

3 Head, mesosoma and petiole yellow to light brownish yellow, gaster very dark brown to black, the two very strongly contrasting. In specimens with full adult colour funiculus segments 2 – 11 darker than the scape. (n. Queensland) .....***quadricolor*** (p. 115)
- Head, mesosoma, petiole and gaster all more or less uniformly coloured dark brown to black, the gaster not strongly contrasting with the remainder. In specimens with full adult colour funiculus segments 2 – 11 the same colour as the scape or slightly lighter.....4

4 With head in profile the longest dorsal pair of setae behind the level of the eye, located less than the length of the maximum eye-diameter anterior to the posterior margin, is followed by other, shorter, setae before the posterior margin (*i.e.* the longest pair of setae is not the posteriormost pair, Fig. 64). With head tilted slightly back from full-face view the posterior margin with short setae present. (Queensland).....***sophiae*** (p. 117)
- With head in profile the longest dorsal pair of setae behind the level of the eye, located less than the length of the maximum eye-diameter anterior to the posterior margin, is not followed by other setae before the posterior margin (*i.e.* the longest pair of setae is the posteriormost pair, Fig. 65). With head tilted slightly back from full-face view the posterior margin without short setae.....5

5 Middle and hind coxae dark brown to black, the same colour as the mesosoma or very nearly so. Hind femur evenly darkly coloured throughout its length. Funiculus segment 1 the same colour as segments 2 – 5. (Queensland).....***furens*** (p. 113)
- Middle and hind coxae dull yellow to bright yellow, contrasting strongly with the dark mesosoma. Hind femur much lighter in colour near the trochanter than in its distal half. Funiculus segment 1 lighter in colour than segments 2 – 5. (Queensland).....***nitens*** (p. 115)

6 With head in profile the dorsum behind the level of the posterior margin of the eye without setae (*i.e.* setae on the dorsum of the head are restricted to the frontal carinae).....7
- With head in profile the dorsum behind the level of the posterior margin of the eye with at least one pair of setae present (*i.e.* setae on the dorsum of the head are not restricted to the frontal carinae).....8

7 Scape relatively short and promesonotum relatively short and broad, SI 91 – 102, DTI 110 – 124. Eye somewhat smaller, OI 24 – 27. With mesosoma in absolute profile the mesonotal dorsal outline convex, more or less evenly rounded (Fig.1). In same view the junction of the propodeal dorsum and declivity is blunt. (*Tramp species*: Queensland).....***albipes*** (p. 68)
- Scape relatively long and promesonotum relatively long and narrow, SI 104 – 115, DTI 128 – 141. Eye somewhat larger, OI 29 – 32. With mesosoma in absolute profile the mesonotal dorsal outline with a more or less flat anterior section that passes through an obtuse angle to a distinctly more strongly sloped posterior declivity (Fig. 2). In same view the junction of the propodeal dorsum and declivity sharply defined. (*Tramp species*: New Caledonia, Christmas I.) .....***vitiensis*** (p. 104)

8 Eyes located relatively posteriorly on head, EPI > 100. In full-face view the eyes are positioned behind the midlength of the sides of the head capsule; eyes tend to be relatively larger, OI 29 – 35.....9
- Eyes located relatively anteriorly on head, EPI < 100. In full-face view the eyes are positioned in front of, or nearly at, the midlength of the sides of the head capsule; eyes tend to be relatively smaller, OI 25 – 29.....11

9 Pronotum and mesonotum each with a single pair of setae; pair on pronotum much longer than those on mesonotum. Eyes relatively slightly larger, OI 34 – 35. (n. Queensland).....***australops*** (p. 111)
- Pronotum with setae present, mesonotum lacks setae (Fig. 62). Eyes relatively slightly smaller, OI 29 – 32.....10

10 Mesosoma in dorsal view dull yellow to brownish yellow; gaster much darker brown and strongly contrasting. (s.e. Queensland, n.e. New South Wales) .....***antonii*** (p. 111)
- Mesosoma and gaster uniformly dark brown. (s.e. Queensland, n.e. New South Wales).....***cedarensis*** (p. 112)

11 With head in profile the dorsum without a pair of setae at about the level of the posterior margin of the eye; dorsum posterior to this either with a single pair of distinct setae before the posterior margin or with two very short inconspicuous pairs (Figs 3, 4).....12
- With head in profile the dorsum with a pair of setae at about the level of the posterior margin of the eye; dorsum posterior to this with at least 2 pairs of distinct setae before the posterior margin (Figs 50, 63).....13

12 Tarsus of hind leg distinctly much lighter in colour than the femur and tibia; femur and tibia about the same colour as the mesosoma and gaster. Dorsum of head behind level of posterior margin of eye usually with a single pair of setae, located about two-thirds the way between the level of the posterior margin of the eye and the posterior margin of the head (Fig. 3). Eyes located somewhat more posteriorly, EPI 72 – 86. Mesosoma slightly more elongate, DTI 127 – 135. (*Tramp species*: Northern Territory, Queensland, Islands of Torres Strait).....***difficilis*** (p. 47)
- Tarsus of hind leg the same colour as the femur and tibia; entire leg distinctly lighter than the mesosoma and gaster. Dorsum of head behind level of posterior margin of eye with two pairs of very short, inconspicuous setae; first pair located about two-thirds the way between the level of the posterior margin of the eye and the posterior margin of the head; second pair at the posterior margin (Fig. 4). Eyes located somewhat more anteriorly, EPI 55 – 71. Mesosoma slightly shorter and broader, DTI 120 – 128. (*Tramp species*: not yet recorded from Austral region).....***pallipes*** (p. 56)

13 Posteriormost pair of setae on dorsum of head longer than the maximum diameter of the eye (Fig. 50). Longest setae on first gastral tergite longer than the maximum diameter of the eye. (n. Queensland ; also in New Guinea). .....***cheesmanae*** (p. 76)
- Posteriormost pair of setae on dorsum of head shorter than the maximum diameter of the eye (Fig. 63). Longest setae on first gastral tergite shorter than the maximum diameter of the eye. (s. West Australia, South Australia, Tasmania, Victoria, New South Wales, s. Queensland, Lord Howe I., Norfolk I., Philip I., New Zealand; invades houses).....***jocosus*** (p. 114)

AUSTRAL SPECIES OF *TECHNOMYRMEX*

Shattuck (1999) summarised the *Technomyrmex* species known from Australia. He pointed out that they are general scavengers that forage "on the ground, low vegetation and trees. They nest in the soil with or without a covering, in twigs or branches, under loose bark, and in nests constructed of plant fibres, which are attached under leaves or to tree trunks." His assertion that they enter houses probably applies only to *T. jocosus* among the native species, see the discussion of that species below (p. 114).

The taxonomy of the Austral fauna has not been investigated previously and until now has consisted entirely of the literature of original descriptions. These references have previously been summarised by Taylor & Brown (1985), Shattuck (1994) and Bolton (1995b). The Austral fauna of *Technomyrmex* currently consists of 13 species, of which 9 are endemic, 3 are tramp species and 1 is shared with New Guinea.

Technomyrmex antonii Forel **stat. n.**

Technomyrmex bicolor var. *antonii* Forel, 1902a: 475. Syntype workers and male, AUSTRALIA: Queensland, Mackay, 6.94 (*R.E. Turner*) (BMNH, MHNG) [examined].

WORKER. Answering the description of *cedarensis* in measurements, indices and morphology, except as follows.

Mesosoma pale, yellowish brown to medium brown; gaster distinctly darker than mesosoma, the two strongly contrasting. All leg segments about the same light colour as the mesosoma or uniformly lighter than the mesosoma.

T. antonii may be nothing more than a colour variant of *cedarensis* (see there), with which it is sympatric and which it matches in all other repects. In *cedarensis* the entire body is a more or less uniform dark brown, without a strong contrast between mesosoma and gaster, and the middle and hind coxae, femora and tibiae are usually dark.

T. antonii is elevated to species rank and is retained as separate from *cedarensis* based on the rather weak characters given above, until a detailed study of their relationship can be undertaken; *antonii* was originally wrongly associated with *bicolor*, a very different species, from Sri Lanka.

MATERIAL EXAMINED

Australia: Queensland, Mackay (*R.E. Turner*); Rollingstone (*F. Gay*); Cunningham's Gap (*P.J.M. Greenslade*).

Technomyrmex australops Bolton **sp. n.**

HOLOTYPE WORKER. *Measurements*: TL 2.9, HL 0.65, HW 0.57, SL 0.63, PW 0.43, WL 0.84. *Indices*: CI 88, SI 111, OI 35, EPI 110, DTI 123.

Frontal carina with 2 setae: in profile the posterior seta at about the level of the anterior margin of the eye. Dorsum of head posterior to this with only a single pair of shorter setae, in profile located between the level of the posterior margin of the eye and the posterior margin of the head; all these setae are shorter than the maximum diameter of the eye. With head in full-face view the eyes relatively large (OI 34 – 35), located distinctly behind the midlength of the sides and their outer margins strongly break the outline of the sides. Number of setal pairs on mesosoma: pronotum 1 – 2 (1 in holotype); mesonotum 1, very much shorter than pronotal pair; propodeal dorsum 0; lateral margins of propodeal declivity 1 – 2, very short and indistinct. Mesonotal dorsum in profile evenly convex. Propodeal dorsum short, shorter than depth of declivity to the spiracle, the dorsum and declivity meet in a well-defined angle. Gastral tergites 1 – 4 each with numerous setae present; longest setae on the first tergite are shorter than the maximum diameter of the eye. Head, mesosoma and petiole medium brown, gaster darker brown. Middle and hind legs distinctly lighter than the mesosoma,

dull pale yellow (see paratype).

PARATYPE WORKER. *Measurements*: HL 0.65, HW 0.58, SL 0.64, PW 0.43, WL 0.90. *Indices*: CI 89, SI 110, OI 34, EPI 105, DTI 130. (TL cannot be measured as gaster crushed.) Right antenna is missing. Middle and hind legs of paratype are darker than those of holotype; yellowish brown, closer to the mesosoma colour than in the holotype but still distinctly lighter than the mesosoma.

Holotype worker (upper specimen of two on pin), **Australia**: North Queensland, nr Dimbulah, 145.05 X 17.05, savanna, c. 450 m., 26.vi.1971, under stone, dry sclero., R.W. Taylor accession 71.632 (*R.W. Taylor & J. Feehan*) (ANIC).
Paratype worker (lower specimen of two on pin) with same data as holotype (ANIC).

This species is close to *antonii* and *cedarensis*. All three share characters of sculptured head, large eyes that are located relatively far posteriorly on the head capsule and presence of a single pair of setae on the dorsum of the head behind the level of the posterior margin of the eye. *T. australops* has the largest eyes of the three and is the only one to possess setae on the mesonotum. At present it is known only from the single collection recorded here.

Technomyrmex cedarensis Forel **stat. n.**

(Figs 62, 75)

Technomyrmex albipes var. *cedarensis* Forel, 1915: 85. Syntype workers, AUSTRALIA: Queensland, Cedar Creek, iii.1913, no. 169 (*Mjöberg*); syntype queen, same locality but iv.1913, no. 115 (*Mjöberg*) (MHNG) [examined].

WORKER. *Measurements*: TL 2.6 – 2.9, HL 0.64 – 0.74, HW 0.56 – 0.68, SL 0.62 – 0.78, PW 0.39 – 0.50, WL 0.84 – 0.96 (18 measured). *Indices*: CI 86 – 92, SI 107 – 115, OI 29 – 32, EPI 104 – 120, DTI 120 – 133.
Frontal carina with 2 setae: in profile the posterior at about the level of the anterior margin of the eye. Dorsum of head posterior to this with only a single pair of setae, in profile located between the level of the posterior margin of the eye and the posterior margin of the head; all these setae are shorter than the maximum diameter of the eye. With head in full-face view the eyes relatively large, located just behind the midlength of the sides and their outer margins break the outline of the sides; also in full-face view the posterior margin is not indented medially, instead the margin is transverse to evenly and very shallowly concave medially. Number of setal pairs on mesosoma: pronotum 1 – 2 (usually 2); mesonotum 0; propodeal dorsum 0; lateral margins of propodeal declivity sometimes 0, but often 1 – 2 present, short. Mesonotal dorsum in profile evenly convex. Propodeal dorsum short, shorter than depth of declivity to the spiracle, the dorsum and declivity meet in an angle. Gastral tergites 1 – 4 each with numerous setae present; longest setae on the first tergite are shorter than the maximum diameter of the eye. Head, mesosoma, petiole and gaster usually a uniform dark brown. On middle and hind legs the coxae, femora and tibiae are usually the same shade as the mesosoma; trochanters and tarsi are paler, usually dull yellow. In some workers the coxae are lighter than the mesosoma and femora, the femora being intermediate in shade between the lighter coxae and darker mesosoma.

This taxon was originally described as a variety of *albipes*, but *cedarensis* is a separate, strictly Australian species that has larger, more posteriorly placed eyes and setae present on the dorsum of the head behind the level of the eyes.

T. cedarensis is closest related to two other Australian species, *antonii* and *australops*, which resemble it closely. All three have relatively large, posteriorly placed eyes, sculptured head and a single pair of setae on the dorsum of the head behind the level of the posterior margin of the eye. In fact, *antonii* and *cedarensis* may be nothing

more than colour variants of a single species, so close is the resemblance. They are retained as separate species here but a more detailed investigation of the taxonomy of these two is required. *T. australops* has even larger eyes than either of these two, and has setae present on the mesonotum.

Steven O. Shattuck (ANIC) informs me that *antonii* and *cedarensis* are both common in the sclerophyll woodlands of south-east Queensland and north-east New South Wales, whereas *australops* is known only from north Queensland. *T. cedarensis* is found under stones and forages both terrestrially and arboreally.

MATERIAL EXAMINED
Australia: Queensland, Cedar Creek (*Mjöberg*); Kroombit Tops, SSW Calliope (*Monteith, Davies, Gallon & Thompson*); Qld, Cooloola (*P.J.M. Greenslade*); Qld, Bauple (*C. Vanderwoude*); Qld., no loc. (*C. Vanderwoude*); New South Wales, Mt Victoria (*Biró*); NSW, Maroota State Forest (*T. Gush*); W of Cobar (*B.B. Lowery*); NSW, nr Hornsby, Galston Gorge (*T. Greaves*); NSW, Royal Nat. Pk (*P.S. Ward*); NSW, Sydney, Kuriag-Gai Chase (*P.S. Ward*).

Technomyrmex furens Bolton **sp. n.**

HOLOTYPE WORKER. *Measurements*: TL 3.1, HL 0.67, HW 0.63, SL 0.64, PW 0.40, WL 0.88. *Indices*: CI 94, SI 101, OI 22, EPI 96, DTI 137.
Answering the description of *sophiae* but the head with fewer setae. In particular, in profile the dorsum of the head lacks setae between the longest pair and the posterior margin (as in *sophiae* the longest pair is located just less than the length of the maximum diameter of the eye from the posterior margin of the head); with head tilted slightly back from full-face view the posterior margin lacks setae.
Colour of funiculi and legs as *sophiae*: first funicular segment as dark as segments 2 – 5; middle and hind coxae the same colour as the mesosoma; hind femur dark to base, trochanter yellow.

NON-PARATYPIC WORKERS. *Measurements*: TL 2.7 – 3.1, HL 0.64 – 0.69, HW 0.60 – 0.66, SL 0.59 – 0.65, PW 0.40 – 0.44, WL 0.80 – 0.90 (6 measured). *Indices*: CI 93 – 96, SI 96 – 101, OI 22 – 23, EPI 96 – 100, DTI 132 – 137. As holotype. The eyes of *furens* appear to average slightly smaller than *sophiae* (OI 23 – 25) but the difference is small and the number measured probably not large enough for certainty. Workers from Wallaman Falls are lighter in colour, uniformly rich dark brown, rather than blackish-brown to black; at present no taxonomic significance is given to this variation. See also notes under *sophiae*.

Holotype worker (upper specimen of two on pin), **Australia**: N. Queensland, 3.2 km. E of Lake Barrine, 1.vii.1971, rain for., c. 700 m., strays ex trunks and low foliage rainforest, R.W. Taylor accession 71.850 (*R.W. Taylor & J. Feehan*) (ANIC).
Paratype. 1 worker-queen intercaste (lower specimen of two on pin), with same data as holotype (ANIC).

The paratypic worker-queen intercaste is larger than the holotype (HL 0.71, HW 0.67), has relatively larger eyes (OI 25), has a small median ocellus present, and has a much stouter mesosoma. Its mesonotum consists of an enlarged mesoscutum and a distinct mesoscutellum, the two separated by a marked suture dorsally; lateral impressions are developed between the scutellum and the pleuron.

All examined material of *furens* has been collected from tree trunks and low foliage; one series was recovered by pyrethrum knock-down from a tree.

NON-PARATYPIC MATERIAL EXAMINED
Australia: Queensland: Kuranda (*B.B. Lowery*); Qld, Wallaman Falls, via Ingham (*G. Monteith*); Qld, Mt Graham, Abergowrie (*S. Hamlet*); Qld, Lake Eacham Nat. Pk (*P.S. Ward*).

Technomyrmex jocosus Forel

(Fig. 63)

Technomyrmex jocosus Forel, 1910c: 56. Syntype workers, AUSTRALIA: Victoria, Yarra District (*Froggatt*) (MHNG) [examined].

WORKER. *Measurements*: TL 2.5 – 3.1, HL 0.64 – 0.70, HW 0.60 – 0.66, SL 0.58 – 0.64, PW 0.40 – 0.43, WL 0.81 – 0.90 (12 measured). *Indices*: CI 90 – 95, SI 94 – 102, OI 25 – 29, EPI 74 – 80, DTI 126 – 135.
With head in profile the dorsum behind the clypeus with numerous pairs of setae: frontal carina with 3 - 4 setae; dorsum above eye with 2 – 4 pairs; dorsum behind level of posterior margin of eye with 2 – 3 pairs; posterior margin usually with an additional short seta on each side, close to the corners. All of these setae are distinctly shorter than the maximum diameter of the eye. With head in full-face view the moderately sized eyes are located just in front of the midlength of the sides, their outer margins just touch or just break the outline of the sides; posterior margin has a slight median indentation. Shagreenate-punctulate sculpture of dorsal head fine and superficial. Number of setal pairs on mesosoma: pronotum 2 – 4; mesonotum 1 - 3; propodeal dorsum 0; lateral margins of propodeal declivity 1 – 2. Mesonotal dorsum in profile evenly convex. Propodeal dorsum short, junction of dorsum and declivity angular but blunt, in absolute profile not sharply angled. Gastral tergites 1 – 4 each with numerous setae present; longest setae on the first gastral tergite are shorter than the maximum diameter of the eye. Head, mesosoma, petiole and gaster uniform blackish brown to black. Middle and hind coxae, femora and tibiae the same colour as the mesosoma and gaster or fractionally lighter; tarsi dull yellow.

The cephalic pilosity of *jocosus* most closely resembles that of *cheesmanae* and the four species related to *quadricolor*. However, in all of these the longest setae on the dorsum of the head (in profile located just anterior to the posterior margin), and the longest on the first gastral tergite, are all distinctly longer than the maximum diameter of the eye. In addition, *quadricolor* and its relatives all have the head unsculptured, smooth and highly polished, and have the eyes located more posteriorly.

T. jocosus is a distinct and very widespread species that forages extensively in leaf litter, in dead trees and under the bark of fallen trees, on shrubs and low vegetation, and on trunks and branches of standing trees. It sometimes enters houses in Australia (Steven O. Shattuck (ANIC), pers. com.) and the Ward series from Sydney University (see below) was collected in a laboratory building. It is probably this species that Shattuck (1999) had in mind when he wrote that they, "enter through small cracks and, on finding a suitable food source, form distinct trails with many workers travelling between their nest sites and the food source"; *jocosus* is probably also the "black house ant" of Clark (1941). The series from Bicheno, Tasmania was collected from "light fixtures in caravan". An earlier reference to ants nesting in electric switches in New Zealand (Little, 1984) probably also refers to this species. *T. jocosus* is most likely the New Zealand species referred to as *albipes* by Brown (1958). He wrote that the species is largely confined to urban areas in the North Island and around Nelson in the South Island. He added that it forms long foraging files and can become a serious pest both indoors and in gardens and orchards.

Worker-queen intercastes occur in this species, as do ergatoid males.

MATERIAL EXAMINED

Australia: West Australia, Coalmine Beach, Walpole-Noralup N.P. (*J.&N. Lawrence*); WA, Moingup Spring, Stirling Ra. N.P. (*P.S. Ward*); South Australia, Kangaroo I. (*P.J.M. Greenslade*); SA, Flinders Ra. (*P.J.M. Greenslade*); SA, Adelaide (*F. Rigato*); Tasmania, Taronga, S. Hobart (*Newton & Thayer*); Tas., Swansea (*L. Weatherill*); Tas., Bicheno (*D.S. Horning*); Victoria, Yarra Distr. (*Froggatt*). New South Wales, Casula (*M. Nikitin*); NSW, National Pk (*W.M. Wheeler*); NSW, Ourimbah State For. (*T. Gush*); NSW, Mt Canobolas Pk (*T. Gush*); NSW, Batemans Bay (*P.S. Ward*); NSW, Sydney University (*P.S. Ward*); NSW, Mt Kembla, nr Wollongong (*P.S. Ward*); ACT, Wombat Ck, Brindabella Ra. (*J.F. Lawrence*);

Queensland, Brisbane (*H.T. Clifford*); Qld, Malanda, Thurling Farm (*A.D. Cutter*); Qld, 1 km. SSE Eungella (*P.S. Ward*); Lord Howe I., Johnston bch (*R.W. Taylor*); Lord Howe I., Boat Harbour (*G.B. Monteith*); Norfolk I., Filmy Fern Gully, Norfolk I.N.P. (*J.E. Feehan*); Philip I., Upper Long Valley (*J.E. Feehan*). **New Zealand**: North Island, Raglan (*B.V. Brown*).

Technomyrmex nitens Bolton sp. n.

(Fig. 65)

HOLOTYPE WORKER. *Measurements*: TL 2.9, HL 0.68, HW 0.64, SL 0.66, PW 0.45, WL 0.92. *Indices*: CI 94, SI 103, OI 27, EPI 94, DTI 129.
Answering the description of *sophiae* but the head with fewer setae. In particular, in profile the dorsum of the head lacks setae between the longest pair and the posterior margin (as in *sophiae* the longest pair is located just less than the length of the maximum diameter of the eye from the posterior margin of the head); with head tilted slightly back from full-face view the posterior margin lacks setae.
Colour of funiculi and legs different from *sophiae*: first funicular segment lighter in colour than segments 2 – 5; middle and hind coxae yellow, strikingly lighter in colour than the mesosoma; hind femur not uniformly coloured, instead yellow basally, the same colour as the trochanter.

PARATYPIC AND OTHER WORKER MATERIAL. *Measurements*: TL 2.7 – 3.1, HL 0.64 – 0.70, HW 0.58 – 0.64, SL 0.58 – 0.68, PW 0.41 – 0.47, WL 0.80 – 0.94 (10 measured). *Indices*: CI 90 – 95, SI 95 – 108, OI 26 – 28, EPI 94 – 100, DTI 124 – 136.
As holotype but one worker from Mt Finnigan has the middle and hind coxae darker than in the other two specimens on the same pin and its first funicular segment is not as obviously lighter than segments 2 – 5 as in other workers. The eyes of *nitens* appear to be somewhat larger than either *sophiae* or *furens*, with *nitens* OI 26 – 28, as opposed to OI 22 – 23 in *furens* and OI 23 – 25 in *sophiae*. See also notes under *sophiae*.

Holotype worker (upper specimen of two on pin), **Australia**: N. Queensland, Hugh Nelson Ra., 2.5 km. S. Crater N.P., 1100 m., 5.xii.1988, pyrethrum logs trees (*Monteith & Thompson*) (ANIC).
Paratypes. 1 worker-queen intercaste (lower specimen on same pin as holotype); 5 workers and 1 worker-queen intercaste, **Australia**: NE. Queensland, Mt Hemmant, 6 km. SW Cape Tribulation, 25.iv.1983, QM Berlesate No. 541, 16.07 S, 145.25 E, rainforest, 880 m., seived litter (*G.B. Monteith & D. Cook*) (ANIC).

Most material examined was obtained by litter sampling or in pitfall traps. However, some specimens were collected by pyrethrum knock-down from trees (including the holotype), which indicates that this species forages as extensively as many others in the genus.

NON-PARATYPIC MATERIAL EXAMINED
Australia: NE. Queensland, Majors Mtn, 7 km SE Ravenshoe (*Monteith & Yeates*); NE. Qld, 22 km. SE of Mareeba (*Yeates & Thompson*); NE. Qld, Thornton Peak, via Daintree (*Monteith & Cook*); N. Qld, Windsor Tbld, 35 km. NNW Mt Carbine (*Monteith, Yeates & Cook*); N. Qld, Mt Windsor Tbld (*P.S Ward*); N. Qld, Mt Finnigan summit, via Helenvale (*Monteith & Cook*).

Technomyrmex quadricolor (W.M. Wheeler)

Aphantolepis quadricolor Wheeler, W.M. 1930: 44, fig. 2. Holotype worker, AUSTRALIA: Queensland, Cairns Distr. (*A.M. Lea*) (MCZC) [examined: holotype mostly lost, only fragments on pin; see note]. [Combination in *Technomyrmex* by Brown, 1953: 5.]

NOTE
Apart from a few leg segments the holotype of *quadricolor* has been missing from its

mount for many years (see Brown, 1953). However, these leg segments are sufficient to isolate *quadricolor* from all other Australian *Technomyrmex* and adequately confirm the identity of the species.

WORKER. *Measurements*: TL 2.9 – 3.3, HL 0.62 – 0.70, HW 0.58 – 0.64, SL 0.61 – 0.66, PW 0.40 – 0.50, WL 0.84 – 0.92 (12 measured). *Indices*: CI 90 – 97, SI 100 – 106, OI 25 – 27, EPI 88 – 96, DTI 120 – 133.
Dorsum of head behind clypeus with numerous setae: in profile 3 – 4 on frontal carina; 2 pairs at level of eye; 2 – 3 pairs from level of posterior margin of eye to posterior margin of head. Setal pair nearest to posterior margin of head the longest, much longer than maximum diameter of eye. Dorsum of head unsculptured, smooth and shining except for setal pits. With head in full-face view the eyes close to the midlength and their outer margins just break the outline of the sides. Anterior clypeal margin almost transverse, with only a minute median indentation. Posterior margin of head with a very slight median indentation. Number of setal pairs on mesosoma: pronotum 2 – 5; mesonotum 2 – 3; lateral margin of propodeal declivity 2 – 3. Pronotum smooth and shining. Propodeum in profile with a weakly convex dorsum that rounds broadly into the declivity. Gastral tergites 1 – 4 each with numerous setae, the longest on the first tergite much longer than the maximum diameter of the eye. First gastral tergite shining, unsculptured except for setal pits. Head, mesosoma and petiole yellow to light brownish yellow; gaster very dark brown to black and very strongly contrasting. Antenna characteristically, in specimens with full adult colour, with funiculus segments 2 – 11 darker than scape plus first funicular segment. Middle and hind coxae usually slightly lighter than mesosoma; femora and tibiae, except for bases and apices, somewhat darker; tarsi light. Scapes and tibiae may have the minute pubescence slightly elevated but setae are absent. Pubescence on first gastral tergite distinctly more sparse than on tergites 2 – 4.

The lack of sculpture on the head and pronotum easily isolate this striking species, together with its close relatives discussed under *sophiae*, from all other Australian congeners. The unique colour pattern of *quadricolor* distinguishes it from *sophiae*, *nitens* and *furens*, all of which have the head, mesosoma and gaster uniformly blackish brown to black and do not have funiculus segments 2 – 11 darker than the scape.

Intercastes between workers and queens appear to be fairly common in *quadricolor* (and also in its close relatives). Several basically worker-like specimens have been noted which have 3 fully developed ocelli. A couple of intercastes examined have a size-reduced but very queen-like complement of mesosoma sclerites, including a strongly differentiated mesoscutellum and a complete dorsal suture separating mesoscutum from mesoscutellum.

All the material examined was collected from trees, manually or by pyrethrum knock-down, but I would be surprised if *quadricolor* did not also forage on the ground like most other members of the fauna.

MATERIAL EXAMINED
Australia: Queensland, Mt Spec, nr Townsville (*E.O. Wilson*); Paluma Ra., Paluma (*E.O. Wilson*); N. Qld, Cairns Distr. (*A.M. Lea*); Cairns (*T. Greaves*); Millaa to Innisfail (*Darlingtons*); Milla Milla (*J. Feehan*); Kuranda (*W.L. Brown*); Wallaman Falls, via Ingham (*G. Monteith*); NE Qld, Hinchinbrook I., Upper Gayundah Ck (*G. Monteith*); Bell Peak North, Gordonvale (*Monteith, Yeates & Thompson*); Douglas Ck, Lamb Range (*Monteith, Yeates & Thompson*); Kirrama Ra., Douglas Ck Road (*Monteith, Yeates & Hamlet*); Lake Eacham Nat. Pk (*P.S. Ward*).

Technomyrmex shattucki Bolton sp. n.

HOLOTYPE WORKER. *Measurements*: TL 3.7, HL 0.82, HW 0.73, SL 0.86, PW 0.50, WL 1.16. *Indices*: CI 89, SI 118, OI 26, EPI 80, DTI 148.
Scapes and tibiae with numerous projecting suberect to subdecumbent setae; longest setae on each slightly shorter than maximum diameter of the segment from which they

arise; obliquely projecting setae also numerous on femora. Dorsum of head with 6 – 7 pairs of long fine setae and a large number of shorter setae of varying length; longest pair, located close to posterior margin, almost two times the maximum diameter of the eye. With head in full-face view the sides with abundant obliquely projecting short setae. Dorsal mesosoma with numerous setae on each sclerite, including the propodeal dorsum where they are relatively short. Gastral tergites 1 – 4 with abundant setae of varying length; the longest on the first tergite almost two times the maximum diameter of the eye. All surfaces of head and body also with fine dense appressed pubescence. Anterior clypeal margin with a shallow median concavity that is much broader than long. With head in full-face view the eyes slightly in front of the midlength of the sides. Mandibles smooth except for setal pits; remainder of head and body with the dense microreticulate-shagreenate sculpture that is prevalent in this genus. Mesosoma moderately elongate (DTI > 135). Propodeum in profile with a relatively long, weakly convex dorsum that rounds posteriorly into the declivity, the two surfaces not separated by a marked angle; straight-line length of dorsum distinctly greater than depth of declivity to the spiracle. Head, mesosoma, petiole and gaster blackish brown to black. All leg segments very dark brown except for the trochanters and tarsi which are yellow.

PARATYPE WORKERS. *Measurements*: TL 3.4 – 3.8, HL 0.78 - 0.88, HW 0.68 - 0.74, SL 0.80 – 0.90, PW 0.49 - 0.54, WL 1.14 – 1.28. *Indices*: CI 84 - 89, SI 118 – 124, OI 26 – 27, EPI 78 – 91, DTI 142 – 152. As holotype.

Holotype worker, **Australia**: NE. Queensland, Kirrama Ra., Mt Hosie, 800 – 930 m., 10.xii.1986 (*Monteith, Thompson & Hamlet*) (ANIC).
Paratypes. **Australia**: 2 workers, N. Queensland, Tully Falls Nat. Pk, c. 750 m., 2.vii.1971, strays ex trunks and low foliage rainforest, R.W. Taylor accession 71.877 (*R.W. Taylor & J. Feehan*); 2 workers, N. Queensland, Thornton Range, 150-180 m., 145.26X16.15, 23.vi.1971, R.W. Taylor accession 71.539 (*R.W. Taylor & J. Feehan*); 1 worker, 1 male, N. Queensland, Koombooloomba, c. 750 m., 4.vii.1971, strays ex trunks and low foliage rainforest, R.W. Taylor accession 71.976 (*R.W. Taylor & J. Feehan*); 3 workers, Queensland, Yungaburra, 17.15 S, 145.44 E, Lake Barrine National Forest, 533/17, iii.1998, ANIC database No. 32 011711 (*A.D. Cutter*) (ANIC). [Note. Any other specimens of these 5 series in ANIC should also be considered as paratypes.]

The spectacular pilosity of this apparently arboreal species immediately isolates *shattucki* from all other *Technomyrmex* species of Australia. Its closest known relative is the Malesian *grandis*, but this tends to be somewhat larger, has longer scapes and has larger eyes that are located more posteriorly on the head.

Technomyrmex sophiae Forel

(Fig. 64)

Technomyrmex sophiae Forel, 1902a: 474. Syntype workers and queen. AUSTRALIA: Queensland, Mackay, 9.91 (*R.E. Turner*) (BMNH) [examined].

WORKER. *Measurements*: TL 2.8 - 3.1, HL 0.65 - 0.72, HW 0.64 - 0.70, SL 0.62 - 0.68, PW 0.42 - 0.48, WL 0.82 – 0.92 (9 measured). *Indices*: CI 94 – 100, SI 94 - 100, OI 23 – 25, EPI 96 – 107, DTI 120 – 126.
With head in profile the dorsum behind the clypeus with numerous pairs of setae; too numerous to count easily, with shorter secondary setae among the longer primary setae. Longest pair of cephalic setae (located a distance less than the length of the maximum diameter of the eye from the posterior margin) much longer than the maximum diameter of the eye. Short setae are present between this longest pair and the posterior margin of the head. With head tilted just back from full-face view the posterior margin with several short setae across its width. Dorsum of head unsculptured, smooth and

shining except for setal pits. In full-face view the anterior clypeal margin and the posterior margin each with feeble median concavities; outer margins of eyes just touch or slightly break the outlines of the sides. Pronotum smooth, unsculptured except for setal pits. Number of setal pairs on mesosoma: pronotum 3 – 5; mesonotum 2 – 4; lateral margin of propodeum 2 – 3. Propodeum in profile with a weakly convex dorsum that rounds broadly into the declivity. Gastral tergites 1 – 4 each with numerous long setae, the longest on the first tergite much longer than the maximum diameter of the eye. First gastral tergite shining, unsculptured except for setal pits. Head, mesosoma, petiole and gaster blackish brown to black. Funiculus segments 1 – 6 all the same dark colour. Middle and hind coxae, femora and tibiae the same dark colour as the mesosoma throughout; trochanters yellow, tarsi yellow to dull brownish yellow. Pubescence on gastral tergite 1 more sparse than on tergites 2 – 4.

The three species *sophiae, nitens* and *furens* form a close complex of species, apparently restricted to north and north-east Queensland. Together they are characterised by their lack of sculpture on the head, pronotum and first gastral tergite, combined with a uniformly darkly coloured head, mesosoma and gaster. They also have numerous pairs of setae on the dorsum of the head, the longest of which is distinctly longer than the maximum diameter of the eye and is located somewhat anterior to the posterior margin; very long gastral setae are also present and pubescence on the first gastral tergite is dilute. The closest relative to this complex within Australia is *quadricolor*, which shares these characters except for colour, which in that species is strikingly different.

T. sophiae is the most setose of the three darkly-coloured species: in profile short setae are present on the head between the longest pair and the posterior margin, and with the head tilted slightly back from full-face view short setae can be seen across the posterior margin; all of these are absent from *nitens* and *furens*. The funiculus and leg colour patterns of *furens* are the same as in *sophiae*, but are different in *nitens* where the first funicular segment is lighter than those succeeding, the middle and hind coxae are yellow and the base of the hind femur is yellow, like the trochanter.

Workers of the three species appear to have relatively slightly different sizes of eye, although the numbers measured are perhaps too small to make this point definite. Of those measured, and excluding worker-queen intercaste forms, *furens* has OI 22 – 23, *sophiae* has OI 23 – 25, and *nitens* has OI 26 – 28.

All three of these species, like *quadricolor*, appear to produce numerous worker-queen intercastes. Those of *nitens* and *furens* often appear to have more numerous setae on the head than their respective workers, and hence more closely resemble *sophiae* workers.

MATERIAL EXAMINED

Australia: Queensland, Mackay (*R.E. Turner*); Qld, Hinchinbrook Is, Gayundah Ck (*Monteith, Davies, Thompson & Gallon*); Qld, Maryborough, Saltwater Ck (*A.G. Orr*); Qld, Cooloola (*P.J.M. Greenslade*); Qld, Cooloola Nat. Pk (*P.S. Ward*); Qld, Hope Vale Mission (*J.E. Feehan*).

CHECKLIST OF NEW WORLD *TECHNOMYRMEX* SPECIES

***albipes* group**

difficilis Forel, 1892 **stat. n.**

= *mayri* st. *nitidulans* Santschi, 1930 **syn. n.**

vitiensis Mann, 1921 **stat. rev., stat. n.**

= *albipes* st. *rufescens* Santschi, 1928 **syn. n.**

***fulvus* group**

fulvus (Wheeler, 1934)

= *fulvum* ssp. *sublucidum* Wheeler, 1934 **syn. n.**

KEY TO NEW WORLD *TECHNOMYRMEX* INCLUDING TRAMP SPECIES (workers)

NOTE. The locations and relative lengths of various setae are critical in the determination of some species. Abraded, or old and damaged, specimens may be difficult or impossible to identify correctly.

1 With head in profile the dorsum behind the level of the posterior margin of the eye without setae.....2
- With head in profile the dorsum behind the level of the posterior margin of the eye with one or two pairs of setae 4

2 Head, mesosoma, petiole, gaster and leg segments entirely yellow to light brownish yellow; middle and hind coxae may be slightly lighter in shade than the mesosoma. (Panama, Costa Rica).....***fulvus*** (p. 119)
- Head, mesosoma, petiole and gaster brown to black; colour may be more or less uniform or slightly different on separate tagmata, but never entirely yellow; middle and hind coxae the same colour as the mesosoma to distinctly lighter.....3

3 Scape relatively short and promesonotum relatively short and broad, SI 91 – 102, DTI 110 – 124. Eye somewhat smaller, OI 24 – 27. With mesosoma in absolute profile the mesonotal dorsal outline convex, more or less evenly rounded (Fig. 1). In same view the junction of the propodeal dorsum and declivity is blunt. (*Tramp species*: as yet no New World records but very widespread and occurs in West Palaearctic hothouses).....***albipes*** (p. 68)
- Scape relatively long and promesonotum relatively long and narrow, SI 104 – 115, DTI 128 – 141. Eye somewhat larger, OI 29 – 32. With mesosoma in absolute profile the mesonotal dorsal outline with a more or less flat anterior section that passes through an obtuse angle to a distinctly more strongly sloped posterior declivity (Fig. 2). In same view the junction of the propodeal dorsum and declivity sharply defined. (*Tramp species*: U.S.A. (California (in hothouses)) .....***vitiensis*** (p. 104)

4 Tarsus of hind leg distinctly much lighter in colour than the tibia. Dorsum of head behind level of posterior margin of eye with a single pair of setae, located about two-thirds the way between the level of the posterior margin of the eye and the posterior margin of the head (Fig. 3). Eyes located somewhat more posteriorly, EPI 72 – 86. (*Tramp species*: U.S.A. (Florida (may invade houses), Washington (in tropical house of zoo), Puerto Rico).....***difficilis*** (p. 47)
- Tarsus of hind leg the same colour as the tibia. Dorsum of head behind level of posterior margin of eye with two pairs of very short, stubbly setae; first pair located about two-thirds the way between the level of the posterior margin of the eye and the posterior margin of the head; second pair at the posterior margin (Fig. 4). Eyes located somewhat more anteriorly, EPI 55 – 71. (*Tramp species*: As yet no New World records but occurs in West Palaearctic hothouses).....***pallipes*** (p. 56)

NEW WORLD SPECIES OF *TECHNOMYRMEX*

Technomyrmex fulvus (W.M. Wheeler)

Tapinoma fulvum Wheeler, W.M. 1934: 184. Syntype workers, PANAMA: Barro Colorado I.C.Z., No. 525.6.21 – 24 (*W.M. Wheeler*) (LACM) [examined]. [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

Tapinoma fulvum subsp. *sublucidum* Wheeler, W.M. 1934: 185. Syntype workers, PANAMA: Barro Colorado I.C.Z., No. 713.7.20.24 (*W.M. Wheeler*) (LACM) [examined]. **Syn. n.** [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

WORKER. *Measurements*: TL 3.2 – 3.8, HL 0.71 – 0.82, HW 0.65 – 0.80, SL 0.69 – 0.78, PW 0.45 – 0.55, WL 0.95 – 1.04 (10 measured). *Indices*: CI 92 – 98, SI 97 – 107, OI 21 – 24, EPI 63 – 70, DTI 130 – 135.
With head in profile the dorsum entirely lacks setae behind the level of the posterior margin of the eye; dorsum of head anterior to this usually with 2 – 4 very short pairs of setae (less than 0.50 × the maximum diameter of the eye) between the torulus and the level of the midlength of the eye, but in some Costa Rican workers apparently with only one extremely short pair. With head in full-face view the posterior margin conspicuously excavated medially, not merely indented. Outer margin of eye distinctly fails to break the outline of the side of the head. Anterior clypeal margin with an extremely weak median concavity, almost transverse in most. Number of setal pairs on mesosoma: pronotum 3 – 7, arising from very well-marked pits; mesonotum 0 – 1 (when present short and close to metathoracic spiracle); lateral margins of propodeal declivity 1 – 2, apparently absent in some smaller workers. Mesonotum in profile shallowly convex anteriorly and with a steeply sloping declivitous face that extends down to the tuberculiform metathoracic spiracle. Propodeal dorsum convex in profile; dorsum rounds evenly into declivity. Gastral tergites 1 – 4 each with numerous setae, the longest of which are slightly shorter than the maximum diameter of the eye. Short pubescence on scapes and dorsal (outer) surfaces of middle and hind tibiae usually almost appressed, but slightly elevated in some. Entirely yellow to light brownish yellow, the middle and hind coxae usually somewhat paler than the mesosoma. Head and body usually finely microreticulate-shagreenate but in some the sculpture may be weaker on the pronotum and mid-dorsal head than elsewhere.

The only extant native species of *Technomyrmex* in the New World and apparently restricted to small areas of Panama and Costa Rica. Its uniform yellow colour alone immediately distinguishes it from any tramp species that is likely to be encountered in the Nearctic and Neotropical regions. Although relatively little material was measured there appears to be some allometric variation, because as HW increases CI seems to decrease slightly and SI to increase.

MATERIAL EXAMINED
Costa Rica: Prov. Limon, Tortuguero (*J. Longino*); Corcovado Nat. Pk (*P.S. Ward*). **Panama**: C.Z., Barro Colorado I. (*J. Zetek*); Barro Colorado I. (*W.M. Wheeler*).

SPECIES EXCLUDED FROM *TECHNOMYRMEX*

Species previously excluded

Engramma denticulatum Wheeler, W.M. 1922: 205. Transferred to ***Axinidris*** by Shattuck, 1991: 112.
Technomyrmex luteus Emery, 1895b: 43. Transferred to ***Tapinoma*** by Mayr, 1907: 18.
Technomyrmex luteus subsp. *emeryi* Forel, 1910a: 447. Transferred to ***Tapinoma*** by Emery, 1913: 42.
Engramma tridens Arnold, 1946: 58. Transferred to ***Axinidris*** by Shattuck, 1991: 119.

Species newly excluded

Tapinoma aberrans (Santschi) **comb. n.**

Technomyrmex aberrans Santschi, 1911a: 127. Syntype queens, MADAGASCAR: Region du sud-est Fort-Dauphin, 1901 (*Ch. Alluaud*) (NHMB, MNHN) [new combination established here by Brian L. Fisher, syntypes examined].

Tapinoma albinase (Forel) **comb. n., stat. n.** (provisional)

Technomyrmex nigriventris subsp. *albinasis* Forel, 1910b: 22. Syntype worker, SOUTH AFRICA: Tafelberg, Febr. 1904 (*Schultze*) (MHNG) [examined].

The single syntype worker available for examination has its apical three gastral segments deeply crushed inwards. Gastral segment 5 is very deformed and difficult to interpret but certainly appears to have a *Tapinoma* structure rather than that of *Technomyrmex*. The taxon is formally transferred to *Tapinoma* and provisionally given species rank, to annul its previous association with *Technomyrmex nigriventris*, to which it is not related.

Tapinoma albomaculatum (Karavaiev) **comb. n.**

Technomyrmex albomaculatus Karavaiev, 1926: 444, fig. 12. Holotype queen, INDONESIA: Sulawesi, Makassar, no. 2434 (*Karavaiev*) (UASK) [examined].

Tergite 5 of the gaster is vertical and flexed down, not visible in dorsal view and conforming to the morphology seen in *Tapinoma* queens. Sternite 5 is slightly damaged, somewhat deformed and everted. The pairs of off-white lunate marks on the anterior margins of gastral tergite 2 – 4 that are so obvious in this species that it should be easily recognisable if it is ever found again.

Axinidris hypoclinoides (Santschi) **comb. n.**

Technomyrmex hypoclinoides Santschi, 1919a: 89. Syntype workers, DEMOCRATIC REPUBLIC OF CONGO: Avakubi, 6-I, no. 103 (*Bequaert*) (NHMB) [examined].
Axinidris parvus Shattuck, 1991: 118. Holotype worker, LIBERIA: Paiata (*J. Bequaert*) (MCZC) [not seen]. **Syn. n.** (provisional).

The syntypes consist of two workers, each on a separate pin. There are no data labels, merely the information "*Technomyrmex hypoclinoides* Sants. type"; the taxonomic synopsis above is thus from the original description. The specimens match the original description perfectly and there is no reason to doubt their validity. They belong in the genus *Axinidris*, where *hypoclinoides* appears to be the senior synonym of *A. parvus* Shattuck, running to that name in Shattuck's revision and matching his description. The synonymy is recorded here as provisional because the holotype of *parvus* has not been seen.

SPECIES INQUIRENDAE

Technomyrmex incisus (Mukerjee)

Engramma incisum Mukerjee, 1930: 155, fig. 3. Syntype workers, INDIA: Consulate Garden, Nasartabad, Seistan, xi-xii.1918 (*N. Annandale & S.W. Kemp*) (supposedly in NZSI but no types known to exist). [Combination in *Technomyrmex* by Shattuck, 1992b: 161.]

The author's rather sketchy drawing shows only 4 visible gastral segments, as in *Tapinoma*, and the mesosoma shape is also reminiscent of *Tapinoma*. The clypeus appears unique (if the drawing is accurate) as it has a narrow, long median incision, somewhat similar to *Tapinoma simrothi* Krausse or small workers of *Technomyrmex voeltzkowi*, but apparently even longer and narrower. From the drawing the scape appears quite long and the eye is of moderate size: SI *ca* 116, OI *ca* 23. No setae are shown in the drawing, nor are any mentioned in the text. From the description it is impossible to be sure whether this species is correctly placed in *Technomyrmex* or *Tapinoma*. Without type-material it must remain in the former as a *species inquirenda*.

Technomyrmex transiens Forel

Technomyrmex transiens Forel, 1913d: 96. Holotype worker, INDONESIA: Sumatra, Bandar Baroe (*v. Buttel-Reepen*) (not in MHNG or ZMHB, presumed lost).

The holotype and only known specimen can not be found and its description is not sufficiently detailed to allow any unequivocal identification of the taxon. No specimen has been seen during the course of this study that satisfactorily matches the description, which in some aspects seems applicable to *sundaicus* but in others is reminiscent of *modiglianii* or even *elatior*. The names of all of these species antedate *transiens* and any one of them may well be its senior synonym. Thus *transiens* must remain a *species inquirenda*, although it would appear to be correctly placed in *Technomyrmex*.

FOSSIL TAXA

Technomyrmex caritatis Brandão & Baroni Urbani

Technomyrmex caritatis Brandão & Baroni Urbani, in Brandão, Baroni Urbani, Wagensberg & Yamamoto. 1998: 416, figs. 1, 4-6. Holotype worker, DOMINICAN REPUBLIC: in Dominican amber fragment MCCB 0060 ("piece Jorge Caridad"), numbered 16O, collected ii.1995, Palo Quemado Mine, about 10 km. NE of Santiago, Cordillera Septentrional (*J. Caridad*). Paratypes: many workers and brood in same amber fragment (Museo de la Ciència, Fundació 'la Caixa', Barcelona, Spain).

Brandão, Baroni Urbani *et al.* (1998) described this species in *Technomyrmex*, and also referred the previously described species *hispaniolae*, also from the Dominican amber (see below), to this genus. These two species are certainly closely related to each other and at first glance seem to be similar to some *Technomyrmex*, especially to species of the *bicolor* group (except that they retain setae on the dorsum of the head that are univerally absent in the *bicolor* group). However, both Dominican amber species lack some critical diagnostic characters of the genus, the absence of which would argue for their exclusion. I have not examined the fossil material but from the descriptions and illustrations their continued inclusion in *Technomyrmex* must be questioned. The fundamental problem is that the structure of the petiole and the base of the gaster is radically different from that of all extant *Technomyrmex* species. In both Dominican amber species the petiole has a distinct, elevated scale, the first gastral tergite does not project forward and does not overhang the petiole, and there is no groove in the first tergite to accommodate the petiole.

During the short taxonomic history of these two names three generic combinations have already been suggested: *Iridomyrmex*, *Linepithema* and *Technomyrmex*. On present consideration they do not appear to fit comfortably in any of these though they appear closer related to *Technomyrmex* than to the other two. Both are best regarded as *incertae sedis* in *Technomyrmex*, at least for the present.

Technomyrmex deletus Emery

Technomyrmex deletus Emery, 1891: 153, pl. 3, figs. 26-28. Holotype worker: SICILIAN AMBER (Museo Mineralogico, Università di Bologna).

This fossil in amber is almost certainly correctly placed in *Technomyrmex*. It is badly damaged and the abdomen is deformed and ruptured. While this has occluded the characteristic external abdominal characters of the genus it has fortunately exposed the proventriculus to view. In *Technomyrmex* the cupola of the proventriculus is sculptured (Forel, 1878; Emery, 1888; Eisner, 1957) and the presence of such sculpture appears to be a unique character of the genus. Emery (1891) points out that such sculpture is present in *T. deletus* and from Emery's original description and figures *deletus* may possibly belong to the *albipes* group.

Technomyrmex hispaniolae (Wilson)

Iridomyrmex hispaniolae Wilson, 1985: 32, fig. 10. Holotype worker, DOMINICAN REPUBLIC: Las Bocas del Licey, in amber (MCZC). Paratype workers. (32 amber pieces) DOMINICAN REPUBLIC: Carlos Díaz, El Valle, La Toca, Llaroa, Los Cacaos, Palo Quemado and Bayaguana (MCZC). [Combination in *Linepithema* by Shattuck, 1992a: 16; in *Technomyrmex* by Brandão, Baroni Urbani, Wagensberg & Yamamoto, 1998: 414.]
See comments under *T. caritatis*.

Technomyrmex septentrionalis Zhang

Technomyrmex septentrionalis Zhang, 1989: 277, fig. 279. Holotype queen (?). CHINA: Shanwang, Shandong.

The fossil is an impression in rock and displays a venation pattern that is common to alates of many dolichoderine genera. No petiole can be seen in the sketchy illustration but the gaster is shown with only four tergites. There is no clear evidence that placement within *Technomyrmex* is correct and the species is ceratinly best regarded as *incertae sedis* in the genus.

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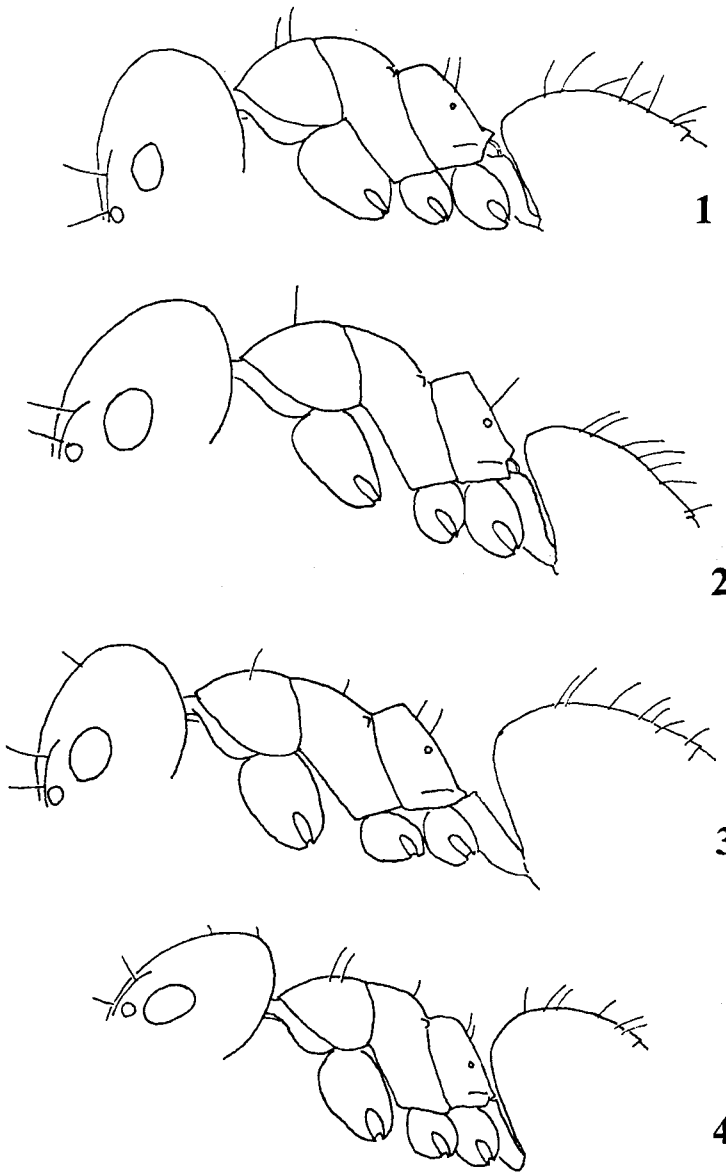
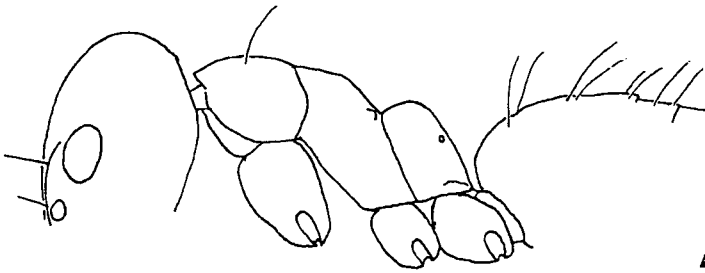


FIGS 1 – 4 *Technomyrmex* workers, body profiles of (1) *albipes*, (2) *vitiensis*, (3) *difficilis*, (4) *pallipes*.



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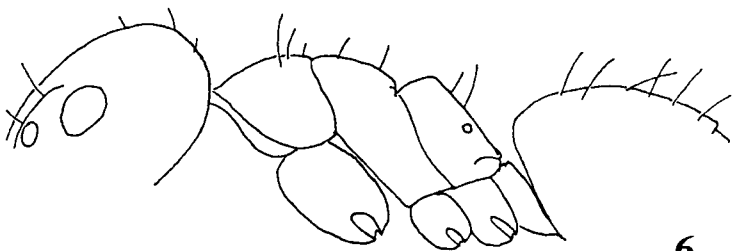

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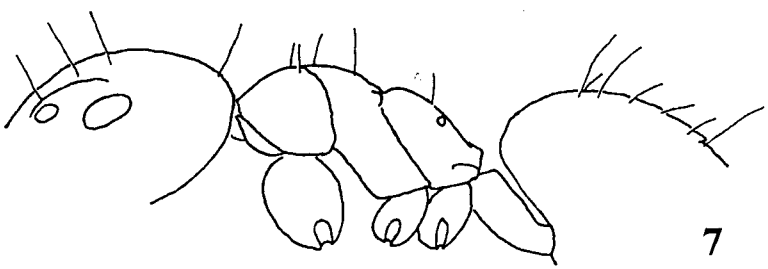

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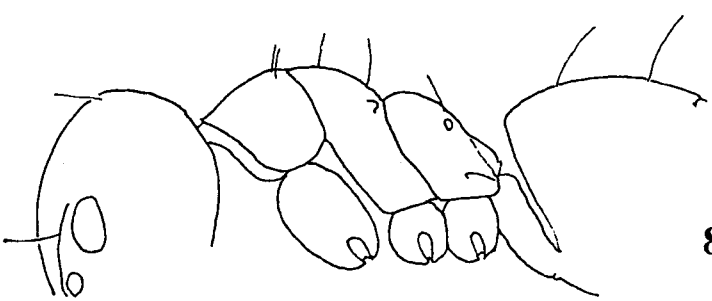

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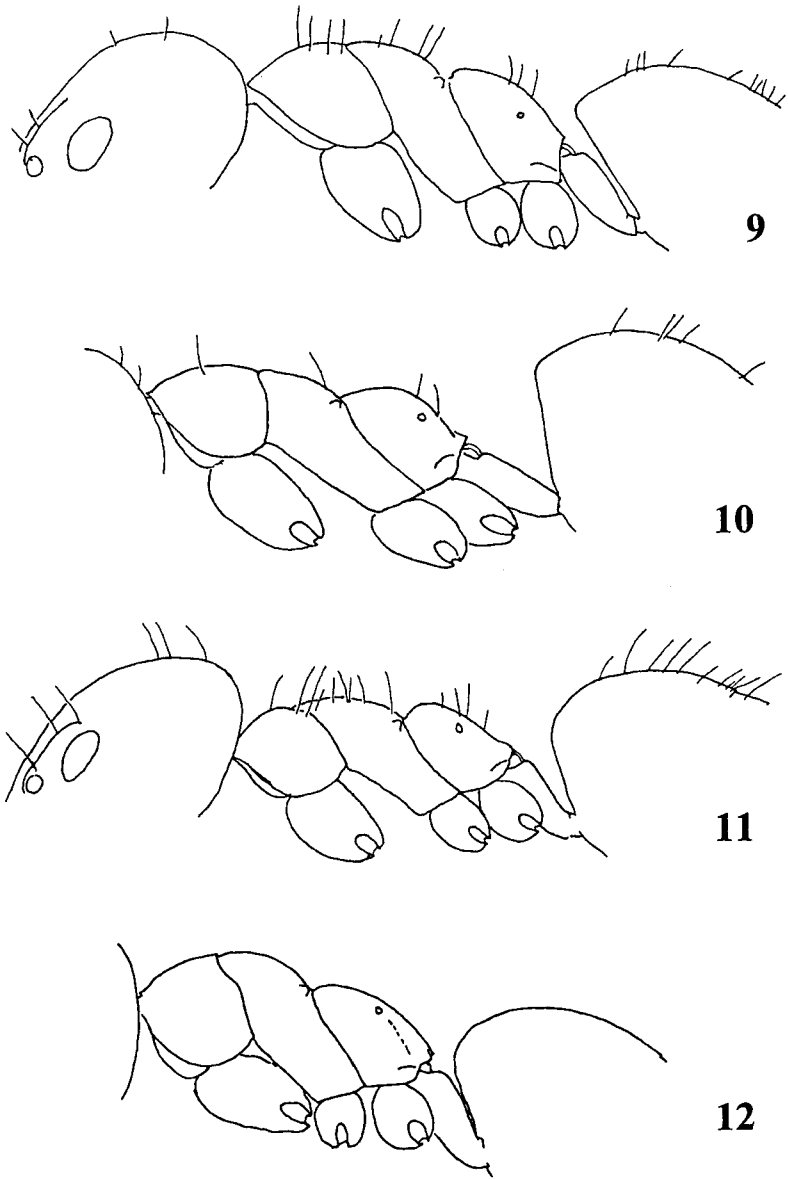
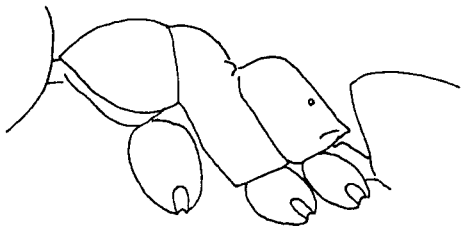
FIGS 5 – 8 *Technomyrmex* workers, body profiles of (5) *moerens*, (6) *vapidus*, (7) *lasiops*, (8) *ilgi*.



FIGS 9 – 12 *Technomyrmex* workers, body profiles of (9) *hostilis*, (10) *menozzii*, (11) *laurenti*, (12) *lujae*



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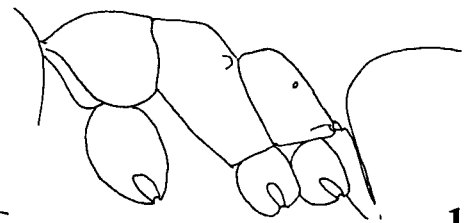

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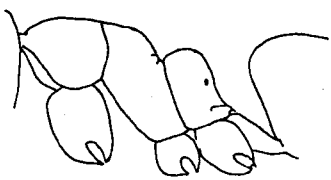

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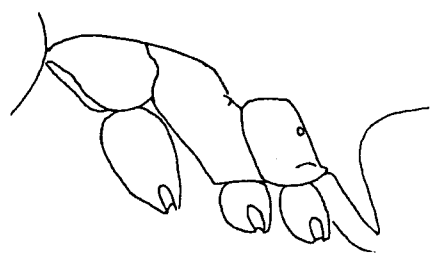

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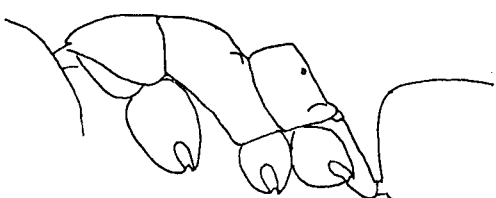

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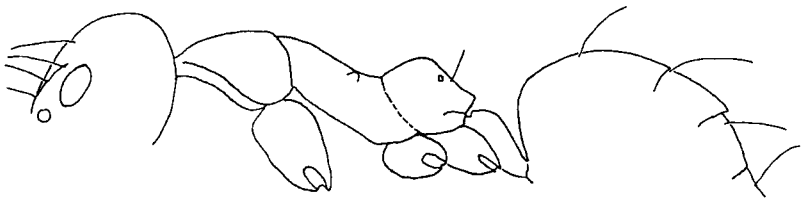
FIGS 13 – 17 *Technomyrmex* workers, body profiles of (13) *vexatus*, (14) *voeltzkowi*, (15) *parviflavus*, (16) *sycorax*, (17) *senex*.



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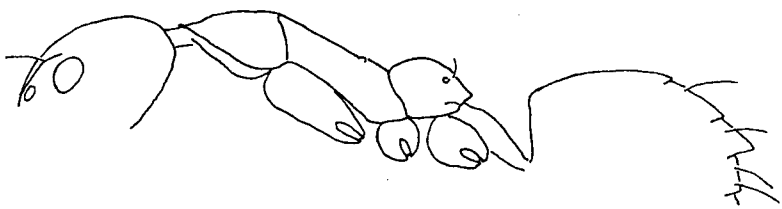

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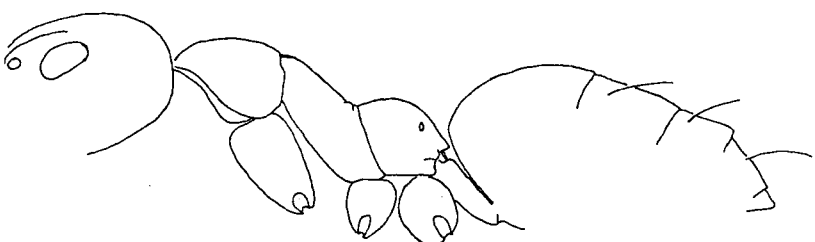

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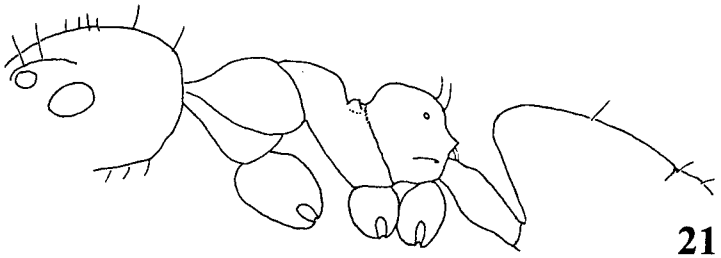
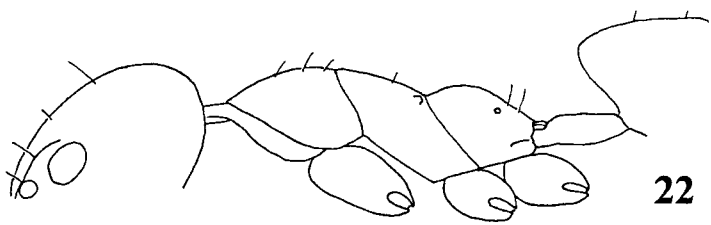
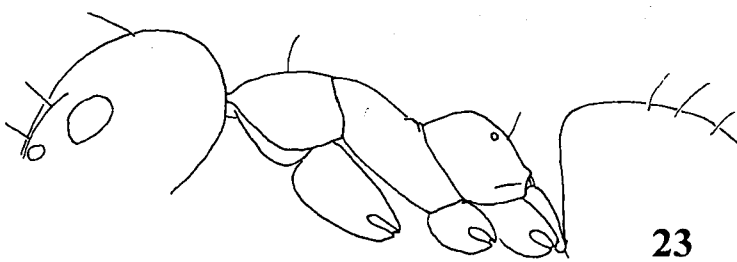
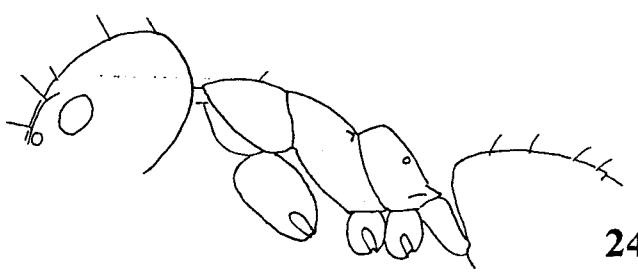
FIGS 18 – 20 *Technomyrmex* workers, body profiles of (18) *camerunensis*, (19) *schoedli*, (20) *andrei*.

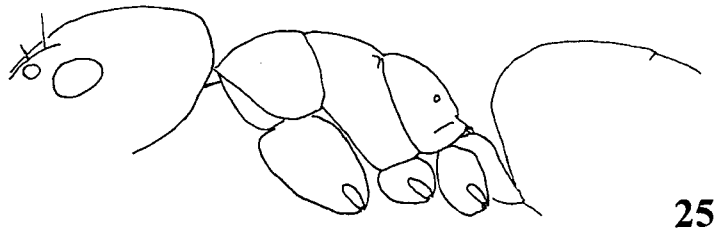


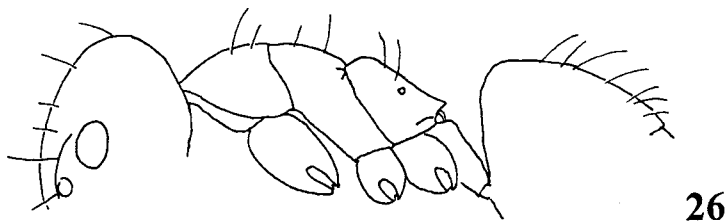


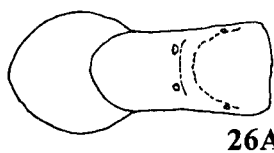


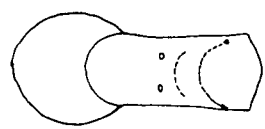


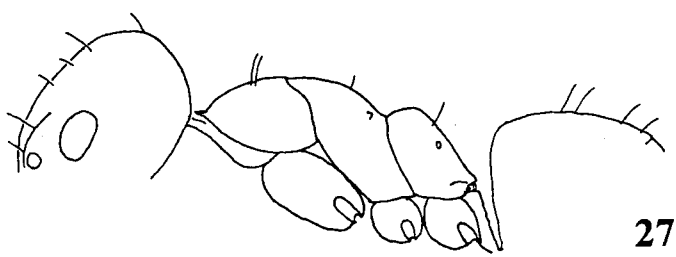
FIGS 21 – 24 *Technomyrmex* workers, body profiles of (21) *schoutedeni*, (22) *anterops*, (23) *mayri*, (24) *fisheri*.



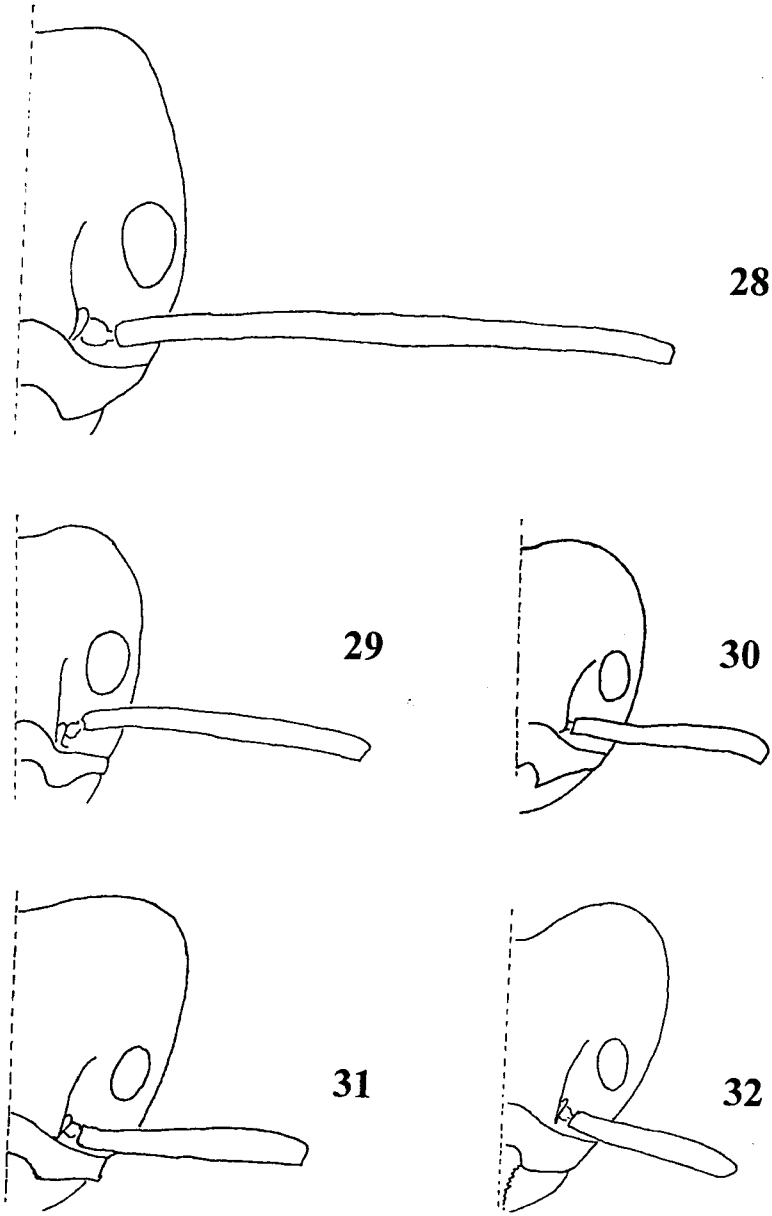




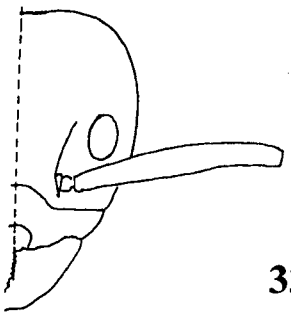


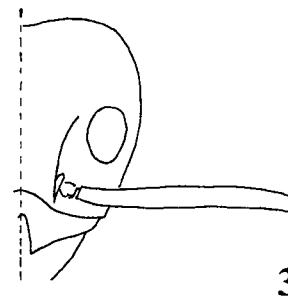


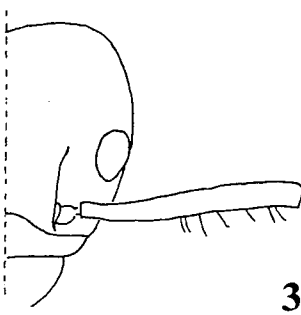
FIGS 25 – 27 *Technomyrmex* workers, body profiles of (25) *curiosus*, (26) *madecassus*, (27) *innocens*; offsets above figs 26, 27 show mesosomal dorsum.

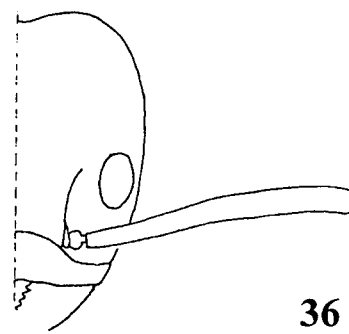


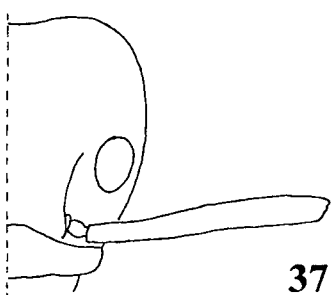
FIGS 28 – 32 *Technomyrmex* workers, heads of (28) *schoedli*, (29) *andrei*, (30) *lasiops*, (31) *lujae*, (32) *laurenti*.



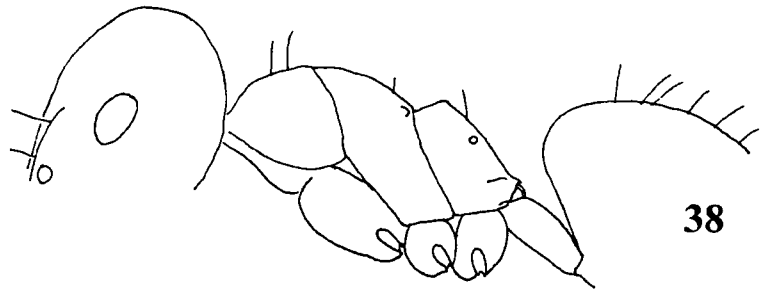


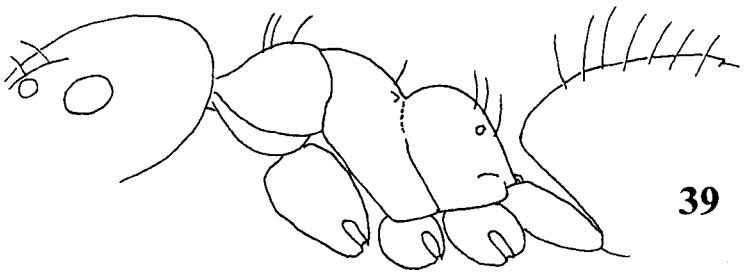


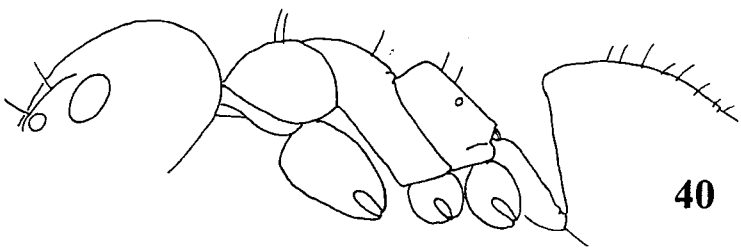


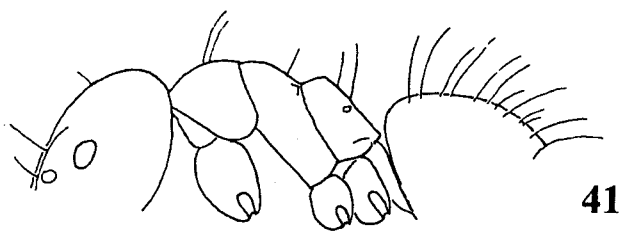


FIGS 33 – 37 *Technomyrmex* workers, heads of (33) *ilgi*, (34) *voeltzkowi*, (35) *schoutedeni*, (36) *anterops*, (37) *hostilis*.

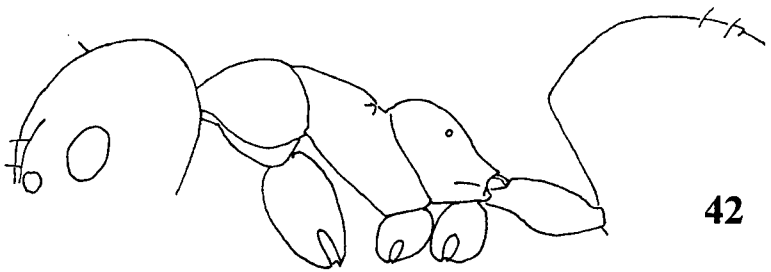


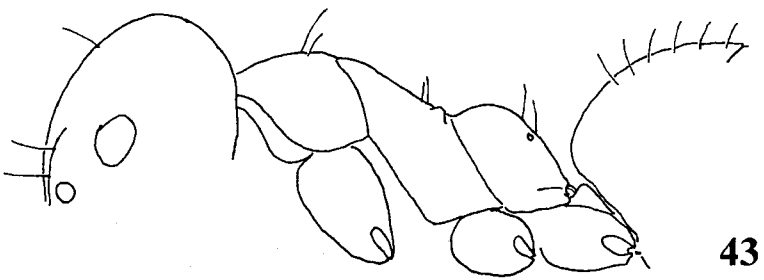


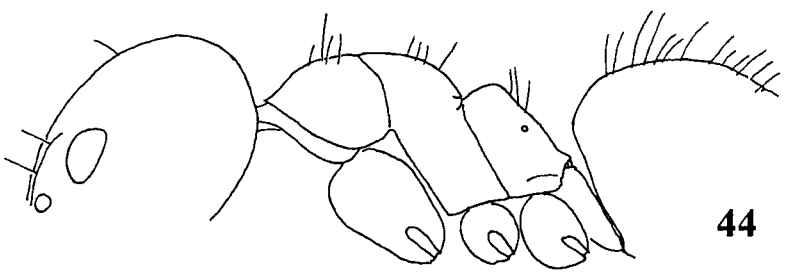




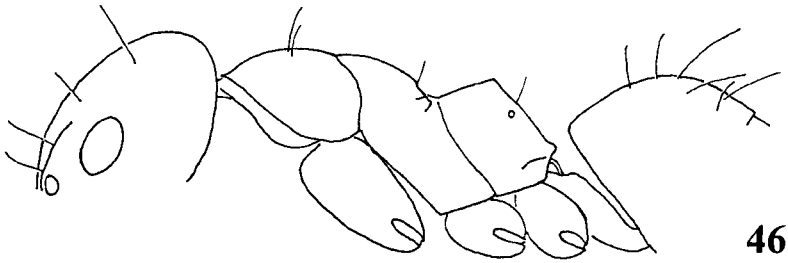
FIGS 38 – 41 *Technomyrmex* workers, body profiles of (38) *brunneus*, (39) *butteli*, (40) *elatior*, (41) *myops*.

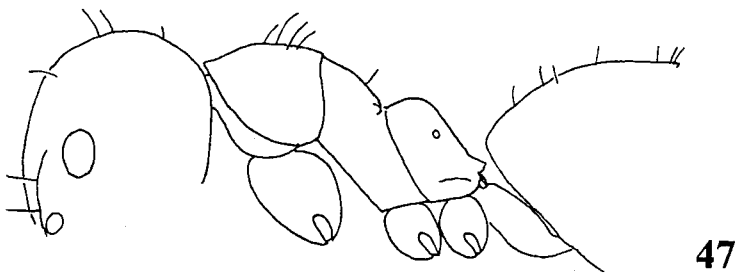


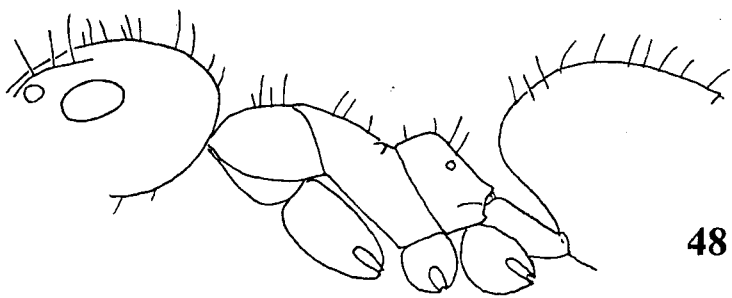


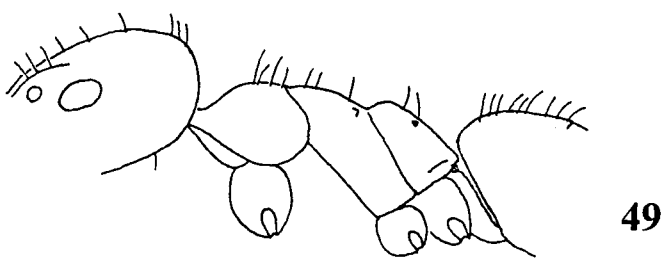


FIGS 42 – 45 *Technomyrmex* workers, body profiles of (42) *tonsuratus*, (43) *mixtus*, (44) *modiglianii*, (45) *fornax*.

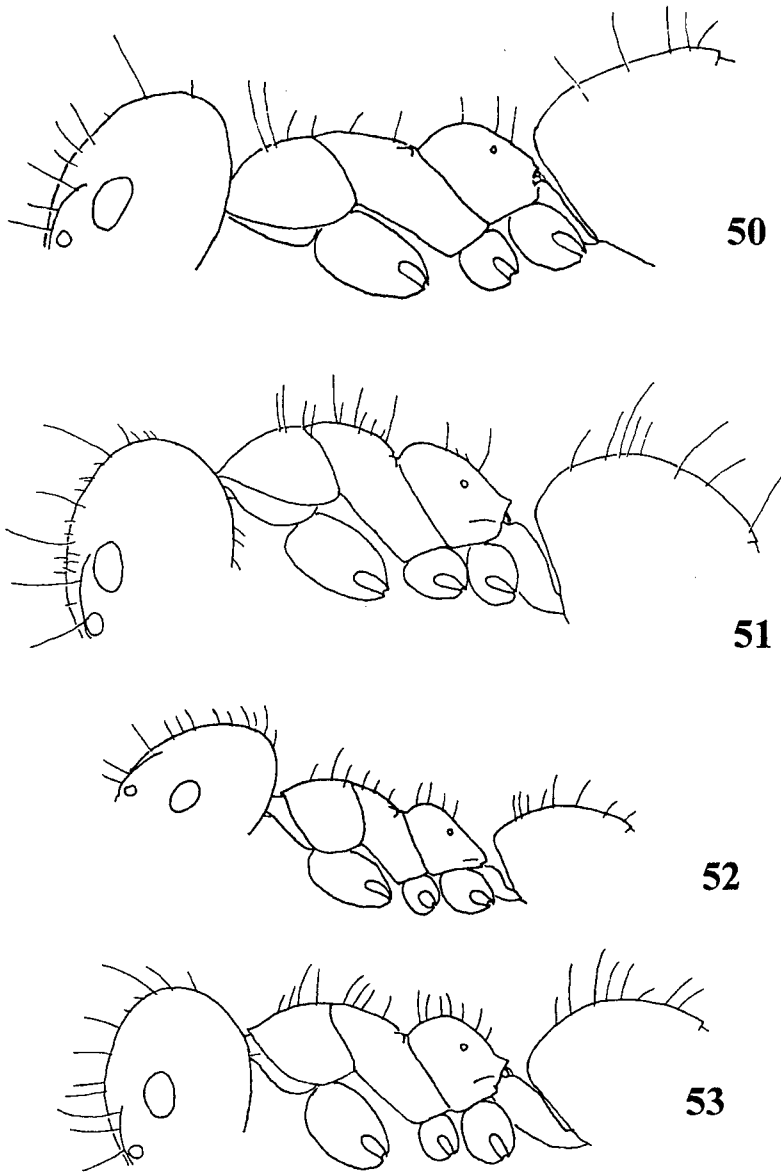




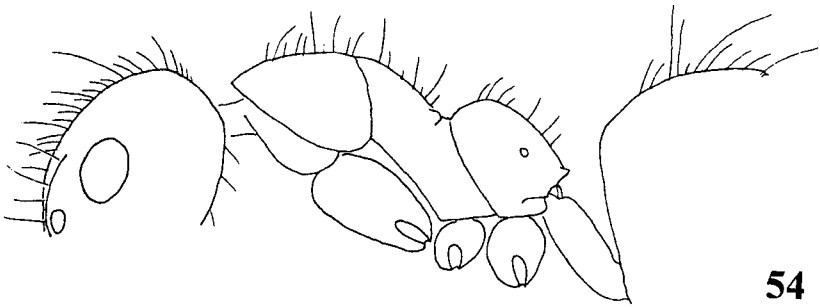


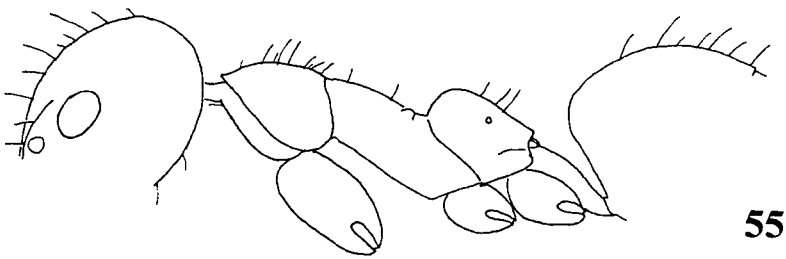


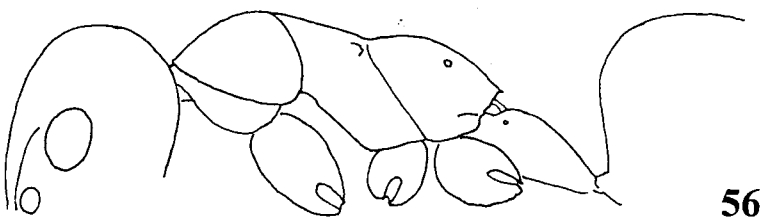
FIGS 46 – 49 *Technomyrmex* workers, body profiles of (46) *subgracilis*, (47) *yamanei*, (48) *indicus*, (49) *certus*.

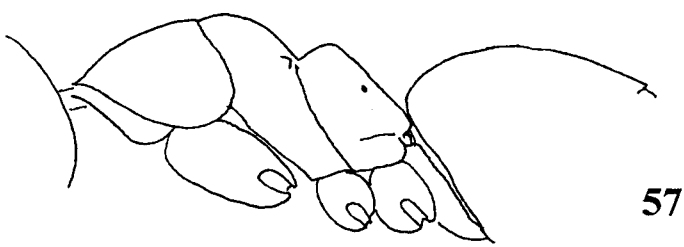


FIGS 50 – 53 *Technomyrmex* workers, body profiles of (50) *cheesmanae*, (51) *pratensis*, (52) *mandibularis*, (53) *strenuus*.

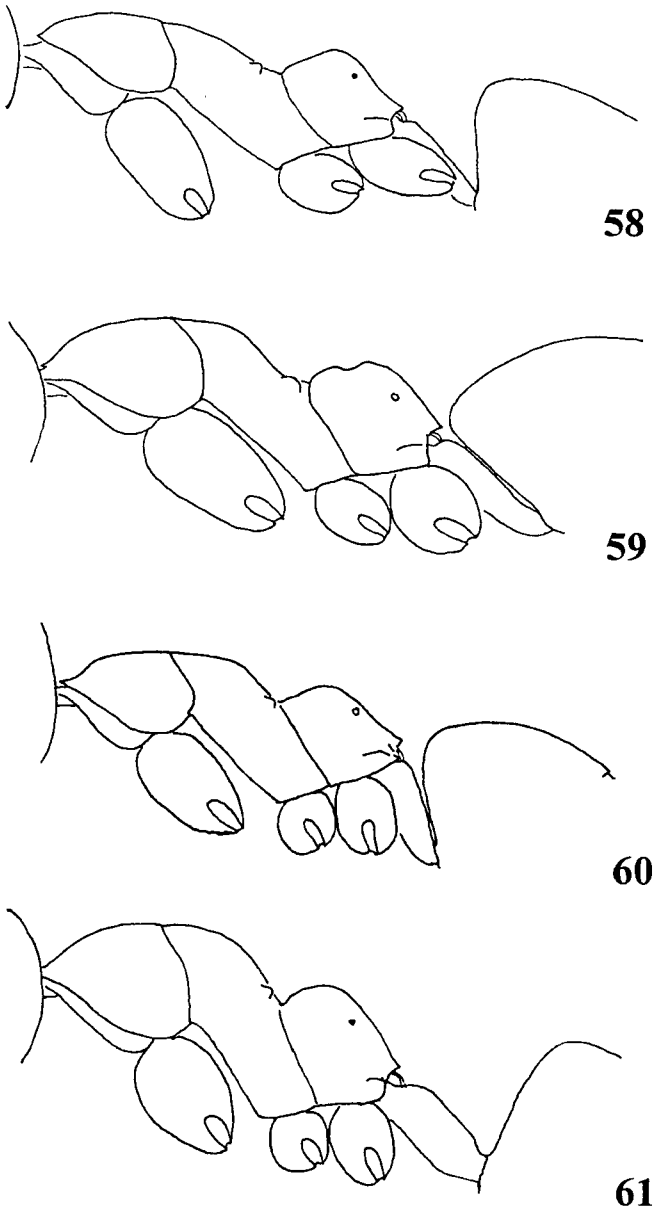




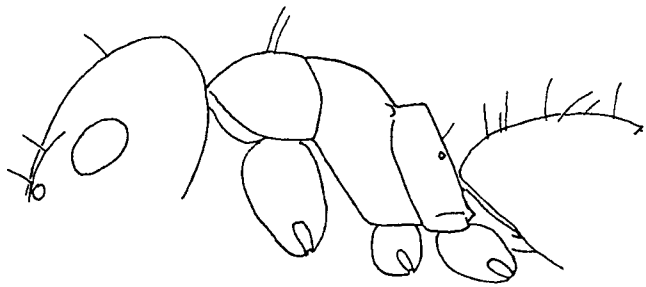




FIGS 54 – 57 *Technomyrmex* workers, body profiles of (54) *grandis*, (55) *wheeleri*, (56) *reductus*, (57) *gibbosus*.



FIGS 58 – 61 *Technomyrmex* workers, body profiles of (58) *obscurior*, (59) *impressus*, (60) *gilvus*, (61) *horrens*.



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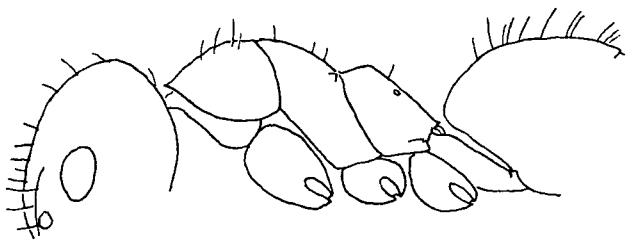

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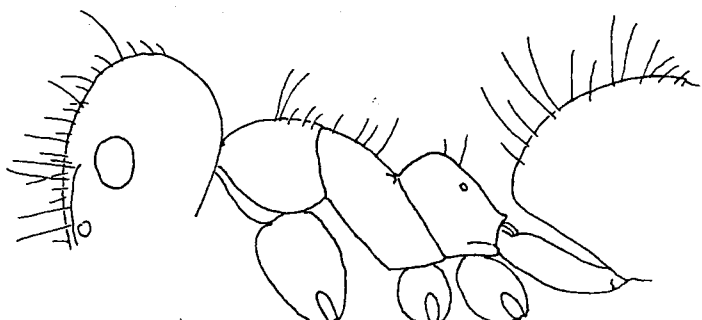

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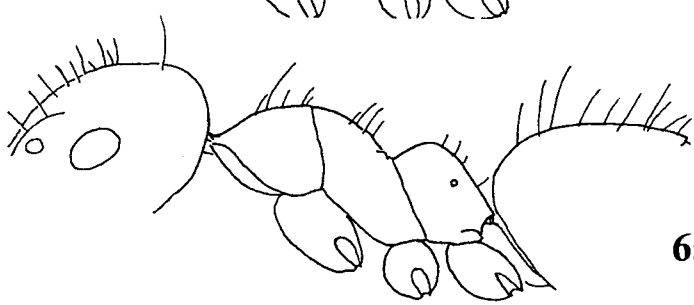

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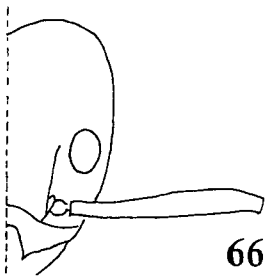
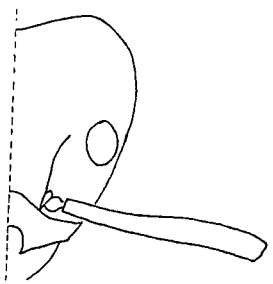
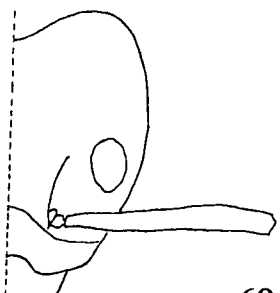
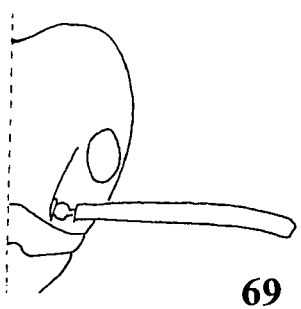
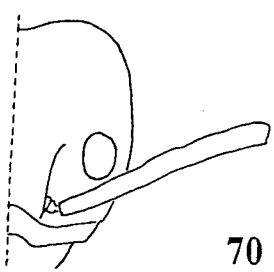
FIGS 62 – 65 *Technomyrmex* workers, body profiles of (62) *cedarensis*, (63) *jocosus*, (64) *sophiae*, (65) *nitens*.



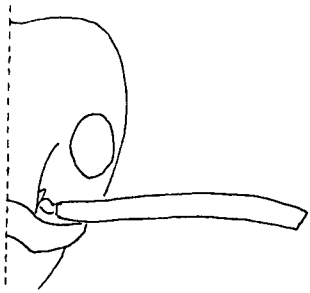








FIGS 66 – 70 *Technomyrmex* workers, heads of (66) *pratensis*, (67) *yamanei*, (68) *modiglianii*, (69) *elatior*, (70) *horrens*.



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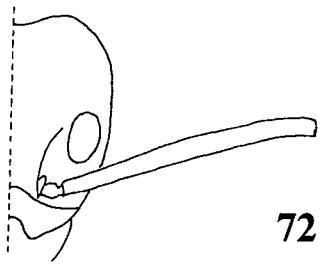

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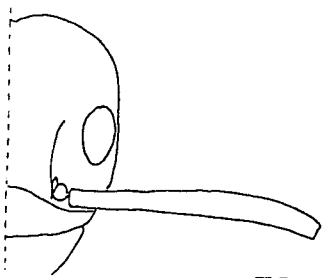

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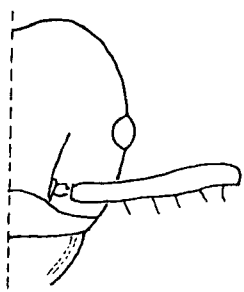

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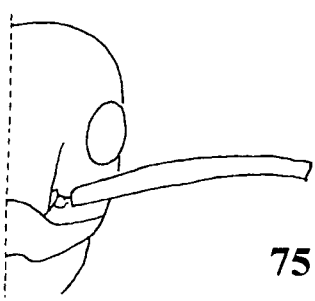

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FIGS 71 – 75 *Technomyrmex* workers, heads of (71) *rector*, (72) *antennus*, (73) *subgracilis*, (74) *mandibularis*, (75) *cedarensis*.

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Currently valid names of species are in ***bold italic***, all others are in *italic*.