

The ant tribe Tetramoriini (Hymenoptera : Formicidae)

The genus *Tetramorium* Mayr in the Oriental and Indo-Australian Regions, and in Australia

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Synopsis

The ant genus *Tetramorium* (= *Xiphomyrmex* Forel) is revised for the Oriental and Indo-Australian regions, and for Australia. Seventy-two species are recognized as valid in the Oriental/Indo-Australian regions and a further 17 endemic Australian forms are recognized (besides 6 species shared with other regions), so that the total number of species known from Australia is 23 and the *Tetramorium* fauna of all these regions together consists of 89 species. Of these 37 are described as new, 9 of them being from Australia. Twenty-nine new synonyms are established, the vast majority being of infraspecific forms.

Two species are newly excluded from *Tetramorium*: *T. confucii* Forel is transferred to *Leptothorax* Mayr; and *T. guineense* (F.) is transferred to *Pheidole* Westwood.

A key is given to the Oriental and Indo-Australian species together, and a separate key to the Australian species.

Introduction

This paper represents part two of a projected series which, when completed, will cover the entire tribe Tetramoriini. The first part (Bolton, 1976) dealt with a review of the smaller genera, a revision of *Triglyphothrix* Forel, and an introduction to the genus *Tetramorium* with discussion of its genus-level synonyms. This part is thus the first dealing with *Tetramorium* proper and covers the faunas of the Oriental and Indo-Australian regions, and of the Australian continent. The genus also occurs in the Ethiopian and Malagasy regions and a few species are present in the Palaearctic; there is also a single endemic species in the New World.

For the sake of convenience Australia is treated separately from the other regions as its fauna consists to a large extent of endemic forms, with only a few species being shared with other regions. The Oriental and Indo-Australian are treated as a single region which also includes the whole of New Guinea and all the Pacific Island systems.

In all, the regions now under consideration have a total of 89 recognized species, 17 of which are found only in Australia. Most of the species have a fairly restricted distribution but some notable exceptions are present such as *bicarinatum*, *pacificum* and *simillimum* which occur throughout these regions, and others such as *kraepelini* and *smithi* have wide distributions within the regions.

Previous studies of the genus in these regions include Forel (1902b) and Bingham (1903) on the Indian-Sri Lankan fauna, and Mann (1919; 1921) on the Solomon Is and Fiji Is faunas respectively. Apart from these the fauna of the rest of the Oriental region, the Indo-Australian region and Australia have never been monographed previously.

Measurements and indices

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

Head Length (HL). The length of the head proper, excluding the mandibles; measured in a straight line from the anterior clypeal margin to the mid-point of the occipital margin, in full-face view. (In species with a strongly concave occipital margin the head length is measured to the mid-point of a line connecting the posterolateral projections.)

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

Cephalic Index (CI). $\frac{HW \times 100}{HL}$.

Scape Length (SL). The straight-line length of the antennal scape excluding the basal constriction or neck.

Scape Index (SI). $\frac{SL \times 100}{HW}$.

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

Alitrunk Length (AL). The diagonal length of the alitrunk in lateral view from the point at which the pronotum meets the cervical shield to the base of the metapleural lobes or teeth.

All measurements are expressed in millimetres.

Abbreviations of museums

ANIC, Canberra
BMNH

Australian National Insect Collection, Canberra City, Australia
British Museum (Natural History), London, U.K.

CAS, San Francisco	California Academy of Sciences, San Francisco, California, U.S.A.
IE, Bologna	Istituto di Entomologia dell'Università, Bologna, Italy
MCSN, Genoa	Museo Civico di Storia Naturale 'Giacomo Doria', Genoa, Italy
MCZ, Cambridge	Museum of Comparative Zoology, Cambridge, Mass., U.S.A.
MHN, Geneva	Muséum d'Histoire Naturelle, Geneva, Switzerland
MNHN, Paris	Muséum National d'Histoire Naturelle, Paris, France
MNHU, Berlin	Museum für Naturkunde an der Humboldt-Universität, Berlin, Germany (D.D.R.)
NM, Basle	Naturhistorisches Museum, Basle, Switzerland
NM, Vienna	Naturhistorisches Museum, Vienna, Austria
NR, Stockholm	Naturhistoriska Riksmuseet, Stockholm, Sweden
TM, Budapest	Természettudományi Múzeum, Budapest, Hungary
UM, Oxford	University Museum, Oxford, U.K.
USNM, Washington	United States National Museum, Washington, D.C., U.S.A.
UZM, Copenhagen	Universitetets Zoologiske Museum, Copenhagen, Denmark
ZSBS, Munich	Zoologische Sammlung des Bayerischen Staates, Munich, Germany
ZMU, Helsinki	Zoological Museum of the University, Helsinki, Finland

Diagnosis of *Tetramorium*

TETRAMORIUM Mayr

Tetramorium Mayr, 1855 : 423. Type-species: *Formica caespitum* L., 1758 : 581, by subsequent designation of Girard, 1879 : 1016.

Xiphomyrmex Forel, 1887 : 385 [as subgenus of *Tetramorium*]. Type-species: *Tetramorium* (*Xiphomyrmex*) *kelleri* Forel, loc. cit.; by subsequent designation of Wheeler, 1911 : 175. [Synonymy by Bolton, 1976 : 359.]

Xiphomyrmex Forel; Emery, 1896 : 183; 1914a : 42. [Raised to genus.]

For a full statement of the generic synonymy of *Tetramorium* see Bolton (1976 : 359).

DIAGNOSIS OF WORKER AND FEMALE. Myrmicine ants of the tribe Tetramoriini which have the following combination of characters. Mandibles with 2-3 enlarged apical teeth followed by a row of 4 (rarely more) denticles, so that at least 6 (usually 7) teeth are present altogether. Sting with an apical or apico-dorsal translucent lamelliform appendage which may be spatulate, triangular, dentiform or pennant-shaped. Lateral portions of clypeus raised into a sharp ridge or shielding wall in front of the antennal insertions. Palp formula 4, 3 at maximum. (Usually with this count, very rare reductions to 4, 2; 3, 3 and 3, 2 are known.) Antennae with 11 or 12 segments, with an apical club of 3 segments. Body hairs never regularly branched bifid, trid or quadrifid, usually simple but very rarely absent or bizarre. Head not roughly heart-shaped in full-face view.

DIAGNOSIS OF MALE. Myrmicine ants of the tribe Tetramoriini which have the following combination of characters. Mandibles dentate. Antennae with 10 or 11 segments, the second funicular an elongate fusion-segment; funiculus filiform. Palp formula 4, 3 at maximum, as worker/female. Body hairs as worker/female, never regularly branched.

A fuller definition of the genus has been given previously (Bolton, 1976), along with a discussion of the genus-level synonymy of *Tetramorium*. An abridged version of this synonymy is given above as in the regions at present under discussion only one other previously recognized generic name was applied, *Xiphomyrmex*. It has been shown that this name, based only on the reduced antennomere count of 11 in worker and female castes (as opposed to 12) has no significance as the 11-merous condition appears to have arisen several times from 12-merous ancestors in a number of widely divergent groups whilst other characters of generic significance have remained fixed. In consequence *Xiphomyrmex* was sunk as a junior synonym of *Tetramorium*.

The Oriental/Indo-Australian regions and Australia have two other tetramoriine genera represented besides *Tetramorium* itself. These are *Triglyphothrix* Forel and *Rhoptromyrmex* Mayr. The first of these has many endemic species in the Oriental/Indo-Australian but none in Australia. However, the widespread tramp species *Tr. lanuginosa* (Mayr) is present in all the regions. *Triglyphothrix* is differentiated from *Tetramorium* in all castes by the presence of regularly

branched hairs which are bifid, trifid or quadrifid and are usually conspicuous, although in a few species they are sparse or mixed with simple hairs.

Rhoptromyrmex has two species which occur in these regions. The workers may be distinguished from *Tetramorium* by their heart-shaped heads, broadly arcuate and prominent clypeal margins, 3, 2 palp formulae and complete absence of antennal scrobes. In the few *Tetramorium* species completely without scrobes the other characters noted do not apply. In the males the antennae are basically 9-segmented in *Rhoptromyrmex* and the three apical antennomeres form a club; the males also share the reduced palp formula count shown in the workers. Females (queens) of *Rhoptromyrmex* retain the basic tetramoriine traits but are strongly aberrant in other respects and are suspected of being temporary social parasites, although this has not yet been proved.

Species excluded from *Tetramorium*

Species originally described in *Tetramorium* (or its junior synonym *Xiphomyrmex* Forel) and removed prior to this study.

Tetramorium melleum Emery, 1897a : 586. Transferred to genus *Rhoptromyrmex* Mayr by Emery (1922 : 290) (see also Bolton, 1976).

Tetramorium scrobiferum Emery, 1897a : 587. Transferred to genus *Romblonella* Wheeler by M. R. Smith (1956 : 18) along with its described varieties (see also M. R. Smith, 1953).

Tetramorium opacum (F. Smith), 1861 : 47 [originally described in genus *Myrmica* Latreille]. Transferred to genus *Romblonella* Wheeler by Bolton (1976 : 294).

Tetramorium nitidum F. Smith, 1876 : 480. Transferred to genus *Chelaner* Emery by Ettershank (1966 : 96). [Synonym of *C. antarcticus* (White).]

Tetramorium striatum F. Smith, 1876 : 481. Transferred to genus *Huberia* Forel by Forel (1890 : CV).

Tetramorium coonoorensis Forel, 1902a : 237. Transferred to genus *Triglyphothrix* Forel by Bolton (1976 : 346).

Tetramorium indosinense Wheeler, 1927a : 97. Transferred to genus *Triglyphothrix* Forel by Bolton (1976 : 348).

Xiphomyrmex flavigaster Clark, 1938 : 366. Transferred to genus *Chelaner* Emery by Bolton (1976 : 294).

Species newly excluded from *Tetramorium*.

Tetramorium confucii Forel, 1912 : 53. Syntype worker, TAIWAN (=Formosa): Pilam (*H. Sauter*) (MHN, Geneva) [examined]. This species is a quite ordinary member of the genus *Leptothorax* Mayr; its correct name is therefore *Leptothorax confucii* (Forel) **comb. n.**

Tetramorium guineense (F.), 1793 : 357 [originally described in genus *Formica* L.] Combination based on a misidentification as the types of *Formica guineensis* F. belong in genus *Pheidole* Westwood. Correct combination of the types is thus *Pheidole guineensis* (F.) **comb. n.**, and the first available name for the *Tetramorium* species involved in the misidentification is *T. bicarinatum* (Nylander) **stat. rev.** For discussion see p. 94.

Species of the Oriental and Indo-Australian regions

The 72 *Tetramorium* species of the Oriental and Indo-Australian regions are roughly divisible into 14 species-groups, of which 9 are restricted to these regions, the remainder having at least a few species occurring elsewhere.

Of the 14 groups some are relatively easily defined and compact, but a few are purely groups of convenience at present. The *bicarinatum*-, *mixtum*- and *tortuosum*-groups for instance have fairly good consistent characters which delimit them, but such as the *ornatum*-group are rather more vaguely defined as this is basically a group which has radiated widely in a comparatively restricted area (almost exclusively in New Guinea), and which has spread into niches occupied elsewhere by members of differing groups. Other groups which are mostly for convenience include the *scabrosom*- and *tonganum*-groups. In both of these the majority of species are small or minute and are not well enough known to allow their broader relationships to be deduced, though at least each group is based upon a core of certainly related species. The *ciliatum*-group is based

upon a core of related species surrounded by a number of peripheral and apparently not closely related forms which are linked mainly by their large size and coarse sculpture. Rather than create a lot of groups each containing one or two species I have placed all these forms together for the time being, until their derivations are better understood.

Three species occur in these regions which belong to groups based outside the regions, namely *nursei* of the *caespitum*-group (mostly Palaearctic), and *smithi* and *simillimum* of the *angulinode*- and *simillimum*-groups respectively, which are mostly of the Ethiopian region.

In the present study only species based in or restricted to the Oriental and Indo-Australian regions are dealt with. A few species in the northern Oriental region extend their range into the southern Palaearctic and these species are covered here. However, some species of the *caespitum*-group based on the Palaearctic may extend their ranges southward into the northern Oriental region. These are excluded from this survey and will be considered in a later part of the study.

Synonymic list of species

tortuosum-group

- belgaense* Forel
- eleates* Forel stat. n.
- flavipes* Emery
- noratum* sp. n.
- pilosum* Emery
- rinatum* sp. n.
- shensiense* sp. n.
- tortuosum* Roger
 - tortuosum* var. *bellii* Forel syn. n.
 - tortuosum* var. *ethica* Forel syn. n.

urbanii sp. n.

vertigum sp. n.

yerburyi Forel

carinatum-group

- aspersum* (F. Smith) comb. n.
 - bismarckii* Forel syn. n.
 - costatus* subsp. *willowsi* Wheeler syn. n.
- carinatum* (F. Smith) comb. n.
 - costatus* Emery syn. n.
 - costatus* subsp. *flavescens* Emery syn. n.
 - costatus* subsp. *deficiens* Emery syn. n.
 - aruensis* Karavaiev syn. n.

diligens (F. Smith) comb. n.

gambogecum (Donisthorpe) comb. n.

- gambogecum* var. *flavus* Donisthorpe syn. n.

tenuicrinis-group

tenuicrinis (Emery) comb. n.

angulinode-group (mostly African species)

smithi Mayr

- smithi* var. *kanariense* Forel syn. n.

- simillimum* subsp. *laevinode* Forel syn. n.

fergusoni-group

fergusoni Forel

caespitum-group (mostly Palaearctic species)

nursei Bingham

bicarinarum-group

bicarinarum (Nylander) stat. rev.

- cariniceps* (Guérin-Méneville)

- kollari* (Mayr)

- modesta* (F. Smith)

- reticulata* (F. Smith)

bicolor Viehmeyer

cynicum sp. n.

indicum Forel stat. n.

insolens (F. Smith)

- guineense* var. *macrum* Emery syn. n.

- melanogyna* Mann syn. n.

- pacificum* var. *wilsoni* Mann syn. n.

- melanogyna* var. *pallidiventre* Wheeler syn. n.

nipponense Wheeler stat. n.

obtusidens Viehmeyer

pacificum Mayr

- scabrum* Mayr syn. n.

- pacificum* var. *subscabrum* Emery syn. n.

tricarinarum Viehmeyer stat. n.

- tricolor* Donisthorpe syn. n.

validiusculum Emery

- longicarinum* Donisthorpe syn. n.

ornatum-group

basum sp. n.

centum sp. n.

etiolum sp. n.

navum sp. n.

ornatum Emery

- ornatum* var. *obscurius* Forel syn. n.

politum Emery

rigidum sp. n.

salomo Mann

sculptatum sp. n.

wagneri Viehmeyer

inglebyi-group

elisabethae Forel

inglebyi Forel

myops sp. n.

mixtum-group

amium Forel stat. n.

mixtum Forel

rugigaster sp. n.

transversarium Roger

scabrosum-group

aptum sp. n.

curtulum Emery

kraepelini Forel

- eidmanni* Menozzi (nomen nudum)

- yanoi* Santschi syn. n.

parvum sp. n.

<i>pulchellum</i> Emery	<i>ciliatum</i> sp. n.
<i>punctiventre</i> Emery	<i>curvispinosum</i> Mayr
<i>scabrosus</i> (F. Smith)	<i>flagellatum</i> sp. n.
<i>papuanum</i> Emery syn. n.	<i>khnum</i> sp. n.
<i>tanakai</i> sp. n.	<i>tylinum</i> sp. n.
<i>tonganum</i> -group	<i>zypidum</i> sp. n.
<i>christiei</i> Forel	<i>simillimum</i> -group (mostly African species)
<i>cuneinode</i> sp. n.	<i>simillimum</i> (F. Smith)
<i>difficile</i> sp. n.	<i>caldarius</i> (Roger)
<i>infraspinum</i> Forel	<i>parallelum</i> (F. Smith) syn. n.
<i>laparum</i> sp. n.	<i>simillimum</i> subsp. <i>denticulatum</i> Forel
<i>salvatum</i> Forel	syn. n.
<i>seneb</i> sp. n.	<i>simillimum</i> var. <i>opacior</i> Forel syn. n.
<i>tonganum</i> Mayr	<i>simillimum</i> var. <i>insulare</i> Santschi syn. n.
<i>magitae</i> Forel syn. n.	<i>antipodum</i> Wheeler (provisional synonym)
<i>vandalum</i> sp. n.	<i>europunctata</i> subsp. <i>brevispinosa</i> Borgmeier
<i>ciliatum</i> -group	Nomen dubium
<i>chapmani</i> sp. n.	<i>infraspinosum</i> Karavaiev

Key to species of the Oriental and Indo-Australian regions (workers)

Note. *T. belgaense* is known only from the female and is omitted from the key.

1	Antennae with 11 segments	2
–	Antennae with 12 segments	17
2	Antennal scapes relatively very long, SI in range 109–148, visibly much longer than the head is broad. Petiole in profile a high, narrow node, the tergal portion much higher than long (Figs 3–5), node completely smooth, unsculptured	3
–	Antennal scapes relatively shorter, SI in range 69–105 but usually <100. If SI in range 100–105 then petiole is not shaped as above and is sculptured, at least on the sides	6
3	Metapleural lobes invisible or nearly invisible when alitrunk is viewed in profile; the lobes are low, rounded flanges, not projecting nor dentiform, not acute apically (Figs 4, 5)	4
–	Metapleural lobes distinctly visible when alitrunk is viewed in profile; the lobes acute and prominent, dentiform or triangular (Fig. 3)	5
4	Dorsum of head behind level of eyes unsculptured (Fig. 2). Antennal scapes with SI < 135 (known range 128–129). Bicoloured species with head and gaster blackish brown, the alitrunk and all appendages bright yellow. (New Guinea) <i>diligens</i> (p. 87)	
–	Dorsum of head behind level of eyes strongly reticulate-rugose. Antennal scapes with SI > 135 (known range 141–148). Colour uniform yellow-brown to mid-brown, not bicoloured as above. (New Guinea) <i>gambogecum</i> (p. 88)	
5	Dorsum of head between frontal carinae with a few sharp, widely spaced longitudinal carinae, the spaces between which are unsculptured; cross-meshes between carinae only present behind level of eyes. Antennal scrobes unsculptured to level of posterior margins of eyes (Fig. 1). (Sulawesi, New Guinea, Aru Is) <i>carinatum</i> (p. 86)	
–	Entire dorsum of head between frontal carinae densely and coarsely rugose or reticulate-rugose, often with the spaces between rugae punctate or reticulate; cross-meshes numerous before level of posterior margins of eyes. Antennal scrobes sculptured or with a series of transverse rugulae before the level of the posterior margins of the eyes. (Philippines, Morotai I., Bismarck Archipelago, Solomon Is) <i>aspersum</i> (p. 86)	
6	Propodeum unarmed, rounded or at most bluntly angulate but never with a differentiated pair of spines or teeth (Fig. 13). (New Caledonia, Fiji Is) <i>tenuicrinis</i> (p. 88)	
–	Propodeum armed with a conspicuous pair of spines or teeth	7
7	Mandibles smooth with scattered pits, not striate. Small species, SL 0.42–0.46. (Sri Lanka, India, Bhutan, Burma, Thailand, Vietnam, Malaya, Borneo, Sulawesi) <i>smithi</i> (p. 90)	
–	Mandibles longitudinally striate; usually this sculpture coarse and distinct but if faint then species much larger, SL > 0.65	8
8	Antennal scapes relatively short, SI in range 75–86	9
–	Antennal scapes relatively long, SI in range 90–105	12
9	Entirety of head and alitrunk a bright orange or bright yellowish brown, the gaster the same colour as the head and alitrunk or lighter	10

- Entirety of head and alitrunk very dark reddish brown or blackish brown, the gaster darker than the head and alitrunk 11
- 10 Metapleural lobes low and rounded; petiole in dorsal view with the node much narrower in front than behind (Fig. 6). Larger species, HW > 0.90. (Sri Lanka) *pilosum* (p. 82)
- Metapleural lobes broadly triangular; petiole in dorsal view with the node about as broad in front as behind (Fig. 10). Smaller species, HW < 0.90. (China) *shensiense* (p. 83)
- 11 Dorsum of petiole with some reticulate-rugulose sculpture. Alitrunk reddish brown, the legs lighter, yellow-brown. (Malaya, Java, Sumatra, Sumba) *eleates* (p. 79)
- Dorsum of petiole with an unsculptured smooth median longitudinal strip. Alitrunk blackish brown, the legs clear pale yellow. (Thailand) *flavipes* (p. 81)
- 12 Propodeum armed with a pair of short triangular teeth which are only slightly longer than their basal width and only marginally longer than the metapleural lobes (Fig. 12). (Bhutan) *urbanii* (p. 84)
- Propodeum armed with a pair of long spines which are much longer than their basal width and considerably longer than the metapleural lobes (Figs 7-9, 11) 13
- 13 Dorsum of postpetiole with rugulose sculpture. (Sri Lanka) *yerburyi* (p. 85)
- Dorsum of petiole unsculptured, smooth and shining 14
- 14 Petiole node in profile with the dorsum strongly arched-convex and usually completely unsculptured both on sides and dorsum; sides of petiole convergent dorsally so that the true dorsal surface is a narrow longitudinal strip; propodeal spines extremely long (Fig. 9). (Malaya, Borneo, Sulawesi) *noratum* (p. 81)
- Petiole node in profile with the dorsum not arched-convex, at least sides of petiole but often also the dorsum with sculpture; sides of petiole not or only slightly convergent dorsally and if the latter then sculpture on sides of node very pronounced; propodeal spines shorter (Figs 8, 11) 15
- 15 Entire body uniform yellow or light yellow-brown. Smaller species, HW in range 0.64-0.70. (Philippines) *rinatum* (p. 82)
- Entire body uniform dark brown or blackish brown. Larger species, HW in range 0.78-0.86 16
- 16 Dorsal surfaces of head and alitrunk with a very coarse, dense rugoreticulum, the edges of which are raised giving a reticulate-foveolate appearance in places. Posterior face of petiole convex in profile and overhanging the petiole-postpetiole junction (Fig. 8). Antennal scapes slightly longer, SI 97 at minimum. (Sulawesi) *vertigum* (p. 84)
- Dorsal surfaces of head and alitrunk with spaced-out low, rounded rugulae which in places form a weak reticulum and which have smooth interspaces, particularly on the promesonotum. Posterior face of petiole not convex in profile. Antennal scapes slightly shorter, SI 97 at maximum. (Sri Lanka, India) *tortuosum* (p. 83)
- 17 Lamelliform appendage of sting dentiform, triangular or pennant-shaped and projecting at an angle from the shaft 18
- Lamelliform appendage of sting linear and spatulate, continuing the line of the shaft. (India) *fergusoni* (p. 91)
- 18 Frontal carinae short, terminating at or in front of the level of the eyes (Figs 33, 36); dorsum of head never regularly and densely coarsely longitudinally rugose or sulcate 19
- Frontal carinae long, projecting back beyond the level of the eyes (Figs 19, 44-46). If the carinae fade out just behind the level of the eyes (as opposed to approaching the occipital margin) then the dorsum of the head is regularly, very densely longitudinally rugose or evenly sulcate 23
- 19 Dorsum of head behind level of eyes unsculptured or at most with only very faint superficial sculpture, most of the dorsal head smooth and shining 20
- Dorsum of head behind level of the eyes sculptured 21
- 20 Antennal scapes relatively long, SI > 95; in full-face view the scapes distinctly and easily surpassing the occipital corners when laid back. Occipital margin evenly convex in full-face view. (New Guinea) *politum* (p. 107)
- Antennal scapes relatively short, SI < 90; in full-face view the scapes failing to reach the occipital corners by a considerable distance when laid back. Occipital margin feebly concave in full-face view. (India) *nursei* (p. 93)
- 21 Eyes minute, with only a single facet. Peduncle of petiole with a large, convex anteroventral lamella (Figs 36, 37). (India) *myops* (p. 111)
- Eyes larger, with five or more facets. Peduncle of petiole without a large convex anteroventral lamella 22

- 22 Petiole node in dorsal view about as long as broad. Median portion of clypeus abruptly down-curved so that its anterior one-third is vertical and separated by a marked angle from the more posterior portion. (India) *inglebyi* (p. 111)
- Petiole node in dorsal view much broader than long. Median portion of clypeus evenly convex in its anterior half. (India) *elisabethae* (p. 111)
- 23 Basal half or more of first gastral tergite sculptured, usually strongly so, with rugosity, dense striation, dense puncturation or a combination of these 24
- Basal half of first gastral tergite unsculptured or at most with sparse, short, regular basigastral costulae or a few pits from which hairs arise 27
- 24 Antennal scapes and hind tibiae with long projecting erect or suberect hairs 25
- Antennal scapes and hind tibiae without long projecting erect or suberect hairs 26
- 25 Petiole node enormously developed, massive, in dorsal view almost as broad as the pronotum (Fig. 40). First gastral tergite feebly rugulose; HW *c.* 0.64. (Sri Lanka) *transversarium* (p. 115)
- Petiole node broader than long but nowhere near as broad as the pronotum in dorsal view. First gastral tergite strongly rugulose; HW 0.70 or more. (India) *rugigaster* (p. 114)
- 26 Bright orange-brown to reddish brown. Node of petiole in dorsal view globular, about as broad as long. Dorsal surfaces of head and alitrunk covered with a dense rugoreticulum, the edges of which are sharply raised; without coarse, close-packed puncturation. (Philippines) *chapmani* (p. 120)
- Black. Node of petiole in dorsal view transversely ovate, broader than long. Dorsal surfaces of head and alitrunk rugulose, with numerous coarse, close-packed punctures. (New Guinea) *punctiventre* (p. 118)
- 27 Propodeum unarmed, the dorsum and declivity separated only by an obtuse angle (Fig. 55). (Java) *infraspinum* (p. 127)
- Propodeum armed with a pair of spines or teeth of variable size and shape 28
- 28 With the gaster in dorsal view the lateral corners of the base extended forward as a pair of horns which surround the posterior portion of the postpetiole (Fig. 38) 29
- With the gaster in dorsal view the lateral corners of the base rounded or sometimes bluntly angular, but never extended forward as a pair of horns which surround the posterior portion of the petiole 30
- 29 Eyes in front of middle of sides of head; scrobes not delimited by a margin posteriorly or laterally; node of petiole usually slightly longer than broad in dorsal view. (India) *mixtum* (p. 113)
- Eyes almost central on sides of head; scrobes delimited by a margin posteriorly and laterally, node of petiole not longer than broad in dorsal view. (Taiwan) *amium* (p. 113)
- 30 Anterior clypeal margin with the median portion convex and notched or sharply indented medially 31
- Anterior clypeal margin with the median portion entire, varying from convex to broadly and shallowly concave, but never notched or sharply indented medially 42
- 31 Mandibles sculptured with fine, dense striation or shagreening, occasionally the striation faint 32
- Mandibles completely smooth and shining except for scattered hair-pits 36
- 32 Median portion of clypeus with at least five major longitudinal carinae or rugae of about equal strength. Dorsum of head between frontal carinae at level of eyes with about 10 sharp longitudinal carinae of equal strength. Dorsum of postpetiole smooth or at most with faint superficial punctures or shagreening. (New Guinea) *wagneri* (p. 110)
- Median portion of clypeus with three major longitudinal carinae or rugae of about equal strength, sometimes with another much weaker pair also present which are often incomplete. Dorsum of head between frontal carinae at level of eyes without 10 sharp carinae of equal strength. Dorsum of postpetiole rugose or reticulate-rugose 33
- 33 Colour uniform dark brown to blackish brown. Petiole in profile shaped as in Fig. 15, with a narrow anterior peduncle, a short anterior face which curves into the long convex dorsum and a posterior face which is much higher than the anterior. In dorsal view the node is usually slightly longer than broad. (Throughout Oriental and Indo-Australian regions; widespread in Pacific islands; north Australia; sporadically introduced in N. America) *pacificum* (part) (p. 102)
- Colour yellow-brown to orange-brown, sometimes with the gaster darker brown. Rarely entirely coloured dark brown approaching that of *pacificum*, but in this case the petiole of different shape (Figs 16–18) 34
- 34 Longest hairs projecting dorsally from frontal carinae behind the level of the antennal insertions shorter than the maximum diameter of the eye (Fig. 21). Gaster always much

- darker in colour than alitrunk and head, contrasting strongly with them. Petiole node in profile roughly square, the dorsum not sloping upwards posteriorly, the anterodorsal and posterodorsal angles approximately on a level (Fig. 16). (Throughout Oriental and Indo-Australian regions; widespread in Australia and Pacific islands; introduced in S. America, southern N. America, Madagascar, islands of Indian Ocean; common tramp in hothouses etc. in temperate zone) *bicarinatum* (p. 94)
- Longest hairs projecting dorsally from frontal carinae behind the level of the antennal insertions longer than the maximum diameter of the eye (as Fig. 22). Gaster usually same colour as alitrunk and head, only rarely noticeably darker. Petiole node in profile with the dorsum sloping upwards posteriorly so that the posterodorsal angle is on a slightly higher level than the anterodorsal (Fig. 18) 35
- 35 Propodeal spines long, either upcurved along their entire length or abruptly upcurved apically, or both (Fig. 18). Dorsum of head with reticular cross-meshes which are as strong as the longitudinal component of the sculpture occurring from the level of the anterior margins of the eyes to the occiput or sometimes from the posterior clypeal border to the occiput. Eyes generally slightly larger, their maximum diameter 0.25–0.28 × HW. (Bhutan, southern strip of China, Vietnam, Japan, Okinawa, Taiwan) *nipponense* (p. 100)
- Propodeal spines usually short, elevated but more or less straight, not upcurved along their entire length, never abruptly upcurved apically. Dorsum of head with only longitudinal rugular sculpture to the level of the posterior margins of the eyes, behind which is a rugoreticulum. Eyes generally slightly smaller, their maximum diameter 0.23–0.25 × HW. (Sri Lanka, India, Bhutan, Andaman Is, Burma, Java, Sumatra) *indicum* (p. 98)
- 36 Strongly bicoloured species with head and gaster blackish brown or black, the alitrunk and appendages yellow 37
- Uniformly coloured species, brown, black or yellow-brown; sometimes with gaster a different shade to remainder of body but never bicoloured as above 38
- 37 Dorsum of head with three strong, parallel longitudinal carinae running its length between the frontal carinae and with a few fainter short rugulae between these three principal carinae. Occipital margin with weak reticulate-rugulation or with anastomosis of the sculpture. (New Guinea, New Ireland) *tricarinatum* (p. 103)
- Dorsum of head with only the median carina developed and often this is broken or incomplete posteriorly. Remainder of dorsum of head with a few faint, weak rugulae but never with three strong carinae running the length of the head. Occipital margin without reticulation or anastomosis of the sculpture. (New Guinea) *bicolor* (p. 97)
- 38 Smaller species, HW < 0.65, SL < 0.55. (Thailand, Singapore, New Guinea) *obtusidens* (p. 101)
- Larger species, HW > 0.65, SL > 0.55 39
- 39 Dorsum of head sculptured with sparse but strong, regular longitudinal carinae or rugae, without any cross-meshes except sometimes for a few anastomoses very close to the occiput, but often absent even here (Fig. 19). Ground sculpture between carinae on head very inconspicuous or absent, the surfaces smooth 40
- Dorsum of head with rather irregular longitudinal rugae, with cross-meshes present varying from sparse to numerous; sometimes the whole head reticulate-rugose, but always with a conspicuous strong rugoreticulum posteriorly. Ground sculpture between rugae on head superficial but fairly conspicuous 41
- 40 Yellow-brown species with clypeal notch very strongly developed and anterior half of median portion of clypeus markedly transversely concave. Antennal scapes somewhat longer, SI in range 86–95. (Philippines) *cynicum* (p. 97)
- Blackish brown to black species with clypeal notch feeble and anterior half of median portion of clypeus not or only very feebly transversely concave. Antennal scapes somewhat shorter, SI in range 76–87. (New Guinea, north Queensland). *validiusculum* (p. 103)
- 41 Clear yellow to light orange-brown species, usually with the gaster lighter in colour than the head and alitrunk, more rarely the same colour or slightly darker in shade. First gastral tergite without basal costulae. (Sri Lanka, Flores, Sulawesi, Philippines, Solomon Is, New Guinea, widespread in Pacific islands; introduced in hothouses in Britain and Germany) *insolens* (p. 99)
- Uniform dark brown or blackish brown. First gastral tergite usually with basal costulae present, often faint but hardly ever completely absent. (Throughout Oriental and Indo-Australian regions; widespread in Pacific islands; north Australia; sporadically introduced in N. America) *pacificum* (part) (p. 102)

- 42 Spaces between rugulose sculpture on entire dorsum of head (and often also dorsal alitrunk) completely filled by a dense and very conspicuous reticulate-puncturation so that the surface appears dull, matt and very granular, the punctate sculpture often as conspicuous as the rugulae 43
- Spaces between rugulose sculpture on dorsum of head either smooth or with superficial faint or vestigial sculpture so that the surface appears mostly or entirely shiny and largely or partially smooth, the punctate sculpture never as conspicuous as the rugulae 46
- 43 Propodeum armed with a pair of short and usually stout teeth which are generally shorter than the metapleural lobes, only rarely slightly longer (Fig. 60). Dorsal alitrunk with sparse, short, thick, apically blunt hairs. (Pantropical tramp species of African origin; also introduced in hothouses in temperate zone). *simillimum* (p. 131)
- Propodeum armed with a pair of elongate, narrow spines which are distinctly much longer than the metapleural lobes (Figs 28, 30). Dorsal alitrunk with numerous elongate fine hairs which are generally acute apically 44
- 44 In profile the propodeal spines elevated and downcurved along their length (Figs 28, 30). Node of petiole in dorsal view as long as or longer than broad. Head and alitrunk dark reddish brown or blackish brown 45
- In profile the propodeal spines elevated and feebly upcurved along their length. Node of petiole in dorsal view broader than long. Head and alitrunk pale yellow-brown. (Philippines) *laparum* (p. 127)
- 45 Rugose sculpture of dorsum of head entirely longitudinal, without trace of cross-meshes. Basal one-third of first gastral tergite bright yellow, the remainder black or blackish brown. Propodeal spines very long, strongly downcurved (Fig. 30). (New Guinea) *basum* (p. 104)
- Rugose sculpture on dorsum of head mainly longitudinal but with numerous strong cross-meshes behind the level of the eyes. Gaster uniform blackish brown. Propodeal spines shorter than above and more feebly downcurved (Fig. 28). (New Guinea) *rigidum* (p. 108)
- 46 Antennal scapes relatively long, SI 95-100. (New Guinea) *etiolum* (p. 105)
- Antennal scapes relatively shorter, SI < 93 47
- 47 Dorsum of head completely covered with very close-packed, regular coarse longitudinal rugae or sulci which run the length of the head, without any reticulation or cross-meshes 48
- Dorsum of head either reticulate-rugose or with disorganized, irregular, meandering or wavy spaced-out rugulation, or with numerous cross-meshes or with the rugulae short and broken 49
- 48 Antennal scrobes absent. With the head in full-face view the longitudinal sculpture strongly deflected posteriorly, often running down the sides of the head between the eye and the occipital corner. (New Guinea) *sculptatum* (p. 109)
- Antennal scrobes present but feeble. With the head in full-face view the longitudinal sculpture fanning out posteriorly and directed towards the occipital corners but not strongly deflected nor running down the sides of the head between the eye and occipital corner. (New Guinea, Bismarck Archipelago, Queensland) *ornatum* (p. 107)
- 49 Petiole in profile wedge-shaped, with the posterior and dorsal surfaces forming a single steep, shallow convexity (Fig. 56). (Thailand) *cuneinode* (p. 126)
- Petiole in profile nodiform, with the posterior and dorsal surfaces not forming a steep convexity, the two faces usually separated by an angle 50
- 50 Dorsal (outer) surface of hind tibiae with decumbent or appressed pubescence only or with very short hairs which are curved through 90° at the base so that the apical portions of the hair are nearly flush with the surface; erect or suberect hairs or erect pubescence completely absent from the outer tibial surface 51
- Dorsal (outer) surface of hind tibiae with conspicuous erect or suberect hairs or with erect pubescence, sometimes with both 56
- 51 Dorsum of postpetiole completely covered by a fine, dense, conspicuous rugoreticulum. (Solomon Is) *salomo* (p. 109)
- Dorsum of postpetiole completely smooth or at most with vestigial traces of punctulation 52
- 52 Propodeal spines in profile over twice as long as the metapleural lobes and somewhat downcurved or sinuate along their length (Fig. 27). Primary sculpture of dorsal head consisting of 7-8 very strong, distinct, sharp carinae which run the length of the dorsum. Colour uniform blackish brown. (New Guinea) *navum* (p. 106)
- Propodeal spines varying from shorter than the metapleural lobes to slightly longer, but never twice as long, never downcurved or sinuate along their length (Figs 54, 58, 59). If

- spines somewhat longer than metapleural lobes then primary sculpture of head is not of 7-8 strong carinae or the head and alitrunk are yellow to light yellowish brown, or both 53
- 53 Antennal scapes relatively longer, SI 87-91. Colour uniform black. (India) *christiei* (p. 124)
- Antennal scapes relatively shorter, SI 76-86, but if SI approaches 86 the entire body is yellow or yellowish brown 54
- 54 Peduncle of petiole in profile short, stout and straight, not downcurved along its length from node to insertion nor passing through an angle at about its midlength (Fig. 54). Metapleural lobes bluntly rounded. (India) *salvatum* (p. 128)
- Peduncle of petiole long, narrow and curved; either downcurved along its length from node to insertion or passing through a rounded angle at about its midlength so that the anterior portion slopes more strongly than the posterior portion (Fig. 59). Metapleural lobes triangular 55
- 55 Larger species, HW > 0.55, SL > 0.45, AL > 0.70, with slightly longer antennal scapes, SI 80-87. (Malaya, Java, Sumba, Philippines, Solomon Is, Sri Lanka, Japan, very widespread in Pacific islands; sporadically introduced in temperate zone hothouses etc.) *tonganum* (p. 129)
- Smaller species, HW < 0.55, SL < 0.45, AL < 0.70, with slightly shorter antennal scapes, SI 75-77. (Nepal, Bhutan) *difficile* (p. 126)
- 56 Propodeal spines in dorsal view thick, long and strongly bowed along their length so that the apical halves tend to converge (Fig. 50). (Sri Lanka). *curvispinosum* (p. 121)
- Propodeal spines in dorsal view not bowed along their length, usually distinctly divergent, sometimes short or very short 57
- 57 Node of petiole in dorsal view distinctly longer than broad, usually with an unsculptured median longitudinal strip; postpetiole unsculptured 58
- Node of petiole in dorsal view usually as broad as long or broader than long. If only fractionally longer than broad then either petiole dorsum is completely sculptured or postpetiole is sculptured, or both 59
- 58 Antennal scapes relatively longer, SI 81-86. Occipital margin of head broadly but very feebly concave in full-face view. (New Guinea) *centum* (p. 105)
- Antennal scapes relatively shorter, SI 69-75. Occipital margin of head strongly impressed medially in full-face view. (Philippines) *zygidum* (p. 123)
- 59 Larger species, HW 0.80 or more 60
- Smaller species, HW 0.75 or less 62
- 60 Erect hairs projecting from dorsal (outer) surface of hind tibiae varying in length but the longest of them at least as long as the maximum width of the tibia, usually longer. Postpetiole with coarse sculpture dorsally 61
- Erect hairs projecting from dorsal (outer) surface of hind tibiae uniformly short, the longest of them much shorter than the maximum width of the tibia. Postpetiole predominantly or entirely smooth and shining dorsally. (Borneo) *tylinum* (p. 123)
- 61 Hairs on dorsum of head and alitrunk exceptionally long, the longest being 0.45-0.50, well over half the length of the scape (Fig. 48). Leading edge of scapes without erect hairs that are longer than the maximum scape width. Postpetiole in profile relatively narrowly rounded (Fig. 48). (Borneo) *flagellatum* (p. 122)
- Hairs on dorsum of head and alitrunk long but not as above, the longest being c. 0.30, less than half the length of the scape (Fig. 49). Leading edge of scapes with a spaced row of long hairs that are longer than the maximum scape width. Postpetiole in profile relatively broadly rounded (Fig. 49). (Thailand, Vietnam) *ciliatum* (p. 121)
- 62 Anterior (leading) edge and dorsal surface of antennal scapes with pubescence only or with abundant short hairs of approximately uniform length, without a spaced row of distinctly longer, usually stouter erect hairs. Hairs on dorsal (outer) surface of hind tibiae uniformly short, fine and dense 63
- Anterior (leading) edge or dorsal surface of antennal scapes with a spaced row of long, erect hairs, all of which are conspicuously longer and usually stouter than any underlying pubescence which may be present. Dorsal (outer) surface of hind tibiae usually with at least a few elongate, quite stout hairs 64
- 63 Antennal scapes both relatively and absolutely longer, SL > 0.50, SI > 83. Propodeal spines narrow and short, at most only slightly longer than the metapleural lobes. Entirety of head and body black or blackish brown. (New Guinea) *vandalum* (p. 131)
- Antennal scapes both relatively and absolutely shorter, SL < 0.45, SI < 76. Propodeal spines

	well developed, much longer than the metapleural lobes. At least the alitrunk yellow or yellow-brown, never entirely black. (Malaya, Java)	<i>seneb</i> (p. 128)
64	Dorsum of head between frontal carinae predominantly or entirely coarsely reticulate-rugose or reticulate-foveolate	65
-	Dorsum of head between frontal carinae predominantly or entirely longitudinally rugulose, usually with some reticulation occipitally	67
65	Both petiole and postpetiole entirely covered with a coarse rugoreticulum, the two segments equally strongly sculptured and as strongly sculptured as the dorsal alitrunk. Larger species with shorter scapes, HW 0.66-0.74, SI 65-70. (Philippines)	<i>khnum</i> (p. 122)
-	Petiole and postpetiole not covered with a rugoreticulum, the two segments very obviously less strongly sculptured than the dorsal alitrunk and usually with the petiole somewhat more strongly sculptured than the postpetiole. Smaller species with longer scapes, HW 0.56-0.62, SI 78-87	66
66	With alitrunk in dorsal view the anterior pronotal corners angular, giving a square-shouldered appearance (Fig. 41). (New Guinea, Aru Is)	<i>scabrosum</i> (p. 119)
-	With alitrunk in dorsal view the anterior pronotal corners broadly rounded, giving a round-shouldered appearance (Fig. 42). (New Guinea)	<i>pulchellum</i> (p. 118)
67	Dorsal surfaces of both petiole and postpetiole completely covered by coarse sculpture. Eyes of moderate size, the maximum diameter 0.20-0.23 × HW. (Thailand, Malaya)	<i>aptum</i> (p. 115)
-	Dorsal surfaces of either petiole, postpetiole or both unsculptured and shining. Very rarely both with some faint punctulation, in which case the eye size is outside the above range	68
68	Eyes very small (Fig. 44). In HW range 0.58-0.70 the maximum diameter of the eye is 0.10-0.14, or about 0.16-0.19 × HW. (Malaya, Borneo)	<i>curtulum</i> (p. 116)
-	Eyes larger (Fig. 45). In HW range 0.52-0.64 the maximum diameter of the eye is 0.13-0.17, or about 0.25-0.30 × HW	69
69	With the petiole in profile the length of the dorsum of the node less than the height of the tergal portion of the node. Colour usually entirely yellow-brown, sometimes the gaster slightly darker, never bicoloured with alitrunk lighter than head and gaster, never uniformly black. (South China, Japan, Philippines, Java)	<i>kraepelini</i> (p. 117)
-	With the petiole in profile the length of the dorsum of the node equal to or greater than the height of the tergal portion of the node. Colour uniform black or with head and gaster much more darkly coloured than alitrunk	70
70	Head and body uniform black or blackish brown. (Java)	<i>parvum</i> (p. 117)
-	Bicoloured species with head and gaster blackish brown, the alitrunk, petiole, postpetiole and appendages yellow or pale yellowish brown. (Japan)	<i>tanakai</i> (p. 119)

The *tortuosum*-group

Antennae with 11 segments, the sting appendage spatulate. Petiole nodiform and often sculptured, at least on the sides; in dorsal view commonly longer than broad. Propodeum armed with spines or teeth. Mandibles striate; dorsum of head generally with coarse rugose or rugulose sculpture but without strong ground-sculpture, the spaces between rugae being smooth or at most with only feeble traces of sculpture. Gaster always unsculptured. Antennal scapes usually with SI < 100, rarely slightly greater.

This group has 7 species in the Oriental region, 4 in the Indo-Australian, 5 in Australia and is also represented in Madagascar, but it is absent from the Ethiopian region. It is the main group of the genus with 11-segmented antennae in the Oriental and Indo-Australian regions and appears to be the group from which the Australian *striolatum*-group is descended.

Within the group the species *belgaense*, *eleates*, *flavipes*, *splendidior*, *strictum*, *turneri* and *confusum* form a complex of smaller, stoutly built species with the pronotum relatively broad. They are generally dark in colour (not *splendidior*) with short propodeal spines and with antennal scapes relatively shorter than in the remainder of the group, SI in range 75-85 in material examined. Of the seven names given above the first three are very closely related Oriental and Indo-Australian forms whilst the last four are Australian. In *splendidior* and *confusum* the petiole nodes are transverse and roughly rectangular in dorsal view (Fig. 63) but the nodes in *turneri* and *strictum* are shaped more like those seen in the Oriental and Indo-Australian species of the complex (compare Figs 64, 65 with 6, 9, 10).

The remainder of the group are generally larger but more slender species with longer propodeal

spines and relatively longer scapes, $SI > 85$, less than this only in *pilosum* and *shensiense*. Within this complex *yerburyi*, *pilosum*, *shensiense*, *urbani* and *rinatum* are yellow-brown to bright orange-brown in colour and are distributed mainly in the Oriental region, only *rinatum* of the Philippines occurring outside it. The remaining species, *tortuosum*, *vertigum*, *andrynicum* and *noratum*, are brown or blackish brown. The first of these occurs in India and Sri Lanka, the second in Sulawesi and the third in Queensland. Only the last species has a wider distribution, being widespread in Malaysia and Indonesia but apparently not reaching New Guinea. In fact, the *tortuosum*-group is completely absent from New Guinea, but this may be explained by the presence of the specialized *carinatum*-group species and of convergent but not closely related species belonging to other groups (e.g. *politum* of the *ornatum*-group) which would appear to fill ecological niches occupied elsewhere by *tortuosum*-group members.

Tetramorium belgaense Forel

Tetramorium (Xiphomyrmex) belgaense Forel, 1902a : 238. Holotype female, INDIA: Belgaum (*Wroughton*) (MHN, Geneva) [examined].

FEMALE (holotype). TL 4.6, HL 0.86, HW 0.80, CI 93, SL 0.68, SI 85, PW 0.80, AL 1.36.

Mandibles striate. Antennal scrobes strongly developed, with an acute and marked dorsal margin; the frontal carinae continuing back almost to the occipital margin, well behind the lateral ocelli. Eyes large, maximum diameter *c.* 0.38. Alitrunk in dorsal view with the pronotal angles rounded, not prominent. Propodeum armed with a pair of long spines, the metapleural teeth about half as long as these spines, acute and upcurved. Node of petiole in profile roughly rectangular, higher than long, with the dorsum evenly but shallowly convex. Node of postpetiole feebly anteroposteriorly compressed, much higher than long, convex above. In dorsal view both nodes distinctly broader than long, maximum width of petiole and postpetiole respectively *c.* 0.36, 0.50. Dorsum of head coarsely longitudinally rugose with a few scattered cross-meshes. Pronotum reticulate-rugose, the remainder of the dorsal alitrunk sculptured as the head but the individual rugae lower and rounded, much less well defined. All surfaces of both pedicel segments coarsely reticulate-rugose, the gaster smooth and unsculptured. All dorsal surfaces of head and body with numerous stout hairs which are blunt apically. Colour reddish brown, the legs and antennae lighter, yellowish brown, the gaster darker red-brown.

Although first described as long ago as 1902 no other specimens which correspond to this species have ever been found. Its closest relative is certainly *eleates* but the known range of this species does not overlap that of *belgaense*. The queens of the two species are separated by the following characters:

<i>belgaense</i>	<i>eleates</i>
Postpetiole reticulate-rugose	Postpetiole dorsum smooth
Tergite of postpetiole in profile much higher than long	Tergite of postpetiole in profile about as long as high
Eyes larger, maximum diameter <i>c.</i> 0.38	Eyes smaller, maximum diameter <i>c.</i> 0.22
Scapes relatively longer, SI 85 (with HW 0.80, HL 0.86)	Scapes relatively shorter, SI 76 (with HW 0.82, HL 0.86)

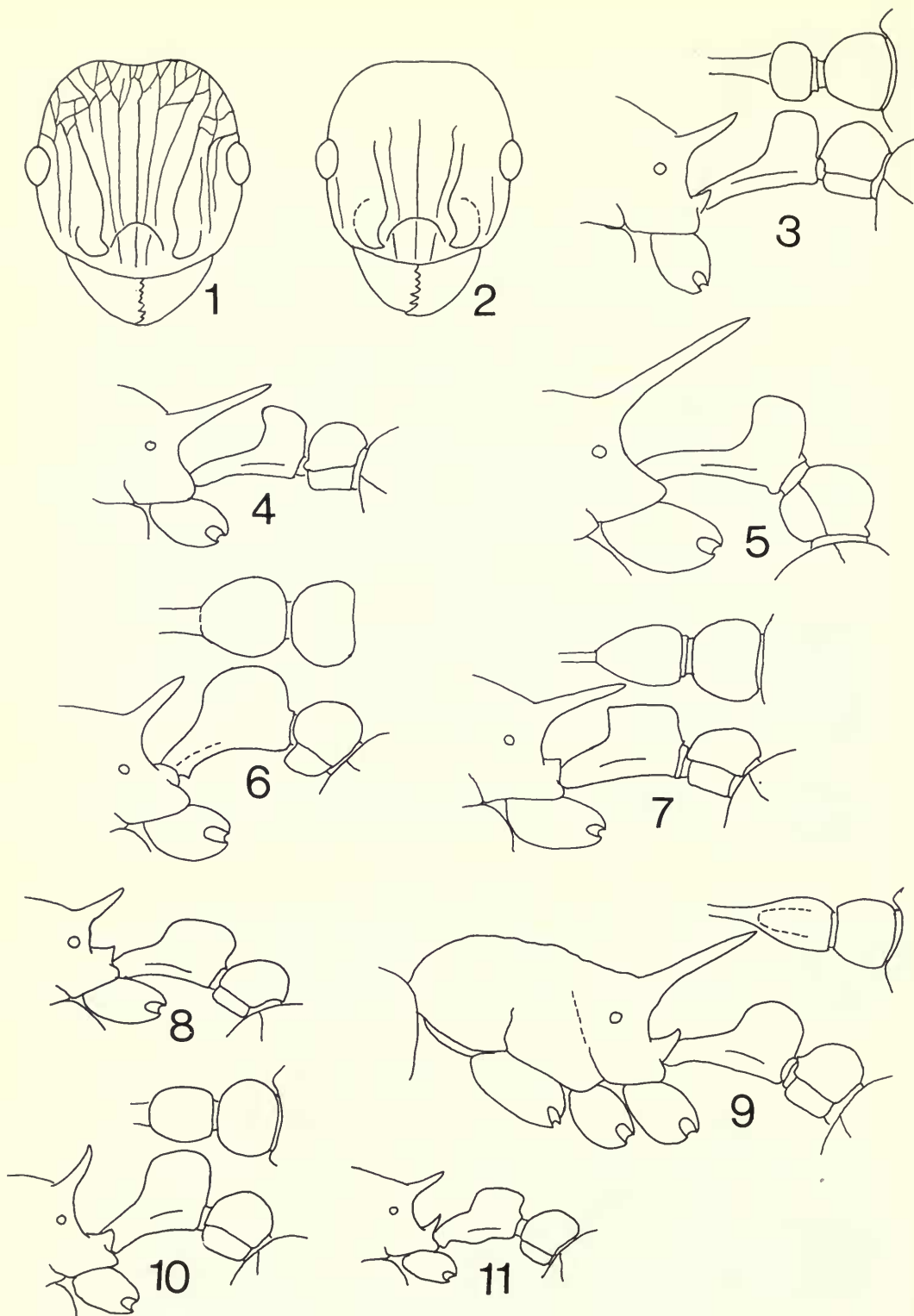
Tetramorium eleates Forel stat. n.

(Fig. 14)

Tetramorium (Xiphomyrmex) tortuosum var. *eleates* Forel, 1913 : 82. Syntype workers, females, SUMATRA: Bah Boelian (*Buttel-Reepen*) (MHN, Geneva) [examined].

WORKER. TL 2.7–3.8, HL 0.72–0.84, HW 0.68–0.78, CI 90–95, SL 0.54–0.62, SI 79–83, PW 0.56–0.66, AL 0.86–0.96 (10 measured).

Mandibles striate. Frontal carinae strongly developed, long, extending back almost to the occipital margin and forming the upper margin of a scrobe which will accommodate the scape. Alitrunk in dorsal view with strongly angulate pronotal corners. Propodeum armed with a pair of stout spines, the metapleural lobes dentiform and acute. Petiole node in profile roughly rectangular, slightly higher than long and shallowly convex dorsally, distinctly more massive than the postpetiole, the node of which is low and rounded. In dorsal view the petiole longer than broad, the postpetiole subglobular, only slightly broader than long. Dorsal surfaces of head and alitrunk reticulate-rugose, on the head the longitudinal



Figs 1-11. *Tetramorium* workers. 1, 2. Heads of (1) *carinatum*, (2) *diligens*, to show sculpture. 3-11. Propodeum and pedicel structure of (3) *carinatum*, (4) *diligens*, (5) *gambogecum*, (6) *pilosum*, (7) *yerburyi*, (8) *vertigum*, (9) *noratum*, (10) *shensiense*, (11) *rinatum*. Sculpture and pilosity omitted except in 1, 2.

component more pronounced than the cross-meshes. Sides and dorsum of petiole rugulose, the sides distinctly more heavily sculptured than the dorsum. Sides of postpetiole usually unsculptured, rarely with one or two fine, longitudinal rugulae, the dorsum always smooth and shining. Gaster unsculptured. Simple erect hairs numerous on all dorsal surfaces.

This medium-sized reddish brown species is apparently widely distributed in the Indo-Australian region, but does not appear to be common. It has been recovered from Malaya, Java, Sumatra and Sumba and shows remarkably little variation, for a tetramoriine, over that range.

The closest known related species are undoubtedly the Thailand *flavipes* and the Indian *belgaense*.

Further collections may show that the rather weak characters separating *eleates* and *flavipes* are not consistent (see key).

MATERIAL EXAMINED. WEST MALAYSIA: Malaya, Selangor, Batu caves (*Pagden*). SUMATRA: Sebesi I. (*Dammerman*). JAVA: Soekaboemi (no data). SUMBA: Mao Marroe (*Dammerman*).

Tetramorium flavipes Emery

Tetramorium (Xiphomyrmex) flavipes Emery, 1893 : 247, footnote 1. Holotype worker, THAILAND (*E. Simon* ?) (Probably in MCSN, Genoa).

WORKER. TL 3.2–3.6, HL 0.76–0.80, HW 0.70–0.76, CI 90–95, SL 0.53–0.62, SI 77–82, PW 0.58–0.62, AL 0.90–0.98 (12 measured).

Mandibles striate. Frontal carinae strong, reaching back almost to the occipital margin, where they merge with the sculpture. Occipital margin more or less straight to feebly concave in full-face view, the sides weakly convex. Antennal scapes moderate, SI as above. Alitrunk in dorsal view with sharply angled pronotal corners giving the alitrunk a 'square-shouldered' appearance. Propodeal spines elongate, narrow and acute; metapleural lobes elongate-triangular and sharp. Petiole node in profile slightly higher than long, with more or less parallel anterior and posterior faces and a convex dorsum. In dorsal view the petiole node is slightly longer than broad and a little broader behind than in front. Dorsal surfaces of head and alitrunk finely reticulate-rugulose, the sides and dorsum of the petiole rugulose but medio-dorsally there is a narrow unsculptured longitudinal strip. Postpetiole either completely smooth or at most with only very faint traces of sculpture laterally. All dorsal surfaces of head and body with erect hairs which are quite stout and tend to be blunted apically. Middle and hind tibiae without such hairs, with only short decumbent hairs. Colour black or blackish brown with pale yellow legs.

Very closely related to *eleates*, separated only tenuously by slight colour differences and the fact that in *eleates* the petiole dorsum tends to be sculptured over its entire surface whilst in *flavipes* there is an unsculptured median strip. These are very weak characters for separating two species of *Tetramorium* and I feel that further collections may show that these are but expressions of the same species.

MATERIAL EXAMINED. THAILAND: Nong Hoi (*D. Jackson*).

Tetramorium noratum sp. n.

(Fig. 9)

HOLOTYPE WORKER. TL 4.5, HL 1.04, HW 0.98, CI 94, SL 0.96, SI 98, PW 0.72, AL 1.22.

Mandibles striate, clypeus with a shallow median impression in the anterior margin. Sides of head evenly shallowly convex, the eyes prominent and quite small, maximum diameter c. 0.20. In full-face view the occipital margin broadly and quite deeply concave. Frontal carinae strongly developed and extending back almost to the occipital margin where they merge into the rest of the sculpture. Antennal scrobes poorly developed, represented by a groove below the frontal carinae which is mostly unsculptured but is considerably shorter than the scape. Pronotal corners angulate in dorsal view. Propodeal spines very long, the metapleural teeth triangular, acute and slightly upcurved. Dorsum of petiole longer than broad, the true dorsal surface a narrow strip as the sides of the petiole are convergent dorsally. In profile the dorsal surface of the petiole is strongly convex and meets the anterior face through a shallow curve so that the two are not separated by an angle. Postpetiole strongly convex dorsally. Head reticulate-rugose, more strongly so posteriorly as anteriorly the cross-meshes tend to be reduced or absent, leaving only the longitudinal component. Dorsal alitrunk reticulate-rugose but more loose and disorganized than on the head, the rugae forming sharp raised ridges. Petiole, postpetiole and gaster completely unsculptured,

smooth and highly polished. Dorsal surfaces of body with numerous erect or suberect hairs, those on the head and alitrunk longer than those on the gaster. The longest head and alitrunk hairs twice as long as the maximum diameter of the eye. Colour light brown, shining.

PARATYPES. As holotype, with a range of: TL 4.0-4.6, HL 0.98-1.06, HW 0.88-0.98, CI 90-95, SL 0.84-0.98, SI 95-100, PW 0.68-0.74, AL 1.14-1.22 (12 measured).

Holotype worker, WEST MALAYSIA: Malaya, Pahang, Fraser's Hill, c. 1220 m, hill forest, 15.viii.1967 (*R. Crozier*) (MCZ, Cambridge).

Paratypes. WEST MALAYSIA: 12 workers with same data as holotype. BORNEO: 1 worker, Pulau Laut c. 6 km E. Stagen dock, 3.vii.1972, rain forest (*W. L. Brown*) (MCZ, Cambridge; BMNH).

A third series of this species is known, collected in SE. Celebes (= Sulawesi), 1-2 km E. of Wolasi, 42 km S. Kendari, 12-14.vii.1972 (*W. L. Brown*). This consists of 28 workers, matching the above description but in most individuals with faint traces of rugulation on the sides of the petiole node.

Tetramorium pilosum Emery (Fig. 6)

Tetramorium (Xiphomyrmex) pilosum Emery, 1893 : 247. Holotype worker, SRI LANKA: Kandy, 1892 (*E. Simon*) (MCSN, Genoa) [examined].

WORKER. TL 4.1-4.5, HL 0.94-0.98, HW 0.90-0.94, CI 94-96, SL 0.76-0.82, SI 81-86, PW 0.66-0.72, AL 1.20-1.30 (6 measured).

Antennae 11-segmented, the scrobe reduced to a short, shallow groove which runs a little beyond the posterior margin of the eye, although the frontal carinae themselves extend almost to the occipital margin. Petiole strongly nodiform in profile (Fig. 6) with the dorsal surface convex; in dorsal view the node is globular and almost as broad as long. Metapleural lobes rounded, not dentiform. Mandibles longitudinally finely striate-rugulose, dorsum of head longitudinally rugose with a rugoreticulum on the sides and close to the occipital margin. Dorsal alitrunk with an open, raised rugoreticulum which is repeated on the dorsum of the petiole node where the rugae are more closely packed. Postpetiole with fainter but still distinct longitudinal rugulae. Gaster smooth and shining. Dorsal surfaces of head, alitrunk, pedicel and gaster with abundant very long, fine, acute hairs, the longest of which are c. 0.30 in length.

This distinctive orange-brown species is very closely related to *yerburyi*, also of Sri Lanka, but the shape of the petiole is radically different in the two species, compare Figs 6 and 7. The other large species from Sri Lanka, *tortuosum*, has the node of the postpetiole quite unsculptured and the hairs on the dorsal surfaces of the head and body are much shorter, stout, and blunt apically.

MATERIAL EXAMINED. SRI LANKA: Kandy (*E. O. Wilson*).

Tetramorium rinatum sp. n. (Fig. 11)

HOLOTYPE WORKER. TL 3.2, HL 0.76, HW 0.66, CI 87, SL 0.68, SI 103, PW 0.50, AL 0.90.

Mandibles striate. Frontal carinae well developed anteriorly but behind the level of the eyes becoming weaker until indistinguishable from the reticulate-rugulose sculpture on the posterior portion of the head. Antennal scapes relatively long, SI 100 or more. Propodeal spines of moderate length, narrow and acute, the metapleural lobes triangular, acute and somewhat upcurved. Petiole node in profile low and long, the ventral surface of the peduncle and node convex through most of its length (Fig. 11). In dorsal view the petiole node slightly longer than broad, narrowest in front and broadening posteriorly. Dorsal surfaces of head and alitrunk everywhere finely reticulate-rugulose, dorsal surfaces of petiole and postpetiole with only the faintest traces of sculpture, almost completely smooth. Sides of petiole with some rugulose sculpture. Gaster unsculptured. All dorsal surfaces of head and body with numerous elongate, fine hairs. Colour uniform yellowish brown.

PARATYPE WORKERS. TL 3.0-3.3, HL 0.76-0.80, HW 0.64-0.70, CI 84-87, SL 0.66-0.70, SI 100-103, PW 0.46-0.52, AL 0.86-0.92 (7 measured).

As holotype but some specimens slightly darker in colour.

Holotype worker, PHILIPPINES (PI on label): Dumaguete, 6.iv.27 (*J. W. Chapman*) (MCZ, Cambridge).

Paratypes. PHILIPPINES: 3 workers with same data as holotype; 4 workers, Dumaguete, Camp 4, 2.iv.31 (*J. W. Chapman*) (MCZ, Cambridge; BMNH).

A number of other specimens of this species are in the Chapman collection housed at MCZ, Cambridge, but are in poor condition. Also there is a single specimen from Taiwan (= Formosa) collected by L. Gressitt which may belong to this species or be a closely related new species. As only one specimen is available I am unable to say at the present time.

T. rinatum is a quite ordinary member of the *tortuosum*-group and the characters given in the key should separate it from its known allies without difficulty; it is the only member of its group known to occur in the Philippines.

Tetramorium shensiense sp. n.

(Fig. 10)

HOLOTYPE WORKER. TL 3·8, HL 0·88, HW 0·84, CI 95, SL 0·64, SI 76, PW 0·62, AL 1·04.

Mandibles striate; anterior clypeal margin with a shallow but quite distinct impression or notch medially. Clypeus with three strong carinae. Frontal carinae long and strong, extending back almost to the occiput and surmounted by a low, vertical, translucent lamella. Antennal scapes relatively short, SI < 80. Maximum diameter of eye *c.* 0·18. Occipital margin of head slightly indented medially, the sides of the head convex. Propodeal spines elongate, narrow, upcurved along their length. Metapleural lobes broadly and quite bluntly triangular. Petiole node in profile massive and high, the height of the tergal portion distinctly greater than the dorsal length. Anterior and posterior faces of node roughly parallel, the dorsum feebly convex. In dorsal view the petiole node about as broad in front as behind, broadest at the midlength. Dorsum of head with spaced-out relatively weak longitudinal rugulae and with sparse, very feeble cross-meshes so that the longitudinal component predominates. Occipital margin with some anastomosis of the rugulae forming a weak reticulum. Dorsal alitrunk with a weak disorganized rugoreticulum which is strongest on the pronotum. Dorsum and sides of petiole with weak rugulae but the postpetiole almost completely smooth. Gaster unsculptured. All dorsal surfaces of head and body with numerous erect hairs. Colour orange-brown but the basal portion of the antennal scapes much darker, blackish brown or black.

PARATYPES. As holotype, with dimensions TL 3·7–3·8, HL 0·86–0·90, HW 0·82–0·86, CI 93–97, SL 0·64–0·66, SI 76–78, PW 0·62–0·64, AL 1·02–1·06 (3 measured).

Holotype worker, CHINA: Shensi Prov., Hu Hsien, 7.vi.1945 (*W. L. Brown*) (MCZ, Cambridge).

Paratypes. 3 workers with same data as holotype (MCZ, Cambridge; BMNH).

This species is close to *pilosum* of Sri Lanka and *urbanii* of Bhutan, but the former is larger than *shensiense* and has a differently constructed petiole node (compare Figs 6, 10), and the latter has much longer antennal scapes and shorter propodeal spines.

Tetramorium tortuosum Roger

Tetramorium tortuosum Roger, 1863a : 181. Syntype worker, female, SRI LANKA (*H. Nietner*) (location of types not known).

Tetramorium (Xiphomyrmex) tortuosum var. *bellii* Forel, 1902a : 239. Syntype workers, INDIA: Kanara (*Bell*) (MHN, Geneva) [examined]. **Syn. n.**

Tetramorium (Xiphomyrmex) tortuosum var. *ethica* Forel, in Escherich, 1911 : 225. Holotype worker, SRI LANKA (MHN, Geneva) [examined]. **Syn. n.**

WORKER. TL 3·8–4·4, HL 0·82–0·92, HW 0·78–0·86, CI 89–95, SL 0·70–0·80, SI 89–97, PW 0·60–0·70, AL 1·12–1·20 (15 measured).

Mandibles striate. Antennal scapes moderately long, with SI approaching 100 but apparently always with HW > SL. Frontal carinae long, reaching back almost or quite to the occipital margin, the latter broadly and very shallowly concave. Antennal scrobes shallow and feeble impressions, shorter than the scape and not capable of containing it. Pronotal corners in dorsal view with rounded angles. Propodeal spines strong and acute, the metapleural teeth acute and generally triangular, but narrow in some specimens. Node of petiole in profile longer than high, the dorsal surface feebly convex and meeting the anterior face in a blunt but distinct angle. Postpetiole rounded, convex above. In dorsal view the petiole node

slightly longer than broad, the postpetiole subglobular and somewhat broader than long. Dorsum of head firmly and predominantly longitudinally rugulose but with a tendency to form narrow and feeble cross-meshes, especially posteriorly. The rugulae themselves are narrow, low and rounded. Dorsal alitrunk with similar but even more feeble rugulation, in places the rugulae tending to be effaced and replaced by shining areas. Sides of petiole usually retaining faint traces of sculpture but the dorsum generally smooth, only rarely with vestiges of sculpture. Postpetiole and gaster unsculptured. Hairs on dorsal head and alitrunk variable in length, usually shorter and stouter in Sri Lankan populations than in examples from India.

This species is close to *yerburyi* and *pilosum*; its distinction from those species is discussed under *yerburyi*.

MATERIAL EXAMINED. INDIA: Kerala State, Wynaad Taluk, Kottiyoor (*A. B. Soans & W. L. Brown*); Cannonore Dist., Peria Res. (*Soans & Brown*); Wynaad Taluk, Thirunelly (*Soans & Brown*); Madras (*Soans & Brown*); Mysore (*D. Cavagnaro*); Kerala State, Silent Valley (*A. B. Soans & W. L. Brown*). SRI LANKA: Nuwara Eliya (*K. L. A. Perera*); Hakgala (*K. L. A. Perera*).

Tetramorium urbanii sp. n.

(Fig. 12)

HOLOTYPE WORKER. TL 4.0, HL 0.86, HW 0.80, CI 93, SL 0.74, SI 93, PW 0.62, AL 1.10.

Mandibles striate. Frontal carinae strongly developed, running back almost to the occipital margin, equipped above with a narrow, raised lamella which is distinct to the level of the eyes. Antennal scapes moderately long (SI range 90–95), much longer than the narrow scrobe which, however, is visible on the side of the head to just behind the posterior margins of the eyes. Maximum diameter of eye *c.* 0.20, about 0.25 × HW. In full-face view the occipital margin of the head more or less straight, only very feebly indented medially, sides of head feebly convex. Propodeum armed with a pair of short acute teeth which are only slightly longer than their basal width and only marginally longer than the narrowly rounded metapleural lobes. Petiole in profile as shown in Fig. 12; in dorsal view about as long as broad and much broader behind than in front. Dorsum of head with a few low meandering longitudinal rugulae and very few cross-meshes. Promesonotal dorsum mostly unsculptured, smooth and shining, with traces of rugulose sculpture towards the sides and also posteriorly. Petiole and postpetiole weakly rugulose but with a narrow unsculptured median strip on the dorsum of each segment. Gaster unsculptured. Erect hairs present on all dorsal surfaces of head and body. Colour orange-brown.

PARATYPES. TL 3.8–4.1, HL 0.78–0.88, HW 0.72–0.82, CI 91–95, SL 0.68–0.74, SI 90–95, PW 0.56–0.64, AL 1.00–1.12 (9 measured). As holotype but colour varying from orange-brown to light yellow-brown and with some individuals having the propodeal teeth broader than the holotype.

Holotype worker, BHUTAN: Phuntsholing, 2/400 m, 21–28.iv., Nat. Hist. Mus. Basel – Bhutan expedition 1972 (*C. Baroni Urbani*) (NM, Basle).

Paratypes. 9 workers with same data as holotype (NM, Basle; BMNH; MCZ, Cambridge).

Of the known species of the *tortuosum*-group *urbanii* has the shortest propodeal spines. This character, coupled with the moderately long scapes, should serve to separate *urbanii* from other species of the group.

Tetramorium vertigum sp. n.

(Fig. 8)

HOLOTYPE WORKER. TL 4.0, HL 0.96, HW 0.90, CI 94, SL 0.90, SI 100, PW 0.70, AL 1.20.

Mandibles longitudinally striate. Sides of head slightly convex, the occipital margin broadly but shallowly concave. Frontal carinae extended behind the level of the eyes but posteriorly petering out and becoming confused with the sculpture on the vertex. Scrobes narrow and poorly defined, not capable of accommodating the scapes, which are long, SI about 100. Propodeum with a pair of acute spines, the metapleural lobes triangular. Node of petiole in profile longer than high, shaped as in Fig. 8, the post-petiole lower and broadly rounded. In dorsal view the petiole node roughly oval, longer than broad, somewhat broader behind than in front and slightly flattened posteriorly. Postpetiole in dorsal view subglobular, slightly broader than long. Dorsum of head behind level of eyes and entire dorsal alitrunk very coarsely reticulate-rugose, the reticulations raised and very conspicuous. Anterior portion of cephalic dorsum with the longitudinal component predominating. Sides of petiole with coarse rugae which are

mostly directed diagonally, the dorsum with a median unsculptured longitudinal strip. Postpetiole and gaster unsculptured, smooth. All dorsal surfaces of head and body with numerous long, erect fine hairs which are acute apically. These hairs densest on the head and alitrunk, the longest being distinctly longer than the maximum diameter of the eye. Colour a very dark brown, almost black.

PARATYPE WORKERS. As holotype but in some the mandibular striation less distinct and the rugae on the sides of the petiole irregular. Size range: TL 3.6-4.2, HL 0.90-1.02, HW 0.80-0.92, CI 89-94, SL 0.84-0.90, SI 97-105, PW 0.60-0.70, AL 1.12-1.22. In general the smaller workers have relatively longer scapes than the larger workers.

Holotype worker, SULAWESI (S. Celebes on data label): S., Balampesoang Forest, 5-8 km NE. Tanete, 400 m, 8-10.vii.1972, rot. wood; degrad. rain for. (*W. L. Brown*) (MCZ, Cambridge).

Paratypes. 14 workers with same data as holotype (MCZ, Cambridge; BMNH).

In the MCZ, Cambridge collection is a single worker collected by *W. L. Brown* in N. Sulawesi at Mt Tangkoko-Batuangus Res. In this specimen the mandibles are predominantly smooth and the metapleural lobes are low and triangular.

Tetramorium yerburyi Forel

(Fig. 7)

Tetramorium (Xiphomyrmex) pilosum st. *yerburyi* Forel, 1902a : 238. Syntype workers, SRI LANKA (*Yerbury*) (MHN, Geneva) [examined].

Tetramorium yerburyi Forel; Bingham, 1903 : 187. [Raised to species.]

WORKER. TL 4.2-5.0, HL 1.02-1.10, HW 0.94-1.04, CI 90-95, SL 0.94-1.02, SI 98-102, PW 0.70-0.74, AL 1.24-1.36 (11 measured).

Mandibles striate. Frontal carinae extended back almost to the occipital margin, becoming confused with the sculpture close to the margin, the latter broadly and distinctly concave. Scapes of moderate length, SI in range given above. Antennal scrobes feebly developed, merely a short, shallow impression below the anterior half of the frontal carina. Pronotal corners rounded in dorsal view. Propodeal spines long and acute, metapleural lobes very obtusely triangular, variable in shape. Petiole shape in profile characteristic of the species, the anterior face straight and vertical, the dorsal surface flat or at most very feebly convex, the two meeting in a sharply defined right-angle (Fig. 7). The node itself is longer than high and the postpetiole is broadly rounded above in profile. In dorsal view petiole node narrowed in front. Head longitudinally rugose, finely reticulated posteriorly. Dorsal alitrunk with a rugoreticulum which is coarser than that on the head though less clearly defined. Dorsal surfaces and sides of petiole and postpetiole rugose, usually reticulate on the sides; the postpetiolar dorsum with weaker sculpture than the petiole, often longitudinal. Dorsal surfaces of head and body with numerous hairs, some of which are extremely long and fine. Colour orange-brown.

Of the three species of this group occurring in Sri Lanka two (*pilosum* and *yerburyi*) are endemic, and a third, *tortuosum*, is also found in south India. (The fourth Sri Lankan species, *smithi*, is widespread in the Oriental region but does not belong to this group.) *T. pilosum* and *yerburyi* are closely related and share the character of having the postpetiole sculptured. In *tortuosum* this sclerite is smooth. The two endemic Sri Lankan species are quickly separable by the shape of the pedicel, and a comparison of Figs 6 and 7 conveys these differences better than a verbal description.

MATERIAL EXAMINED. SRI LANKA: (*Yerbury*); Kandy (*E. O. Wilson*).

The *carinatum*-group

Antennae with 11 segments, the sting appendage spatulate. Large, rather slender, elongate species with long legs and relatively long or very long antennal scapes, SI in the range 109-148. Propodeal spines long, the metapleural lobes very reduced in *diligens* and *gambogecum* but moderately developed in *aspersum* and *carinatum*. Peduncle of petiole very long, the petiole node high and narrow (Figs 3-5). Petiole, postpetiole and gaster unsculptured but sculpture of head and alitrunk variable in density and intensity. Mandibles striate but sometimes only feebly so.

A small group of only four species centred upon New Guinea where three of the four are present. One species, *aspersum*, does not occur on New Guinea itself but is widely distributed in

the Philippines, Bismarck Archipelago and Solomon Islands. Of the other species, *diligens* and *gambogecum* are only known from New Guinea or its offshore islands but *carinatum* is also recorded from the Aru Islands and Sulawesi.

In general appearance the members of this group show convergence upon the *aculeatum*-group of Africa which show many modifications similar to those of the *carinatum*-group but which retain 12-merous antennae and a dentiform sting appendage. On New Guinea members of the *carinatum*-group replace in part the members of the *tortuosum*-group, which are absent from the island.

Tetramorium aspersum (F. Smith) comb. n.

Myrmica aspersa F. Smith, 1865 : 72. Syntype workers, INDONESIA: Morty (= Morotai) Is (A. R. Wallace) (UM, Oxford; BMNH) [examined].

Tetramorium (Xiphomyrmex) bismarckii Forel, 1901 : 11. Holotype worker, BISMARCK ARCHIPELAGO: 'bei Ralum in Lowon. Im Wald bei Kabakaul' (F. Dahl) (MHN, Geneva) [examined]. **Syn. n.**

Xiphomyrmex aspersa (F. Smith) Donisthorpe, 1932 : 473.

Xiphomyrmex costatus subsp. *willowsi* Wheeler, 1934b : 177. Syntype workers, SOLOMON IS: Malaita I., Uras Cove, 28.v.1933, and San Cristoval I., Star Harbour, 1.vii.1933 (M. Willows) (MCZ, Cambridge; CAS, San Francisco) [examined]. **Syn. n.**

WORKER. TL 3.6-4.4, HL 0.86-1.00, HW 0.76-0.90, CI 82-93, SL 0.86-1.10, SI 109-126, PW 0.60-0.74, AL 1.06-1.20 (31 measured).

Mandibles feebly and superficially longitudinally striate. Antennal scapes very long. SI always > 105, projecting well beyond the occipital margin when laid back in full-face view. Scrobes reduced to a narrow impression bounded above by the extensions of the frontal carinae, petering out posteriorly, and with a series of transverse rugae running across the impression. Metapleural lobes long and dentiform, acute. Petiole in profile a high, narrow node, the tergal portion much higher than long. Postpetiole generally more massive than petiole. Dorsum and sides of head covered with a loose, open rugoreticulum except anteriorly between the frontal carinae where the cross-meshes are feeble or absent and the sculpture is predominantly or completely of longitudinal rugae. Density and intensity of cephalic sculpture vary amongst different populations but are always distinctive. Dorsal alitrunk with a rugoreticulum but the pedicel segments and gaster unsculptured, completely smooth. All dorsal surfaces of body and head with erect or suberect hairs. Colour uniform yellow-brown to reddish brown.

This is a widespread and very variable species. Of the material which I have examined no two populations are exactly alike but all show variation in eye diameter, intensity and density of sculpture, size and degree of hairiness. Considerable variation may be met in nest-series as one sample from Dumaguete (Philippines) collected by J. W. Chapman on 4.ix.1927 shows a CI range of 87-93 and an SI range of 109-123, which virtually spans the known range for the species as a whole.

There is an obvious temptation to separate the more extreme forms of this species and treat them as separate entities but I am by no means convinced (with the rather limited number of samples available) that any lines other than arbitrary ones can be drawn to subdivide this mass at present. Of course, when more collections have been made one or more siblings may possibly be separated, but I feel that this will not be accomplished for some time yet.

MATERIAL EXAMINED. PHILIPPINES: Los Banos (*Baker*); Los Banos (*F. X. Williams*); Dumaguete (several series) (*J. W. Chapman*); Mindanao, Mt McKinley (*F. G. Werner*). SOLOMON IS: San Jorge (R. ent. Soc. exped.); West Bay (*W. M. Mann*); Fulakora (*W. M. Mann*); Bio (?) (*W. M. Mann*).

Tetramorium carinatum (F. Smith) comb. n.

(Figs 1, 3)

Myrmica carinata F. Smith, 1859 : 148. LECTOTYPE worker, INDONESIA: Aru Is (A. R. Wallace) (UM, Oxford), here designated [examined].

Tetramorium (Xiphomyrmex) costatus Emery, 1897a : 587, pl. 15, fig. 26. Syntype workers, NEW GUINEA (L. Biró) (MCSN, Genoa) [examined]. **Syn. n.**

Tetramorium (Xiphomyrmex) costatus subsp. *flavescens* Emery, 1897a : 588. Holotype worker, NEW GUINEA: Berlinhafen (L. Biró) (MCSN, Genoa) [examined]. **Syn. n.**

Tetramorium (Xiphomyrmex) costatus subsp. *deficiens* Emery, 1897a : 588. Holotype worker, NEW GUINEA: Berlinhafen (?) (L. Biró) (location of type not known). **Syn. n.**

Xiphomyrmex carinata (F. Smith) Donisthorpe, 1932 : 455.

Xiphomyrmex aruensis Karavaiev, 1935 : 105, fig. 24. Syntype workers, INDONESIA: Aru Is, Wammer, 9.iii.1913, no. 2567 (V. Karavaiev) (location of types not known). **Syn. n.**

WORKER. TL 3.9–4.6, HL 0.92–1.00, HW 0.82–0.90, CI 86–93, SL 0.94–1.04, SI 109–119, PW 0.64–0.74, AL 1.16–1.24 (20 measured).

Mandibles usually very feebly striate, more rarely smooth. Antennal scapes elongate, projecting beyond the occipital border when laid back in full-face view and with SI > 105. Antennal scrobes reduced to an impression bounded above by the frontal carinae and below by a strong longitudinal ruga but appearing quite distinctive as they lack any sculpture to the level of the posterior margin of the eye. Propodeal spines quite short (Fig. 3), generally feebly upcurved along their length. Metapleural lobes dentiform, usually narrow and acute but more rarely triangular. Peduncle of petiole long, the node in profile high and narrow. Sculpture on dorsum of head sparse, consisting anteriorly of a few longitudinal, widely spaced and strongly defined carina-like rugae. Posteriorly on the dorsum, behind the level of the eyes, these rugae tend to branch and to form cross-meshes so that a very loose and open rugoreticulum is present. The spaces between all these rugulae are smooth and unsculptured. Dorsal alitrunk loosely reticulate-rugose, the pedicel and gaster unsculptured. Colour uniform yellowish brown to light brown, often with the head and gaster darker in shade than the alitrunk.

The species most closely related to *carinatum* is *aspersum*, and their relationship appears to be close indeed. They are separable on details of cephalic sculpture which appear to be consistent and by the fact that they seem to be mutually exclusive as regards their respective ranges. Although this is based on relatively little material it is interesting to note that the known range of *carinatum* includes Sulawesi, New Guinea and the Aru Is whilst that of *aspersum* tends to be more easterly, occurring in the Philippines, Morotai I., Bismarck Archipelago and Solomon Is.

MATERIAL EXAMINED. SULAWESI: Mt Tangkoko-Batuangus Res. (W. L. Brown). NEW GUINEA: Maffin Bay (E. S. Ross); Humboldt Bay (L. E. Cheesman).

Tetramorium diligens (F. Smith) comb. n.

(Figs 2, 4)

Myrmica diligens F. Smith, 1865 : 73. Syntype workers, NEW GUINEA (A. R. Wallace) (UM, Oxford; BMNH [examined]).

Xiphomyrmex diligens (F. Smith) Donisthorpe, 1932 : 473.

WORKER. TL 3.8–3.9, HL 0.92–0.94, HW 0.74–0.78, CI 80–83, SL 0.96–1.00, SI 128–129, PW 0.62–0.66, AL 1.12 (2 measured).

Mandibles very feebly striate; antennal scapes long, SI > 120. Frontal carinae extended back only to the level of the posterior margin of the eye and terminating in this vicinity. Scrobes virtually non-existent, merely a very shallow impression below the frontal carinae. Propodeal spines stout and very long, the metapleural lobes very reduced, low and broadly rounded, not dentiform, scarcely or not visible when the alitrunk is viewed in profile. Peduncle of petiole long, the node high and narrow in profile with a concave anterior face (Fig. 4). Dorsum of head mostly unsculptured, with one or two short rugulae between the frontal carinae, the median cephalic carina fading out posteriorly. Vertex unsculptured, smooth and shining. Dorsal alitrunk with a few coarse and widely spaced rugae, pedicel and gaster unsculptured. Bicoloured, the head and gaster blackish brown, the alitrunk, legs and antennae yellow. In the syntypes the petiole is yellow-brown, the postpetiole darker, almost as dark as the gaster.

Known only from the original collection, this distinctive species appears closest related to *carinatum* but in that species the head is broader, the scapes shorter, the integument more densely sculptured and the metapleural lobes are dentiform.

Two other New Guinea species, *bicolor* and *tricarinatum*, have the same distinctive coloration as *diligens*, but both of these species belong to the *bicarinatum*-group and hence have 12-segmented antennae and a dentiform sting-appendage.

Tetramorium gambogecum (Donisthorpe) comb. n.
(Fig. 5)

Xiphomyrmex gambogecus Donisthorpe, 1941 : 57. Holotype and paratype workers, NEW GUINEA: Japen I., Mt Eiori, 2000 ft, x.1938 (L. E. Cheesman) (BMNH; MCZ, Cambridge) [examined].

Xiphomyrmex gambogecus var. *flavus* Donisthorpe, 1941 : 58. Holotype worker, NEW GUINEA: Japen I., Mt Baduri, 1000 ft, viii.1938 (L. E. Cheesman) (BMNH) [examined]. Syn. n.

WORKER. TL 4·7–5·4, HL 1·08–1·14, HW 0·92–1·00, CI 84–87, SL 1·30–1·44, SI 141–148, PW 0·76–0·82, AL 1·48–1·60 (10 measured).

Mandibles striate; antennal scapes extremely long, SI > 140. Posterior extensions of frontal carinae weak, petering out and becoming indistinguishable from the sculpture behind the level of the eye. Antennal scrobes very reduced, vestigial, consisting only of a shallow impression running from the insertions to the level of the eye and sculptured throughout. Propodeal spines very long (Fig. 5), metapleural lobes reduced to low, rounded flanges, not dentiform nor prominent, invisible when the alitrunk is viewed in profile. Petiole in profile with an extremely long peduncle and a high, narrow node. Dorsum and sides of head and dorsal alitrunk with a distinct rugoreticular sculpture the meshes of which are more distinct on the head than on the alitrunk. Pedicel and gaster completely smooth and shining. Colour uniform yellow-brown to mid-brown.

This large and very distinctive species is apparently confined to New Guinea and appears to be known only from the type-series and the single specimen of its absolute synonym *flavus*.

The *tenuicrinis*-group

Antennae with 11 segments. Sting appendage spatulate and projecting at a distinct angle from the shaft. Propodeum unarmed. Sculpture very reduced, predominantly unsculptured. Petiole with anterior and dorsal faces of node united in a single shallow curve (Fig. 13).

This enigmatic little species has a very limited distribution (see below) at the extreme eastern edge of the known range of *Tetramorium* species in which the antennae have 11 segments. Its affinities are not clear but I suspect that it may be derived from the *tortuosum*-group although I have no clear evidence to support the statement.

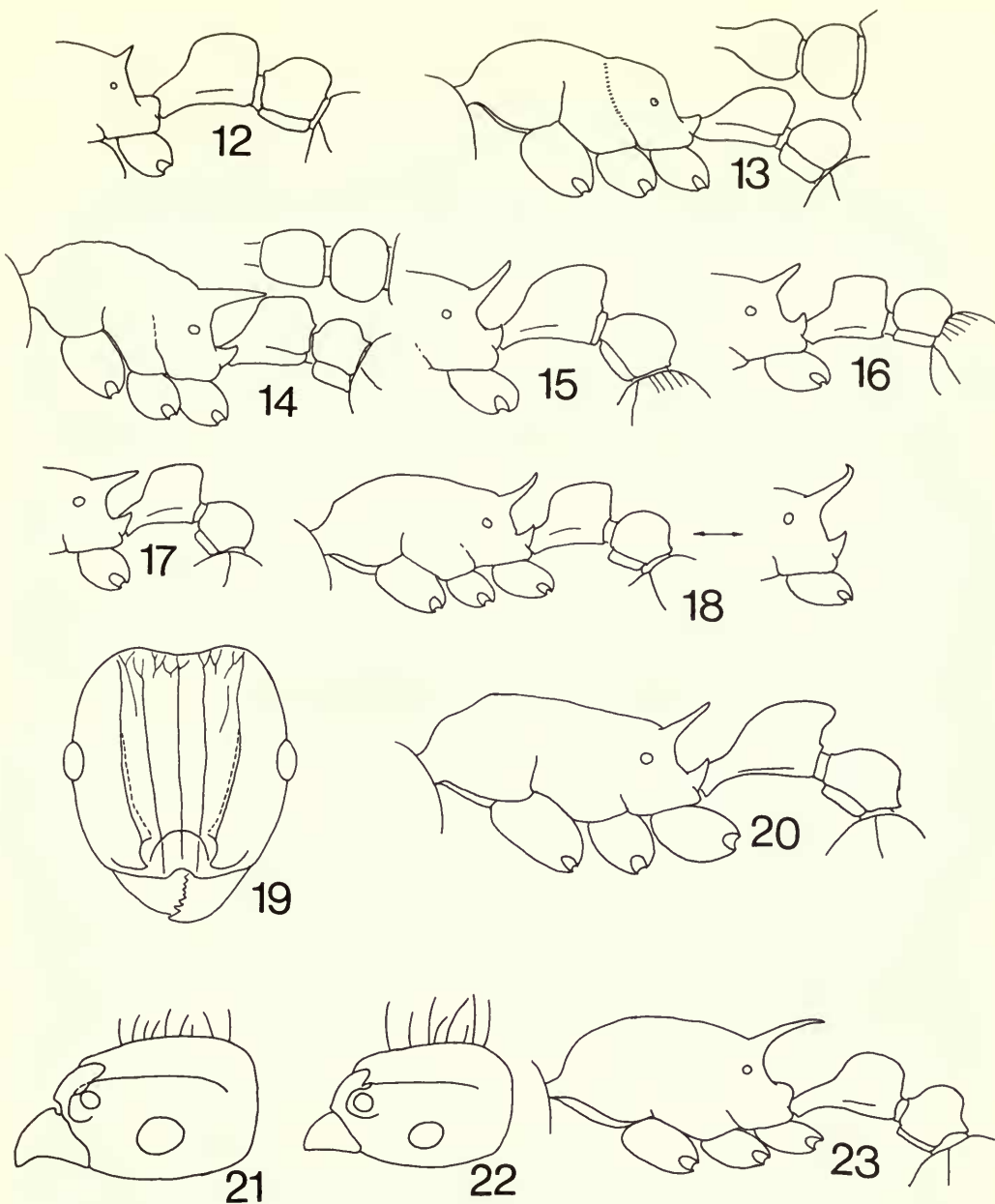
Of all the known *Tetramorium* species of the regions at present under consideration only two have the propodeum unarmed. One of these is *tenuicrinis*, the other *infraspinum* of Java. This last-named species has 12-segmented antennae, a dentiform sting appendage, and is densely sculptured; thus there is little chance of confusing the two.

Tetramorium tenuicrinis (Emery) comb. n.
(Fig. 13)

Xiphomyrmex tenuicrinis Emery, 1914b : 416. Holotype worker, NEW CALEDONIA: Vallée de la Ngoi (*Sarasin & Roux*) (location of type not known).

WORKER. TL 3·40–3·80, HL 0·74–0·80, HW 0·64–0·74, CI 83–90, SL 0·58–0·68, SI 85–92, PW 0·52–0·58, AL 0·88–1·02 (20 measured).

Mandibles feebly striate to virtually smooth. Frontal carinae extending well beyond the level of the posterior margins of the eyes, forming the upper boundary of the feebly developed scrobe which is scarcely more than a shallow groove, not capable of containing the entire scape. Propodeum rounded to bluntly angulate but without spines or teeth, the metapleural lobes triangular and well developed. Node of petiole in profile longer than high, the anterior and dorsal surfaces confluent through a gentle curve (Fig. 13). In dorsal view both pedicel segments subglobular. Dorsum of head with median longitudinal carina present and with one or two short rugulae on each side of it, otherwise unsculptured. Promesonotal dorsum unsculptured or with a few very faint longitudinal rugulae separated by wide shining areas; propodeal dorsum usually with a few very fine rugulae. Pedicel segments and gaster smooth and shining, unsculptured. All dorsal surfaces of head and body with numerous long, fine hairs. Colour very variable. In series examined the colour has varied from entirely clear pale yellow to entirely blackish brown, the most common intermediate pattern being head and alitrunk (and usually pedicel) blackish brown, gaster and appendages yellow. Forms also occur in which the gaster is darker in shade than the alitrunk.



Figs 12-23. *Tetramorium* workers. 12-18. Alitrunk, propodeum and pedicel structure of (12) *urbanii*, (13) *tenuicrinis*, (14) *eleates*, (15) *pacificum*, (16) *bicarinarum*, (17) *insolens*, (18) *nipponense*. 19. Head of *cynicum*. 20. Alitrunk and pedicel of *cynicum*. 21, 22. Profile of head of (21) *bicarinarum*, (22) *insalens*. 23. Alitrunk and pedicel of *politum*. Sculpture and pilosity omitted except in 19, 21, 22.

This species, known only from New Caledonia and the Fiji Islands, represents the furthest easterly penetration of *Tetramorium* species with 11 antennal segments. It is not easy to relate this form to any other 11-segmented species but its lack of propodeal armament and very reduced sculpture make it easily identifiable.

MATERIAL EXAMINED. FIJI ISLANDS: Viti Levu, 5 m, W. Korovau (*E. O. Wilson*). NEW CALEDONIA: Chapeau Gendarme (*E. O. Wilson*); Montagne des Sources (*E. O. Wilson*); Ciu, nr Mt Canala (*E. O. Wilson*); Mt Mou (*E. O. Wilson*); St Louis (*N. L. H. Krauss*).

The *angulinode*-group

Antennae with 11 segments. Sting appendage spatulate and usually with an upcurved apical portion or apical lobe. Mandibles unsculptured, smooth except for a few scattered pits from which hairs arise. Petiole thick-nodiform, usually sculptured, at least on the sides. Antennal scrobes developed, the scapes relatively short, SI 64–75. Sculpture of head and alitrunk conspicuous.

The *angulinode*-group consists of eight African species and a single species, *smithi*, which occurs outside the Ethiopian region. This small species is very widely distributed in the Oriental and Indo-Australian regions but apparently does not occur in Australia.

Tetramorium smithi Mayr

Tetramorium smithi Mayr, 1878 : 673. Syntype workers, INDIA: Calcutta (*Rothney*) (BMNH; NM, Vienna) [examined].

Tetramorium simillimum subsp. *laevinode* Forel, 1902a : 235. Holotype worker, INDIA: Calcutta (*Rothney*) (MHN, Geneva) [examined]. **Syn. n.**

Tetramorium (Xiphomyrmex) smithi var. *kanariense* Forel, 1902b : 703. Syntype workers, INDIA: Kanara (*Wroughton*) (MHN, Geneva) [examined]. **Syn. n.**

WORKER. TL 2.40–2.60, HL 0.60–0.68, HW 0.56–0.64, CI 89–97, SL 0.42–0.46, SI 69–75, PW 0.44–0.52, AL 0.68–0.76 (25 measured).

Mandibles unsculptured, smooth and shining with scattered small pits. Frontal carinae extending back beyond the level of the posterior margins of the eyes. Antennal scrobes shallow but quite broad and long enough to accommodate the scapes; the latter short, with SI < 80. Pronotum in dorsal view with the corners sharply angulate. Propodeum with a pair of spines, the metapleural lobes triangular, upcurved, acute apically. Petiole in dorsal view with the node as broad as or broader than long, the postpetiole distinctly broader than long. In profile the node of the petiole a roughly rectangular block, usually slightly higher than long, with parallel and near-vertical anterior and posterior faces, and the dorsum flat to feebly convex. Postpetiole lower and rounded dorsally. Head and dorsal alitrunk predominantly longitudinally rugose but with scattered, smaller cross-meshes which are not as conspicuous. Petiole usually sculptured dorsally, only very rarely with this sculpture completely effaced. Postpetiole and gaster without sculpture. Hairs numerous on all dorsal surfaces. Colour light to mid-brown, usually with the gaster darker.

This small species is a member of the *angulinode*-group, otherwise confined to the Ethiopian region. Its small size, unsculptured mandibles and short antennal scapes immediately separate it from all other *Tetramorium* with 11-segmented antennae in the regions at present under consideration.

MATERIAL EXAMINED. SRI LANKA: Coragas, nr Eliy (Univ. Lond. exped.). INDIA: Cochin (*Rothney*); no loc. (ex coll. F. Smith); Travancore (*Bingham*); Ratnagar (?); Assam, Misamari (*A. C. Cole*); Bombay (*Rothney*). BHUTAN: Samchi (*C. Baroni Urbani*). BURMA: Mandalay (*N. N. Myaing*). THAILAND: Bangkok (*H. Hillman*). VIETNAM: Saigon, Jardin Bot. (*R. H. Crozier*). WEST MALAYSIA: Malaya, Kuala Lumpur (*B. Bolton*). BORNEO: Timur Sengata R. (*J. Kurland*). SULAWESI: N.E., Tanete, Balampesoang For. (*W. L. Brown*).

The *fergusoni*-group

Antennae with 12 segments; sting appendage spatulate. Frontal carinae short, ending before level of eyes. Antennal scrobes absent. Propodeal spines long, peduncle of petiole long (Figs 31, 32).

A very easily characterized group containing at present only a single species, *fergusoni*, known only from the type-collection made in India. The unique combination of 12-segmented antennae and spatulate sting appendage is not encountered in any other species in the Oriental, Indo-Australian or Australian faunas. This condition does, however, occur in some African species, as discussed following the description of *fergusoni*.

***Tetramorium fergusoni* Forel**
(Figs 31, 32)

Tetramorium fergusoni Forel, 1902a : 234. Syntype workers, INDIA: Travancore, Iviii, 76 (*Ferguson*) (MHN, Geneva; BMNH) [examined].

WORKER. TL 2·8–3·0, HL 0·68–0·70, HW 0·66–0·68, CI 97, SL 0·46–0·50, SI 70–74, PW 0·44–0·46, AL 0·76–0·78 (2 measured).

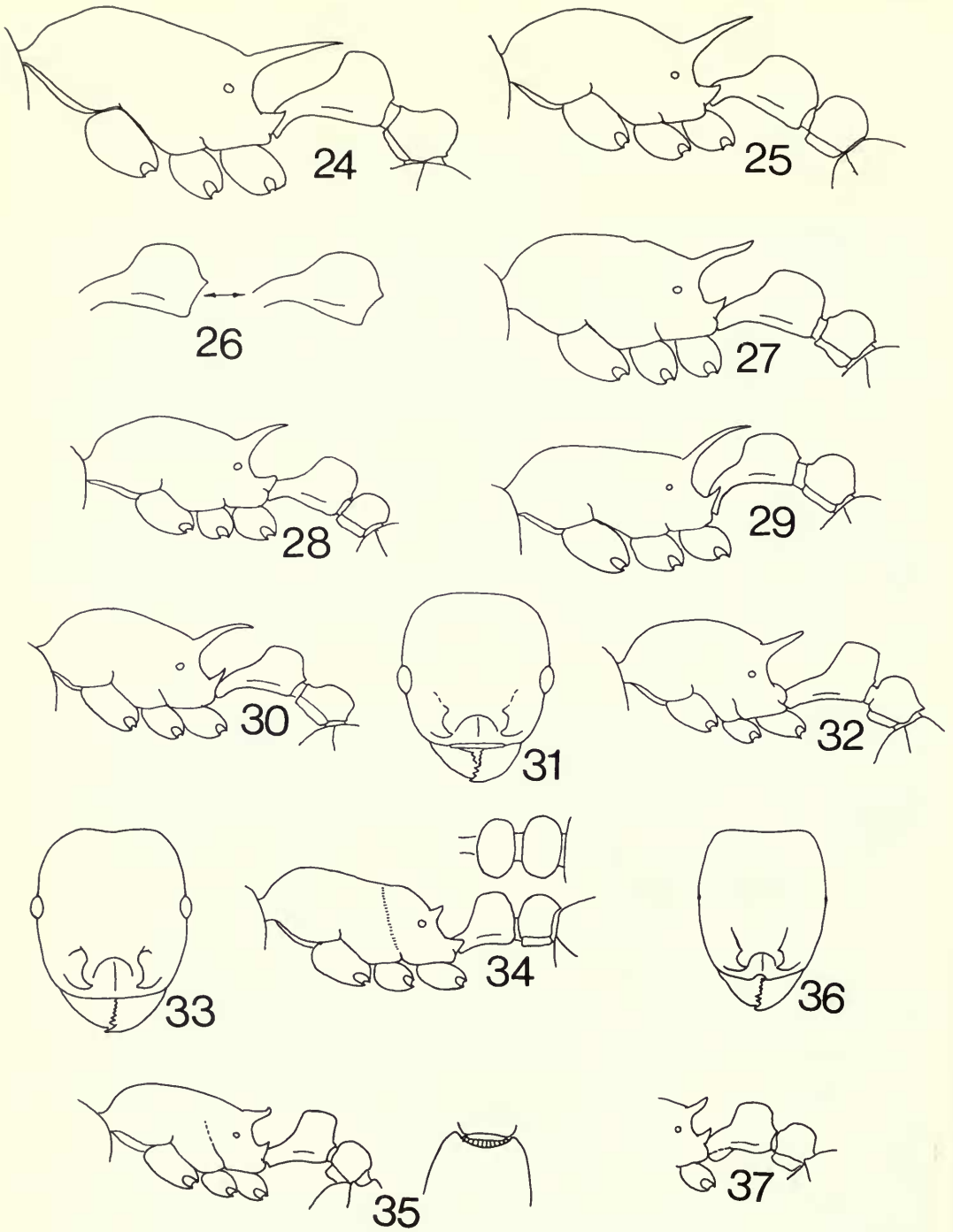
Mandibles striate; anterior clypeal margin entire and the median portion equipped with a narrow but quite distinct lamelliform apron or flange. Median portion of clypeus flat. Frontal carinae very short, ending just behind the level of the posterior margin of the clypeus. A few weak rugulae may arise from the apices of the frontal carinae and these are directed strongly laterally, the most posterior of them directed towards the midlength of the inner margin of the eye. Antennal scrobes completely absent. Maximum diameter of eyes *c.* 0·14. Propodeal spines in profile stout, quite long, acute and more or less straight; metapleural lobes low and rounded. Petiole in profile with a long anterior peduncle and a high, quite narrow and roughly rectangular node. In dorsal view both nodes distinctly broader than long. Lamelliform appendage of sting spatulate and in line with the long axis of the sting shaft. Dorsum of head with widely spaced but quite numerous straight, feeble, longitudinal rugulae, spaces between them shining. Dorsal surfaces of alitrunk and petiole mostly shining but with faint scattered rugulation; dorsum of postpetiole and entire gaster unsculptured. Short erect or suberect hairs numerous on all dorsal surfaces of head and body, and also on the leading edges of the scapes and the dorsal (outer) surfaces of the middle and hind tibiae. Some hairs on dorsum of body flattened from side to side. Colour uniform orange-yellow.

Known only from the type-series, this species is unique in the tetramoriine fauna of the regions at present under consideration as it is the only one to have 12-segmented antennae matched with a spatulate sting appendage. In the Ethiopian region two species-groups (*squaminode*-group and *grassii*-group) show this combination, but in both of these the frontal carinae tend to be strongly developed, and in the former group the petiole node is markedly squamiform. Thus *fergusoni* stands quite alone at the present time, an obscure and poorly known species whose affinities are not at all apparent.

The *caespitum*-group

Antennae with 12 segments. Sting appendage triangular or dentiform. Anterior clypeal margin entire. Frontal carinae short, sometimes virtually absent, never extending back as far as the posterior margins of the eyes, generally much shorter. Antennal scrobes absent. Eyes usually at about the midlength of the sides of the head. Metanotal groove almost always impressed in profile, even if only weakly so. Propodeal spines short, often dentiform, sometimes reduced to tubercles. Nodes of both petiole and postpetiole in dorsal view at least as broad as long, usually distinctly broader than long. Basal angles of first gastral tergite not projecting as a pair of tubercles or horns. Scapes and hind tibiae dorsally without long, erect or suberect hairs but often with suberect or subdecumbent pubescence. Sculpture of head of fine, regular longitudinal rugulation or reduced, in some species the head virtually unsculptured.

This is the dominant and only endemic group of *Tetramorium* in the Palaearctic region and most of its species are restricted to that region. One or two species occur in the Ethiopian region proper and a single species (*nursei*) occurs in the northern Oriental region. At the far eastern end of the Palaearctic region it is possible that *T. caespitum* (L.) and perhaps some of its close relatives may overlap the regional boundaries and occur in the northern strip of the Oriental region, just as a few species which are properly Oriental in distribution (but not of *caespitum*-group) may occur in the southern portion of the Palaearctic region. Such overlaps by *caespitum* into the Oriental region are ignored in this paper and will be dealt with in the section dealing with the Palaearctic fauna.



Figs 24-37. *Tetramorium* workers. 24, 25. Alitrunk and pedicel of (24) *wagneri*, (25) *salomo*. 26. Variation of petiole shape in *sculptatum*. 27-30. Alitrunk and pedicel of (27) *navum*, (28) *rigidum*, (29) *etiolum*, (30) *basum*. 31. Head of *fergusoni*. 32. Alitrunk and pedicel of *fergusoni*. 33. Head of *nursei*. 34. Alitrunk and pedicel of *nursei*. 35. Alitrunk, pedicel and shape of base of gaster in *ingleyi*. 36. Head of *myops*. 37. Propodeum and pedicel of *myops*. Sculpture and pilosity omitted.

Tetramorium nursei Bingham

(Figs 33, 34)

Tetramorium nursei Bingham, 1903 : 181 fig. 67. Syntype workers, PAKISTAN: N.W. Frontier, Quetta, 4.02 (*Nurse*) (BMNH) [examined].

WORKER. TL 3.0-3.2, HL 0.74-0.80, HW 0.66-0.74, CI 89-92, SL 0.56-0.60, SI 81-85, PW 0.44-0.48, AL 0.88-0.94 (4 measured).

Mandibles striate, anterior clypeal margin entire. Frontal carinae very short, ending at the posterior level of the depression accommodating the antennal insertions. Antennal scrobes absent. Maximum diameter of eyes *c.* 0.14. Occipital margin of head shallowly concave in full-face view, the sides of the head feebly convex. With the alitrunk in profile the site of the metanotal groove feebly impressed. Propodeal spines minute, triangular and dentiform. Metapleural lobes short and broadly triangular. Petiole in profile high and relatively narrow, the height of the tergal portion greater than the length of the dorsum. In dorsal view both petiole and postpetiole distinctly broader than long. Dorsum of head largely unsculptured, with some very fine, faint longitudinal rugulae medially and a few stronger rugulae between the eye and the antennal insertion. Dorsal alitrunk mostly unsculptured but the anterior pronotum with some superficial punctulation and elsewhere with sparse, very faint, almost effaced superficial shagreening. Dorsal surfaces of petiole, postpetiole and gaster unsculptured. All dorsal surfaces of head and body with numerous quite stout erect or suberect hairs, absent from the appendages. Colour uniform dark yellowish brown.

This species belongs to the predominantly Palaearctic *caespitum*-group and has affinity with *semilaeve* André and its allies. The taxonomy of this group has never been satisfactorily worked out although the group itself is compact and well defined (see above). This definition of the group plus the above diagnosis of *nursei* should serve to separate this species from all others in the Oriental and Indo-Australian regions, although the latter may not be sufficient to separate it from other members of the *caespitum*-group, should any more be found in these regions.

The *bicarinatum*-group

Antennae with 12 segments. Sting appendage triangular, dentate or pennant-shaped. Anterior clypeal margin convex and with a notch or impression medially, this notch better developed in some species (*bicarinatum*, *cynicum*) than in others (*pacificum*, *validiusculum*). Median portion of clypeus with three main longitudinal carinae, often without other sculpture but sometimes with another pair of carinae which are much weaker, often incomplete or broken. Mandibles variously sculptured, smooth or striate. Frontal carinae always strongly developed, reaching back almost or quite to the occipital margin. Propodeal spines always strongly developed, straight or somewhat upcurved along their length. Base of gaster never modified as in *mixtum*-group but several species with basigastral costulae present. Basic sculpture throughout the group is a rugoreticulum, variously modified amongst the constituent species, especially upon the head.

The members of this group constitute the larger, more common and more conspicuous members of the genus in the regions at present under consideration, and the group falls roughly into two complexes of species. The first complex includes *pacificum* and its allies *bicolor*, *tricarinatum*, *cynicum* and *validiusculum*. In these species there is a tendency for the mandibles to be unsculptured and the petiole is modified into a characteristic shape (Figs 15, 20). Of the five species *pacificum* has the widest range, being found throughout the Oriental and Indo-Australian regions and also appearing in northern Australia. It may occasionally be introduced into the United States (M. R. Smith, 1943). Compared to this the ranges of other species in the complex are relatively restricted; *cynicum* to the Philippines, *bicolor* and *tricarinatum* to New Guinea (the latter also occurs on New Ireland) and *validiusculum* to New Guinea and Queensland.

The second complex has three species with sculptured mandibles (*bicarinatum*, *indicum*, *nipponense*) and two with them unsculptured (*insolens*, *obtusidens*). In general these species are more widely distributed than those related to *pacificum* and their petioles are not modified as in that complex. *T. bicarinatum* occurs throughout the tropics but is absent from the Ethiopian region. It is also a common tramp species in hothouses and zoological gardens in the temperate zones. The distribution of *indicum* forms an arc around the eastern Indian Ocean from India to Java but *nipponense* has a more northerly distribution in the Oriental region. *T. obtusidens* is

known from collections in Thailand and Singapore and also from New Guinea, but I suspect that those from this last-named locality may represent a separate species. Finally, *insolens* ranges widely in the Indo-Australian region, occurs sporadically in the Oriental and also acts as a tramp species, being known from heated buildings in England and Germany. This tramp activity may account for the Oriental region captures of *insolens* also, but strangely it has not yet been recorded from Australia.

At this point I should correct a couple of errors made in part one (Bolton, 1976) of this study. The first is that under the discussion of *Tetramorium* I refer to *T. guineense*. This name is now known to be incorrect (see below) and the name *bicarinatum* should be substituted throughout. The second error is that under the discussion of subgenera *Lobomyrmex* and *Sulcomyrmex* (p. 364), I state that in some members of *guineense*-group (recte *bicarinatum*-group) the frontal carinae are short. My concept of this group has changed since that time and the species with shorter or very reduced frontal carinae are now placed in the *ornatum*-group. This in no way affects the argument for the synonymy of the subgenera as long-carinate species also occur in this group, but at this point *ornatum*-group should be read for '*guineense*- and *pacificum*-group' in part one of this study.

The *bicarinatum*-group as a whole has a very wide distribution for, apart from the ten species discussed in the present paper, an approximately equal number of species occur in the Ethiopian region.

Tetramorium bicarinatum (Nylander) **stat. rev.**

(Figs 16, 21)

Myrmica bicarinata Nylander, 1846 : 1061. Syntype workers, female, U.S.A.: California, 1840 (types lost; not in ZMU, Helsinki nor MNHN, Paris). [Synonymized to *guineense* (F.) by Roger, 1862 : 293.]

Myrmica cariniceps Guérin-Méneville, 1852 : 79. Holotype worker, DOMINICAN REPUBLIC: Santo Domingo I., 19.iv.1850 (*A. Sallé*) (ZSBS, Munich) [examined]. [Synonymy *guineense* = *cariniceps* by Roger, 1862 : 293.]

Myrmica kollari Mayr, 1853 : 283. Syntype workers, female, male, AUSTRIA: Vienna, in hothouses in botanical gardens (NM, Vienna) [examined]. [Synonymy *guineense* = *kollari* by Roger, 1862 : 293.]

Tetramorium kollari (Mayr) Mayr, 1855 : 425.

Myrmica modesta F. Smith, 1860 : 108. Syntype workers, INDONESIA: Batjan I. (= Bachian) (*A. R. Wallace*) (UM, Oxford) [examined]. [Junior homonym of *Myrmica modesta* Foerster, 1850 : 49; the synonymy *guineense* = *modesta* F. Smith by Donisthorpe, 1932 : 463.]

Myrmica reticulata F. Smith, 1862 : 33. Syntype workers, PANAMA: (*R. W. Stretch*) and GREAT BRITAIN: England, Exeter, botanic gardens (*Parfitt*) (BMNH) [examined]. [Synonymy *guineense* = *reticulata* by Roger, 1862 : 293.]

[*Myrmica guineensis* (F.) sensu Roger, 1862 : 293 (= *Myrmica bicarinata*, *Myrmica cariniceps*, *Myrmica reticulata* and *Tetramorium kollari*). Misidentification.]

[*Tetramorium guineense* (F.) sensu Mayr, 1862, 1863; Roger, 1863b and all subsequent authors (with the above included as synonyms – see discussion below). Misidentifications; not *Formica guineensis* Fabricius, 1793 : 357 nor sensu Fabricius, 1804; Latreille, 1802.]

NOTE. The species described as *Formica guineensis* by Fabricius (1793) has consistently been referred to as *Tetramorium guineense* in all publications since the early 1860s, but examination of the types of *guineensis* shows that this generic placement in *Tetramorium* is incorrect and that the correct placement is in the genus *Pheidole* Westwood, as all six type-specimens are minor workers of a small West African species of that genus. Hence *Pheidole guineensis* (F.) is the **comb. n.** for *Formica guineensis* Fabricius, 1793 : 357; LECTOTYPE and five paralectotype minor workers, GUINEA (*Dr Isert*) (UZM, Copenhagen), here designated [examined].

It is certain that when Roger (1862) equated *guineensis* with *bicarinata*, *cariniceps*, *reticulata* and *kollari* (these last four names representing a single true *Tetramorium* species), he did not see the types of *guineensis* but relied upon comparison of specimens in his possession with the rather poor original description. In point of fact true *bicarinatum* remains unknown from West Africa, the type-locality of *guineensis*, and specimens of *bicarinatum* do not completely fit Fabricius' original description of *guineensis*. In the same year as Roger's publication Mayr (1862) referred *guineensis* to *Tetramorium* and it was later referred to in indexes under this genus by both Roger (1863b) and Mayr (1863). The misidentification of the previous year was thus given an authority which it did not deserve to possess and it has since been universally

accepted, despite the fact that the types of *guineensis* do not appear to have been examined by any later workers.

Thus, with the removal of *guineensis* to *Pheidole* the next available name for this well-known tramp species is *bicarinatum* which now becomes the valid name, with the others listed above as its junior synonyms. Although this species is widely distributed and quite well known it has no particular economic importance and I can see no reason for attempting to maintain *guineense* as a *Tetramorium* by act of the International Commission.

WORKER. TL 3.4–4.5, HL 0.80–1.00, HW 0.68–0.86, CI 80–87, SL 0.54–0.68, SI 75–84, PW 0.50–0.62, AL 0.94–1.20 (114 measured).

Mandibles very finely and densely longitudinally striate; extremely rarely the striae disorganized and the mandibles appearing finely shagreened. Anterior clypeal margin with a marked median notch or impression. Median portion of the clypeus with three longitudinal carinae of about equal strength, a median and one on each side. Sometimes another carina present on each side of the median but these are very feeble by comparison and nearly always incomplete or broken. Frontal carinae strong, running back almost to the occiput and equipped above with a narrow, raised semi-translucent flange or rim. Eyes relatively large, maximum diameter *c.* 0.19–0.24 in the head width range given above, so that diameter of eye is about 0.26–0.29 × HW, the eyes prominent in full-face view. Pronotal angles sharp in dorsal view, giving the alitrunk a 'square-shouldered' appearance. Metanotal groove absent but some specimens with a shallow impression in the alitrunk outline at its approximate position. Propodeal spines in profile strong and acute, moderately long, varying from more or less straight to slightly upcurved along their length. Metapleural lobes elongate-triangular and upcurved. Petiole node in profile roughly rectangular, with parallel or almost parallel anterior and posterior faces and an evenly convex dorsum which meets each face in an angle (Fig. 16). The anterodorsal and posterodorsal angles of the node in profile are on a level as the dorsum of the node does not slope upwards posteriorly. Dorsum of head with scattered irregular longitudinal rugae with a few cross-meshes but behind the level of the eye with a strong rugoreticulum. Ground sculpture between the rugae superficial and inconspicuous. Dorsum of alitrunk, petiole and postpetiole reticulate-rugose, the sides of the pedicel segments similarly sculptured. Gaster unsculptured for the most part but nearly always with some short, fine basal costulae on the first tergite. These may be very faint but are only rarely completely absent. All dorsal surfaces with numerous erect or suberect hairs, those projecting from the dorsum of the frontal carinae between the antennal insertions and the occipital corner relatively short (by comparison with other species of the group), shorter than the maximum diameter of the eye (Fig. 21). Head, alitrunk, petiole and postpetiole varying from light yellow-brown to bright orange-yellow, the gaster always much darker, deep brown or blackish brown.

Because of the extremely wide range, tramping behaviour and ability to establish itself in temperate-zone hothouses this species is one of the best known of the genus *Tetramorium*. Its remarkable range takes in all tropical and subtropical land masses (with the exception of the Ethiopian region), most if not all of the Pacific island systems, and numerous other islands in the Atlantic and Indian Oceans. It has also been introduced into many temperate lands but here appears capable only of surviving in constantly heated buildings.

Over this vast area the species remains extremely stable, only showing variation in intensity of sculpture, propodeal spine length and degree of curvature, slight differences in colour and node shape, and some differences in size, none of which show any geographical significance and all of which seem characteristic variations of *Tetramorium* species in general.

Of the numerous samples from the Ethiopian region which were determined as *guineense* (= *bicarinatum*) and which I have examined, not a single specimen was in fact referable to this species, but all belonged to a complex of the group apparently restricted to sub-Saharan Africa. It appears that this complex of species is capable of excluding *bicarinatum* from Africa, even in areas disturbed by man. Wherever this complex is absent, as in Madagascar and the islands of the Malagasy region, *bicarinatum* is able to establish itself. Because of this and because a number of closely related species overlap the range of *bicarinatum* in the Oriental and Indo-Australian regions I am now of the opinion that *bicarinatum* is of SE. Asian origin and not African origin as I and others originally thought (most recently Creighton, 1950; Brown, 1957; Wilson & Taylor, 1967; Bolton & Collingwood, 1975). One closely related species, *insolens*, ranges over the Pacific islands and many islands of Indonesia and the Philippines, extending its range to Sri Lanka in the west. Further north *nipponense* occurs, a sibling of *bicarinatum* which is widely dispersed in the mountains of Bhutan, south China, north Vietnam, Japan, Okinawa and Taiwan.

A very small relative, *obtusidens*, is known from collections in Thailand, Singapore and New Guinea but is a much less conspicuous species than those mentioned previously; and finally *indicum* ranges widely in the Oriental and the Indo-Australian regions. Characters separating *bicarinatum* and *insolens* are tabulated under the latter name; those separating *nipponense* are summarized in the key and discussion of that species; similarly with *indicum*.

MATERIAL EXAMINED. MADAGASCAR: Perinet (*W. L. Brown*). SEYCHELLE IS: Frigate I. (*U. Müller*); Cargados (*J. S. Gardiner*). CHAGOS ARCHIPELAGO: Eagle I. (*M. J. D. Hirons*); Diego Garcia (*A. M. Hutson*). COSMOLEDO IS: Menai I. (*B. Cogan & A. M. Hutson*). INDIA: Kanara (*Aitken & Wroughton*); Assam, Misamari (*A. C. Cole*). SRI LANKA: Maha-Oya distr. (*R. Winney*); Udugalla (*K. L. A. Perera*); Laxapathiya (*K. L. A. Perera*); Penadura (*K. L. A. Perera*); Galle distr., Udugama (*A. E. Stubbs*); no loc. (*Uzel*). PAKISTAN: no loc. (coll. Agric. Dept.). BHUTAN: Punakha (*C. Baroni Urbani*); Phuntsholing (*C. Baroni Urbani*). CHINA: Foochow (*F. Silvestri*); Hainan I. (*L. Gressitt*). BURMA: Mandalay (*Nyo Nyo Myaing*). ANDAMAN IS: Stewart Sound (*G. Rogers*). WEST MALAYSIA: Malaya, Gombak (*R. Crozier*); Kedah (*E. S. Ross & D. Q. Cavagnaro*); Gunong Jerai (*G. H. Lowe*); Sg. Patani (*G. H. Lowe*). CHRISTMAS I. (*C. W. Andrews*). SUMATRA: Takengon (*G. Fairchild*). SUMBA: Laora (*Dammermann*). JAPAN: Chichi-Jima I., Ogasahara (*M. Tanaka*); Kagoshima Pref., Tanegashima (*M. Tanaka*); Iriomote I., Komi (*M. Tanaka*); Okinawa I., Hedo (*G. E. Bohart*); Nozato (*C. Parsons*); Chinen (*C. Parsons*), Shido (*F. G. Werner*); Loochoo I. (*L. Gressitt*). TAIWAN: Kyukyokudo (*K. Sakimura*), Bantan (*K. Sakimura*); Taihoku (*P. Takahashi*); Funkiko (*F. Silvestri*). PHILIPPINES: Manila (*R. Thaxter*); no loc. (*L. E. Griffin*); Dumaguete (*J. W. Chapman*); Horns of Negros (*J. W. Chapman*); Los Banos (*R. Thaxter*); Baguio (*J. W. Chapman*); Samar (*McGregor*); Los Banos (*L. B. Uichunco*). PALAWAN IS: Binaluan (*G. Boettcher*). NEW GUINEA: Maffin Bay (*E. S. Ross*); Mt Nomo (*L. E. Cheesman*). NEW BRITAIN: Lindenhafen (*B. A. O'Connor*). SOLOMON IS: Santa Cruz I. (*R. A. Lever*); Three Sisters I. (*R. A. Lever*); Malaita I. (*M. Willows*). AUSTRALIA: Queensland, Townsville (*F. P. Dodd*); Q., Cairns (*E. B. Britton*); Q., Cairns (*W. M. Wheeler*); Q., Capricorn I. (*F. A. Rodway*); Q., Redlynch (no coll.); Q., Mackay (*R. E. Turner*); Q., Kuranda (*F. P. Dodd*); Q., Kuranda (*W. M. Wheeler*); Q., Montville (*W. L. Brown*); Q., Ravenshoe (*Darlington*); Q., Rotnest I. (*L. Glauert*); Sydney (*H. Ashton*); Northern Territory, Rutherford (*H. B. Weiss*). LOYALTY IS: Maré (*B. Malkin*). NEW HEBRIDES: Erromanga (*L. E. Cheesman*); Malekula (*L. E. Cheesman*); Malekula (*B. Malkin*). FIJI IS: Vanua Balava (*H. S. Evans*); Suva (*H. W. Simmonds*); Nausori (*R. Vietch*); Nasoqo (*W. M. Mann*); Suva (*W. M. Wheeler*); Nadarivatu (*W. M. Mann*); Suene (*W. M. Mann*); Viti Levu (*N. L. H. Krauss*). WALLIS IS: Nuku Hifala I. (*G. Hunt*); Nuku Tapu I. (*G. Hunt*). FUTUNA IS (*G. Hunt*). SAMOAN IS: Upolu, Apia (*H. Swale*); Upolu, Malololelei (*P. A. Buxton*); Apia (*Buxton & Hopkins*); Afiamalu (*O. H. Swezey*); Tapatapao (*E. C. Zimmermann*); Tapatapao (*O. H. Swezey*); Tutuila (*E. C. Zimmermann*); Tutuila (*O. H. Swezey*); Tutuila (*D. T. Fullaway*); Pago Pago (*W. M. Wheeler*). TOKELAU IS (*E. H. Bryant*). TONGA IS: Tongatabu I. (*N. L. H. Krauss*). SOCIETY IS: Opoa (*N. L. H. Krauss*); Tahiti (*L. E. Cheesman*). MARQUESAS IS: Nuka-hiva (*L. E. Cheesman*); Fatu-hiva (*L. E. Cheesman*). MARIANA IS: Saipon I. (*H. S. Dybas*); Saipan (*N. L. H. Krauss*); Saipan (*R. M. Bohart*); Saipan (*R. K. Enders*); Pagan (*Yasu. et Yoshi.*); Guam (*N. L. H. Krauss*); Guam (*Bohart & Gressitt*). CAROLINE IS: Yap I. (*R. J. Goss*); Palau I. (*J. L. Gressitt*); Mogmog Is (*N. L. H. Krauss*); Woleia I. (*N. L. H. Krauss*); Tobi I. (*N. L. H. Krauss*); Fasserai I. (*N. L. H. Krauss*); Truk I. (*Yasu. et Yoshi*); Truk I. (*R. W. L. Potts*); Sonsorol I. (*N. L. H. Krauss*). AUSTRAL IS: Rapa I. (*A. M. Stokes*); Rapa I. (*Zimmermann*); Rimatara I. (*A. M. Stokes*). GILBERT IS: Tarawa (*E. S. Brown*); Butaritan (*N. L. H. Krauss*); Tarawa (*N. L. H. Krauss*). ELLICE IS: Funafuti (*E. S. Brown*). WAKE IS: (*T. Lyons*). GALAPAGOS IS: Tower I. (*W. M. Wheeler*). BAHAMA IS: Andros I. (*W. M. Wheeler*). TRINIDAD: (*G. Murray*); Mayaro Bay (*W. M. Wheeler*). CUBA: Zaza d. Media (*W. M. Wheeler*); Pinar del Rio (*E. O. Wilson*); Cienaga de Zapata (*W. M. Wheeler*); Soledad (*N. A. Weber*); Cunagua (*H. L. Plank*); Soledad (*W. M. Wheeler*); Soledad (*C. T. & B. B. Brues*); Vinales (*W. M. Wheeler*). PUERTO RICO: Mayaquez (*M. R. Smith*); Maricao For. (*P. Darlington*); Caguso (*Wheeler*); Pico Turquino (*P. J. Darlington*); Cerro Cabras (*W. M. Wheeler*). DOMINICA: Roseau (*W. M. Wheeler*). HAITI: Ennery (*W. M. Mann*); Grande Riviere (*W. M. Mann*). PANAMA: Toboga (*L. E. Cheesman*). HONDURAS: Punta Gorda (*J. J. White*). NICARAGUA: (*W. Fluck*). VENEZUELA: Orinoco Delta

(*N. A. Weber*). GUIANA: no loc. (*G. E. Bodkin*). COLOMBIA: Buenaventura (*M. Cooper*); Arboletes Pt (*B. Mortin*); Dept. Valle, Buenaventura (*W. L. Brown*); Aracataca (*P. J. Darlington*). BRAZIL: no loc. (ex coll. F. Smith). PERU: Tingo Maria (*Brown & Sherbrooke*). U.S.A.: Texas, Laredo (*McClendon*); N.Y., Brooklyn (*W. T. Dario*); Florida, Bisc. Bay (*W. M. Wheeler*); Florida, Key Largo (*E. O. Wilson*); Wisc., Milwaukee (*C. E. Brown*). CAPE VERDE IS: Bea Vista (*L. Fea*). AZORES: Ponta Delgada (*A. Schatzmayr*). MADEIRA (*Wollaston*). GREAT BRITAIN: Edinburgh bot. gdns (ex coll. Donisthorpe); Glasgow (ex coll. Donisthorpe); Nottingham (ex coll. Donisthorpe); Stroud (*Rev. White*); Kew Gardens (*Donisthorpe*); Kew Gardens (*W. C. Crawley*); Liverpool (ex coll. Donisthorpe). HOLLAND: Amsterdam (*v. d. Wiel*).

Tetramorium bicolor Viehmeyer

Tetramorium bicolor Viehmeyer, 1913 : 39. Holotype worker, NEW GUINEA: Wareo (MNHU, Berlin) [examined].

WORKER. TL 3.6–3.8, HL 0.84–0.90, HW 0.68–0.76, CI 80–84, SL 0.64–0.72, SI 76–80, PW 0.52–0.56, AL 0.98–1.08 (2 measured).

Mandibles smooth with scattered pits. Anterior clypeal margin with a median notch or impression. Clypeus with three strong longitudinal carinae. Frontal carinae feeble but extending back almost to occiput. Median carina of head distinct only to level of posterior margins of eyes, behind this rapidly fading out or absent. Eyes prominent, maximum diameter *c.* 0.17–0.18. Pronotal corners angular in dorsal view. Metanotal groove absent. Propodeal spines long, narrow and acute, the metapleural lobes triangular and upcurved. Petiole in profile with the tergal portion longer than high, the anterior and dorsal faces united through a curve, not separated by an angle. Dorsum convex and sloping upwards posteriorly so that the posterodorsal angle is on a higher level than the anterodorsal. Head either completely unsculptured dorsally except for the median carina or at most with one or two short, fine rugulae here and there on the surface. Pronotal dorsum with a few rugae anteriorly and laterally but the middle of the pronotum and the whole mesonotum smooth and very shiny. Propodeal dorsum reticulate-rugulose. Petiole and postpetiole each with some rugae, predominantly or entirely longitudinal. Gaster unsculptured. All dorsal surfaces of head and body with abundant erect, long hairs. Colour very distinctive, the head and gaster black or blackish brown, the alitrunk, pedicel and appendages bright yellow, the colours strongly contrasting.

The construction of the petiole and general habitus shows that *bicolor* is very closely related to *pacificum* and its allies, but the reduced sculpture and distinct colouring immediately separates *bicolor*. It is one of three bicoloured (yellow and black) species occurring in New Guinea. One of these, *diligens*, belongs to the *carinatum*-group and hence is separable by its 11-segmented antennae and spatulate sting appendage. The other is *tricarinatum*, which is very closely related to *bicolor* but much more strongly sculptured, and which possesses three carinae on the cephalic dorsum between the frontal carinae, running from the posterior clypeal margin almost to the occiput.

MATERIAL EXAMINED. NEW GUINEA: Cyclops Mts, Mt Lina (*L. E. Cheesman*).

Tetramorium cynicum sp. n.

(Figs 19, 20)

HOLOTYPE WORKER. TL 4.7, HL 1.10, HW 0.98, CI 89, SL 0.84, SI 95, PW 0.66, AL 1.20.

Mandibles smooth, unsculptured except for scattered pits. Anterior clypeal margin with a strongly developed median notch. Clypeus with three strong carinae on the median section, the anterior half of which slopes very steeply and is transversely concave. Frontal carinae strong, reaching back almost to the occiput and surmounted by a low, vertical flange or ridge which is semitranslucent, highest anteriorly, shallowest posteriorly. Eyes prominent, maximum diameter *c.* 0.22. Occipital margin concave medially in full-face view, the sides feebly convex. Pronotal corners angular in dorsal view; metanotal groove absent, not impressed in profile. Propodeal spines elongate, narrow and acute, feebly upcurved. Metapleural lobes triangular and acute. Petiole in profile with the tergal portion slightly higher than long; anterior and dorsal faces meeting through a curve, not separated by an angle. Dorsum convex and sloping upwards posteriorly so that the posterodorsal angle is higher than the point at which the dorsum meets the anterior face. Posterior face slightly concave so that the posterodorsal angle is prominent and over-

hangs the posterior face (Fig. 20). Postpetiole in profile strongly convex. Dorsum of head with sparse, widely scattered longitudinal rugulae without any cross-meshes but with a few anastomoses close to the occiput. Spaces between rugulae broad and smooth, almost devoid of ground sculpture; what little there is being very inconspicuous so that the head is glossy. Pronotum reticulate-rugose, the meshes breaking down centrally; mesonotum mostly unsculptured, with a few faint longitudinal rugulae; propodeum with widely spaced rugosity. Petiole and postpetiole reticulate-rugose everywhere. Gaster unsculptured. All dorsal surfaces of head and body with numerous long, erect or suberect hairs. Colour yellow-brown.

PARATYPE WORKERS. TL 4.1–4.8, HL 0.92–1.10, HW 0.82–0.98, CI 86–90, SL 0.72–0.86, SI 86–95, PW 0.54–0.66, AL 1.06–1.26 (20 measured including largest and smallest). Maximum diameter of eye *c.* 0.18–0.22 so that the maximum diameter is about 0.22–0.23 × HW. As holotype but in some specimens the propodeal spines are straight and the mesonotum completely smooth. In many specimens the median clypeal carina is absent from the steeply sloping anterior portion of the clypeus (Fig. 19).

Holotype worker, PHILIPPINES: Dumaguete, 29.iv.24 (*J. W. Chapman*) (MCZ, Cambridge).

Paratypes. PHILIPPINES: 17 workers with same data as holotype; 12 workers, Dumaguete, 1500 ft (*J. W. Chapman*); 3 workers, Dumaguete, 13.iv.27 (*J. W. Chapman*) (MCZ, Cambridge; BMNH; NM, Basle).

More material of this species is present in MCZ, Cambridge (Chapman coll.), but much of it is in rather poor condition. The localities of this material include Dumaguete, Cuernos Mts and Horns of Negros, all collected by Chapman in the Philippines.

T. cynicum appears to be derived from a *pacificum*-like ancestor but it has certainly developed far enough away from the parent stock to be regarded now as a separate species, endemic in and apparently restricted to the Philippines. In many respects *cynicum* parallels *validiusculum*, a New Guinea-based sibling of *pacificum* which seems to have developed along similar lines. However, in this species the clypeal notch is feeble, the clypeus does not have a very steep anterior half and this portion of the clypeus is not or only extremely feebly transversely concave. The petiole node is longer and lower in *validiusculum* and the posterodorsal angle, though pronounced, does not appreciably overhang the posterior face of the node. All in all, *cynicum* and *validiusculum* appear to be two species descended from the same basal stock, but the first has been more profoundly modified than the second, away from the characters shown by modern *pacificum*.

Tetramorium indicum Forel stat. n.

Tetramorium guineense var. *indica* Forel, 1913 : 81. Syntype workers, females, SUMATRA: Tandjang Slanat and Bah Boelian (*Buttel-Reepen*) (MNH, Geneva) [examined].

WORKER. TL 3.7–4.3, HL 0.84–0.96, HW 0.74–0.88, CI 85–92, SL 0.60–0.72, SI 78–85, PW 0.52–0.62, AL 1.00–1.16 (40 measured).

Mandibles finely and usually quite faintly striate, sometimes the striation effaced in places. Clypeus with a notch or impression medially in the anterior margin, the median portion of the clypeus with three strong longitudinal carinae. Frontal carinae long and strong, extending back almost to the occiput. Eyes of moderate size, maximum diameter *c.* 0.18–0.21, so that the eye is about 0.23–0.25 × HW. Pronotal corners angular in dorsal view. Propodeal spines usually quite short and stout, more rarely elongated, usually approximately straight, elevated but not upcurved along their length nor abruptly and strongly upcurved at their apices. Metapleural lobes triangular, acute and slightly upcurved. Petiole in profile with the anterior face slightly shorter than the posterior so that the anterodorsal angle is on a lower level than the posterodorsal. Rugose sculpture of dorsal head longitudinal to level of posterior margins of eyes, without cross-meshes; behind this a rugoreticulum is present. Dorsal alitrunk reticulate-rugose as are the pedicel segments, although in some the postpetiole dorsum tends to be predominantly longitudinally rugose. Gaster usually with vestiges of basal costulae on the first tergite, more rarely unsculptured. All dorsal surfaces of head and body with numerous erect or suberect hairs, the longest of those projecting dorsally from the frontal carinae behind the antennal insertions longer than the maximum diameter of the eye. Colour uniform light brown to mid-brown, rarely with the gaster slightly darker than the alitrunk.

Like *nipponense* this species is very close to *bicarinatum*, but is separable by the characters shown in the key, especially the fact that the long hairs arising dorsally from the frontal carinae are consistently shorter than the maximum diameter of the eye in *bicarinatum*, and longer in *indicum*. The eye itself is larger in *bicarinatum*, its maximum diameter being 0.26–0.29 × HW

as opposed to 0.23–0.25 × HW in *indicum*. Colour pattern is also of value in separating the two as in *bicarinatum* the gaster is always conspicuously darker than the head and alitrunk, whereas in *indicum* the colour is usually uniform throughout; examples with the gaster slightly darker than the rest of the body are known but they are uncommon.

Without doubt the closest relative of *indicum* is *nipponense* and the best characters for separating this pair are those given in the key. The fact that the eyes of *nipponense* tend to be slightly larger in material examined may not be significant in the long run. In general the ranges of these two species tend to be mutually exclusive, but both forms occur in Bhutan as has been shown by the recent collections made there by Cesare Baroni Urbani. The range of *nipponense* appears to be an upland or mountain one, and the species occurs in a broad belt from Bhutan eastwards across southern and south-eastern China, northern Vietnam, Japan, Okinawa and Taiwan. On the other hand, the distribution of *indicum* occupies an arc around the eastern end of the Indian Ocean from India to Java, in the forested zones.

MATERIAL EXAMINED. SRI LANKA: Ratnapura (*E. O. Wilson*); Colombo (*E. O. Wilson*); Yakkala (*K. L. A. Perera*). INDIA: Kerala State, Kottiyoor (*A. B. Soans & W. L. Brown*). ANDAMAN IS: N. Reef I. (*G. Rogers*). BHUTAN: Phuntsholing (*C. Baroni Urbani*); Khala (*C. Baroni Urbani*); Samchi (*C. Baroni Urbani*). BURMA: no loc. (*G. B. King*). JAVA: Buitenzorg (*Verbeek*); Semarang (*L. G. E. Kalshoven*); Rembang (*L. G. E. Kalshoven*).

Tetramorium insolens (F. Smith)

(Figs 17, 22)

Myrmica insolens F. Smith, 1861 : 47. Holotype female (not worker), SULAWESI: Menado (*A. R. Wallace*) (UM, Oxford) [examined].

Tetramorium insolens (F. Smith); Donisthorpe, 1932 : 468.

Tetramorium guineense var. *macra* Emery, 1914b : 415. Syntype worker, NEW CALEDONIA: Koné, 8.viii.1911 (*Sarasin & Roux*) (NM, Basle) [examined]. **Syn. n.**

Tetramorium melanogyna Mann, 1919 : 345, fig. 28. Syntype workers, female, SOLOMON IS: Ugi, Pawa, 1916 (*W. M. Mann*); and Three Sisters, Malapaina, 1916 (*W. M. Mann*) (MCZ, Cambridge) [examined]. **Syn. n.**

Tetramorium pacificum var. *wilsoni* Mann, 1921 : 460. Syntype workers, FIJI IS: Viti Levu, Nausori, Waiyanitu, 1915–16 (*W. M. Mann*) (MCZ, Cambridge) [examined]. **Syn. n.**

Tetramorium melanogyna var. *pallidiventre* Wheeler, 1934b : 177. Holotype worker, SOLOMON IS: Bellona I., 19.vi.1933 (*M. Willows*) (CAS, San Francisco) [examined]. **Syn. n.**

WORKER. TL 3.3–4.0, HL 0.78–0.94, HW 0.68–0.84, CI 84–88, SL 0.56–0.68, SI 78–86, PW 0.50–0.62, AL 0.92–1.08 (40 measured).

Mandibles smooth and shining, unsculptured except for scattered pits. Anterior clypeal margin with a median notch or impression; median portion of clypeus with three strong longitudinal carinae. Frontal carinae long and strong, extending back almost to the occiput. Eyes of moderate size, maximum diameter *c.* 0.18–0.20, about 0.23–0.26 × HW. Pronotal corners in dorsal view angular. Propodeal spines long and stout, generally somewhat upcurved along their length, more rarely with the extreme apex of each spine suddenly upcurved. Metapleural lobes triangular, acute, somewhat upcurved. Petiole node in profile with anterior and posterior faces approximately parallel, the dorsum convex and rising slightly posteriorly so that the anterodorsal angle is on a slightly lower level than the posterodorsal angle, the latter angle usually distinctly sharper than the former, which has a tendency to be rounded. Dorsum of head to level of eyes with sparse longitudinal rugulae with a few cross-meshes and a fine but fairly conspicuous ground sculpture. Behind the level of the eyes the head reticulate-rugose. Dorsal alitrunk with an irregular rugoreticulum which is usually strongest on the pronotum. Petiole and postpetiole reticulate-rugose both laterally and dorsally. Gaster unsculptured. All dorsal surfaces of head and body with abundant long erect or suberect hairs, those situated in a row on the upper surfaces of the frontal carinae between antennal insertion and occiput very long, distinctly longer than the maximum diameter of the eye (Fig. 22). Colour varying from clear pale yellow to light orange-brown, usually with the gaster distinctly lighter in shade than the head and alitrunk. More rarely the ant is uniformly coloured and only very rarely indeed is the gaster slightly darker in shade than the alitrunk.

In collections from the island systems of the Pacific Ocean this species has in the past been much confused with *bicarinatum*. The most recent survey by Wilson & Taylor (1967) did not

differentiate the two species, although both were present in the material examined. At first glance the two appear quite similar, but are separated by the following differences:

bicarinatum

Mandibles covered with fine, dense striation or shagreening

Long hairs arising from margin of frontal carina behind antennal insertion and in front of occipital corner shorter than maximum eye diameter (Fig. 21)

Gaster always much darker in colour than head and alitrunk

Anterodorsal and posterodorsal angles of petiole in profile approximately on a level (Fig. 16)

Eyes relatively slightly larger, maximum diameter c. $0.26-0.29 \times HW$

insolens

Mandibles smooth and very shiny, with a few scattered pits

Long hairs arising from margin of frontal carina behind antennal insertion and in front of occipital corner longer than maximum eye diameter (Fig. 22)

Gaster usually lighter or same shade as head and alitrunk, only rarely slightly darker

Anterodorsal and posterodorsal angles of petiole in profile not on a level, the latter higher than the former (Fig. 17)

Eyes relatively slightly smaller, maximum diameter c. $0.23-0.26 \times HW$

This species is capable of surviving in permanently heated buildings in the temperate zone. I have seen samples from England and Germany, both of which were determined as *guineense* (now *bicarinatum*), so it is possible that other misidentified introductions of *insolens* have occurred, at present unrecognized. Up to the present *insolens* has not been recorded from Australia, but I have included it in the key to that fauna for completeness, as I feel sure that this widespread species will be found to occur in eastern Australia, if only as an introduction.

MATERIAL EXAMINED. SRI LANKA: Ratnapura (*E. O. Wilson*). FLORES: Wodeng (*W. L. Brown*). PHILIPPINES: Dumaguete (*J. W. Chapman*), Mailum (*F. del Rosario*); Mt Maquiling (*F. X. Williams*). NEW GUINEA: Nadzab (*E. O. Wilson*); Finsch Harbour (*N. G. L. Wagner*); Azeriia Plantation (*Szent-Ivany*); Finschhafen (*E. S. Ross*); Cyclops Mts, Sabron (*L. E. Cheesman*). SOLOMON IS: Wainoni Bay (*W. M. Mann*); Ugi (*W. M. Mann*); Malaita (*E. S. Brown*). NEW CALEDONIA: Dumbea Valley (*N. L. H. Krauss*). NEW HEBRIDES: Espiritu Santo (*E. O. Wilson*); Malekula (*B. Malkin*); Santo (*L. E. Cheesman*); Erromanga (*L. E. Cheesman*). FIJI IS: Suva (*Ehrhorn*); Viti Levu (*E. O. Wilson*); Taveuni (*H. S. Evans*); Nausori (*R. Veitch*). WALLIS IS: Uvea (*G. Hunt*). FUTUNA IS: Leava (*G. Hunt*). SAMOAN IS: Pango Pango (*E. C. Zimmermann*); Savaii (*N. L. H. Krauss*); Tutuila (*E. C. Zimmermann*); Upolu (*E. C. Zimmermann*); Tutuila (*T. Fullaway*); Upola (*Buxton & Hopkins*). CAROLINE IS: Yap I. (*J. L. Gressitt*). LOYALTY IS: Maré, Congeite (*B. Malkin*). NIEU I. (*A. E. Eyles*). GREAT BRITAIN: England, Rawdon, orchid house (*R. B. Benson*). GERMANY: Leipzig, zoological gdns (ex coll. Donisthorpe).

Tetramorium nipponense Wheeler stat. n.

(Fig. 18)

Tetramorium guineense subsp. *nipponense* Wheeler, 1928 : 115. Syntype workers, JAPAN: Nagasaki, Michino-o, 3.vi.25 (*F. Silvestri*) (MCZ, Cambridge) [examined].

WORKER. TL 3.3-3.7, HL 0.72-0.88, HW 0.62-0.78, CI 84-90, SL 0.54-0.64, SI 80-88, PW 0.48-0.58, AL 0.86-1.04 (20 measured).

Mandibles finely and densely longitudinally striate. Anterior clypeal margin with a distinct median notch or impression; median portion of clypeus with three strong longitudinal carinae. Frontal carinae strong, reaching back almost to the occipital margin. Eyes moderate, maximum diameter c. $0.18-0.20$, about $0.25-0.28 \times HW$. Pronotal corners in dorsal view angulate. Propodeal spines in profile elongate and narrow, either upcurved along their whole length or abruptly and strongly upcurved at their apices, or both. Metapleural lobes elongate-triangular, narrow, acute and somewhat upcurved, or with their apical portions more or less spiniform. Petiole node in profile with the anterior face shorter than the posterior so that the dorsal surface slopes slightly upwards posteriorly and the posterodorsal angle is on a higher level than the anterodorsal. Dorsum of head with a loose rugoreticulum, cross-meshes occurring as far forwards as the level of the anterior margins of the eyes or in some cases approaching the posterior border of the clypeus. Dorsal alitrunk and dorsum and sides of pedicel segments reticulate-rugose, but

in some specimens sculpture of postpetiole dorsum is predominantly or entirely longitudinal. Base of the first gastral tergite usually with vestiges of costulae, absent in some specimens, otherwise gaster unsculptured. Numerous long, erect or suberect hairs present on all dorsal surfaces of head and body, the longest of those projecting from the dorsum of the frontal carinae longer than the maximum diameter of the eye. Colour uniform yellowish brown, rarely with the gaster very slightly lighter or darker than the alitrunk.

T. nipponense overlaps the range of the related *bicarinatum* in the northern parts of the Indo-Australian and Oriental regions. The two are separated by the respective lengths of the long hairs arising from the frontal carinae, which are longer than the maximum diameter of the eye in *nipponense*, shorter in *bicarinatum*. Also, the gaster in *bicarinatum* is always conspicuously darker in colour than the head and alitrunk whilst in *nipponense* the entire ant tends to be unicolorous, with only slight variation in gastral colour. Finally, the petiole node in *bicarinatum* tends to have the anterior and posterior faces about equal in length in profile so that the antero- and posterodorsal angles are approximately on a level, whereas in *nipponense* the posterior face is somewhat higher than the anterior so that the angles are not on the same level, the posterodorsal being higher. This node form is also encountered in *insolens*, which overlaps the eastern end of the range of *nipponense*, but in *insolens* the mandibles are not striated. Finally, the closely related *indicum* is best separated by the characters noted in the key.

MATERIAL EXAMINED. BHUTAN: Khala (*C. Baroni Urbani*); Phuntsholing-Timphu (*C. Baroni Urbani*). CHINA: Foochow (*L. Gressitt*); Foochow (*Kellogg*); Kuliang (*S. F. Light*); Hsinching Hsien, Mou Man Shan (*W. L. Brown*); Szechwan Prov., Shwangliu (*W. L. Brown*); Szechwan Prov., Hsinching (*W. L. Brown*). VIETNAM: Tocco (*F. Silvestri*). JAPAN: Kochi (?); Chichijima I., Ogasawara (*M. Tanaka*); Okinawa (*F. G. Werner*). TAIWAN: Funkiko (*F. Silvestri*); Kuan Tao Chi (*A. C. F. Hung*); Sozan (*L. Gressitt*); Sakahan (*L. Gressitt*); Hassenzan (*L. Gressitt*); Bukai (*L. Gressitt*); Musha (*L. Gressitt*); Rokki (*L. Gressitt*); Hori (*L. Gressitt*).

Tetramorium obtusidens Viehmeyer

Tetramorium obtusidens Viehmeyer, 1916 : 138, fig. 6. Syntype females, SINGAPORE: Jurong Road (*H. Overbeck*) (MNHU, Berlin) [examined].

WORKER. TL 2.9-3.1, HL 0.70-0.76, HW 0.58-0.62, CI 81-86, SL 0.48-0.52, SI 80-86, PW 0.44-0.48, AL 0.84-0.94 (8 measured).

Mandibles unsculptured, smooth and shining except for small scattered pits from which hairs arise. Clypeus with a shallow median impression, the median portion with three strong longitudinal carinae. Frontal carinae strong, extending back almost to occiput. Eyes of moderate size, *c.* 0.15-0.16 or about 0.25-0.26 × HW. Propodeal spines of moderate length, usually quite stout, acute, not or only very slightly upcurved along their length; metapleural lobes narrow and acute. Petiole node in profile with the tergal portion very slightly longer than high and the posterior face slightly higher than the anterior so that the convex dorsum slopes feebly upwards posteriorly and the posterodorsal angle is on a slightly higher level than the anterodorsal. Dorsum of head primarily longitudinally rugulose but with a few cross-meshes occurring as far forward as the level of the anterior margins of the eyes. Occipital region with a fine rugoreticulum. Dorsal alitrunk and dorsum and sides of petiole reticulate-rugose, the latter less strongly so than the former. Postpetiole with fine longitudinal rugulae dorsally but in some specimens these are almost effaced. Gaster smooth but usually with very faint traces of basal costulae on the first tergite. All dorsal surfaces of head and body with numerous erect or suberect hairs, those arising from the frontal carinae dorsally at least as long as the maximum diameter of the eye, usually longer. Colour uniform clear pale yellow.

At first glance this species resembles a very small, pale-coloured specimen of *insolens*, to which it appears to be closely related. It differs in being smaller (compare the measurements), somewhat more strongly sculptured on the head and has a rather reduced petiole node when compared to *insolens*. Its sporadic but wide distribution is peculiar and I suspect that the name *obtusidens* may conceal more than one valid species; in particular I think that the New Guinea sample may be a good species. However, as collections are at present so scanty this is conjecture. In the MCZ, Cambridge collection are a number of females of a species close to *obtusidens* but which have the

mandibles strongly striate. They originate in Queensland and probably represent an as yet undescribed member of the group.

MATERIAL EXAMINED. SINGAPORE: Bukit Timah Forest (*D. H. Murphy*). THAILAND: Nong Hoi (*D. Jackson*). NEW GUINEA: Brown Riv., Karema (*E. O. Wilson*); Lai (*E. O. Wilson*); Huon Peninsula, L. Busu Riv. (*E. O. Wilson*).

Tetramorium pacificum Mayr
(Fig. 15)

Tetramorium pacificum Mayr, 1870 : 972, 976. Syntype workers, female, TONGA: Tongatabu (NM, Vienna; BMNH) [examined].

Tetramorium scabrum Mayr, 1878 : 672. Holotype worker, BORNEO: no. 305, 242 (*Xanthus*) (TM, Budapest) [examined]. **Syn. n.**

Tetramorium pacificum var. *subscabrum* Emery, 1893 : 246. Syntype workers, SRI LANKA: Kandy and Colombo (*E. Simon*) (MHN, Geneva) [examined]. **Syn. n.**

WORKER. TL 3.7–4.6, HL 0.86–1.10, HW 0.72–1.02, CI 83–90, SL 0.62–0.82, SI 79–87, PW 0.54–0.68, AL 1.04–1.30 (45 measured).

Mandibles usually unsculptured except for small hair-pits, but in some populations the mandibles with striation of varying intensity, though usually faint. Anterior clypeal margin with a median notch or impression; median portion of clypeus with three strong longitudinal carinae. Frontal carinae long and strongly developed, always reaching back well beyond the eyes, usually approaching the occipital margin. Maximum diameter of eye *c.* 0.18–0.21, about 0.22–0.25 × HW. Propodeal spines long and acute, usually narrow and often somewhat upcurved along their length. Metapleural lobes acute and upcurved, usually broad. Petiole in profile characteristically shaped, with the posterior face longer than the anterior so that the convex dorsum slopes upwards posteriorly and the posterodorsal angle is higher than the anterodorsal. Anterior face and dorsum confluent through a curve (Fig. 15). Sculpture variable in density and intensity. On the head varying from a blanketing rugoreticulum to a system which is predominantly longitudinal, but in this latter case always with cross-meshes present from the level of the anterior margins of the eyes and always with a reticulum posteriorly, close to the occiput. Ground sculpture between the rugae superficial but quite conspicuous. Dorsal alitrunk reticulate-rugose; often the pedicel segments similarly sculptured but in some the sculpture predominantly longitudinal. First gastral tergite usually with at least traces of basal costulae; although these are often vestigial they are only rarely completely absent. Erect or suberect long hairs present on all dorsal surfaces of head and body. Colour a uniform dark brown, blackish brown or black.

One of the commonest species of *Tetramorium* in the regions at present under discussion, *pacificum* ranges over the whole of the Oriental and Indo-Australian regions and is present in northern Australia and most or all of the island systems in the Pacific Ocean. In the Philippines and New Guinea it is to some extent displaced by sibling species (*cynicum* and *validiusculum*) and also in New Guinea a few other species have arisen from *pacificum*, namely *bicolor* and *tricarinatum*, which have developed a striking coloration. A few specimens from New Guinea (in MCZ, Cambridge) are a bright golden-yellow in colour, but whether these represent another valid species or just a very aberrant population of *pacificum* remains to be seen. Suffice to say for the time being that apart from the colour these specimens do not seem separable from *pacificum* on any other grounds.

MATERIAL EXAMINED: SRI LANKA: Colombo (*W. L. Brown*); Laxapathiya (*K. L. A. Perera*); Yakkala (*K. L. A. Perera*); Dehiwala (*W. L. Brown*); Peradeniya (*E. O. Wilson*); Peradeniya (*E. E. Green*); Gilimale (*E. O. Wilson*); Ratnapura (*E. O. Wilson*); Kandy (*E. O. Wilson*); Koslanda (*R. Winney*); Bibile (*R. Winney*). BURMA: Mandalay (*C. T. Bingham*); Rangoon (*C. T. Bingham*). WEST MALAYSIA: Malaya, Cameron Highlands (*B. Bolton*); Genting Highlands (*B. Bolton*); Gombak (*B. Bolton*); Frazer's Hill (*E. S. Ross*); Pasoh Forest (*H. Watanabe*). SUMATRA: Wai Lima (*H. H. Karny*); no loc. (*A. H. G. Alston*). JAVA: Buitenzorg (*Dammermann*); no loc. (*Staudinger*); Bogor (*B. Bolton*); Bogor (*A. H. G. Alston*); Tjibodas (*B. Bolton*). BORNEO: Sarawak, Mt Penrissen (*E. Mjoberg*); Mt Poi (*E. Mjoberg*); Trus Madi Massif (*P. W. Bryant*); Bongo Mt (*J. Hewitt*). PHILIPPINES: Davao (*A. Reyes*); Lanao (*J. W. Chapman*); Cebu (*F. X. Williams*); Romblon I. (*L. Moroto*); Mt Maquiling (*C. F. Baker*); Mt Apo (*C. F. Clagg*); Luzon, Ilcos Norte (*C. S. Banks*); Dumaguete (*J. W. Chapman*); Los Banos (*F. X. Williams*); Leyte,

Tacloban (*E. S. Ross*). TAIWAN: Kuraru (*L. Gressitt*). NEW GUINEA: Port Moresby (*E. O. Wilson*). AUSTRALIA: Northern Territory, Darwin (*G. F. Hill*). NEW BRITAIN: Rabaul (*N. L. H. Krauss*). SOLOMON IS: Rennell I. (*J. D. Bradley*); Bougainville I. (*E. J. Ford*). LOYALTY IS: Tadine, Maré (*B. Malkin*). NEW HEBRIDES: Efate (*P. Greenslade*); Aoba (*B. Malkin*); Efate (*N. L. H. Krauss*); Malekula (*L. E. Cheesman*); Erromanga (*L. E. Cheesman*); Santo (*L. E. Cheesman*); Tanna (*L. E. Cheesman*); Aneityum (*L. E. Cheesman*); Efate (*P. Cachereau*). FIJI IS: Nausori (*W. M. Mann*); Somo Somo (*W. M. Mann*); Waiyanitu (*W. M. Mann*); Suva (*W. M. Wheeler*); Viti Levu (*N. L. H. Krauss*); Viti Levu (*E. O. Wilson*); Ovalau (*W. M. Mann*); Wainunu (*W. M. Mann*); Labasa (*W. M. Mann*); Vunisea (*W. M. Mann*); Nausori (*W. L. & D. E. Brown*). FUTUNA I.: Vaisei to Mt Puke (*G. Hunt*); Pointe Nord (*G. Hunt*). SAMOAN IS: Upolu, Afiamalu (*O. H. Swezey*); Pango Pango (*E. C. Zimmermann*); Tutuila (*O. H. Swezey*); Savaii (*N. L. H. Krauss*); Upolu, Tapatapao (*O. H. Swezey*); Upolu, Malololelei (*N. L. H. Krauss*); Tutuila (*D. T. Fullaway*); Apia (*H. Swale*); Savaii (*E. H. Bryan*). TONGA IS: Tongatabu (*W. Cottrell*); Eua I., Ohonua (*N. L. H. Krauss*). SOCIETY IS: Tahiti (*A. M. Adamson*); Tahiti, Papenoo Valley (*N. L. H. Krauss*). NEW CALEDONIA: St Louis Mission (*G. Hunt*); Ciu (*E. O. Wilson*); Noumea (*E. O. Wilson*); Noumea (*N. L. H. Krauss*); Mt Mou (*E. O. Wilson*); Chapeau Gendarme (*E. O. Wilson*).

Tetramorium tricarinatum Viehmeyer stat. n.

Tetramorium bicolor subsp. *tricarinatum* Viehmeyer, 1914 : 529, fig. 4. Syntype workers, NEW GUINEA: Papua, Rawlinsongebirge (MNHU, Berlin) [examined].

Xiphomyrmex tricolor Donisthorpe, 1949 : 753. Holotype worker, NEW GUINEA: Maffin Bay, 10.vi.1944 (*E. S. Ross*) (CAS, San Francisco) [examined]. **Syn. n.**

WORKER. TL 3.4–4.4, HL 0.86–1.06, HW 0.74–0.92, CI 84–89, SL 0.60–0.78, SI 81–89, PW 0.54–0.64, AL 1.00–1.20 (15 measured).

Mandibles smooth, unsculptured except for scattered pits. Clypeus with a median notch or impression. Median portion of clypeus with three strong longitudinal carinae. Frontal carinae extending back almost to the occiput. Maximum diameter of eye *c.* 0.17–0.20, about 0.22–0.24 × HW. Propodeal spines in profile long, narrow and acute; metapleural lobes broadly triangular, acute and somewhat upcurved. Petiole node in profile with the anterior face distinctly shorter than the posterior so that the convex dorsal surface slopes upwards posteriorly and the posterodorsal angle is on a higher level than the rounded anterodorsal angle. Sculpture of dorsum of head between frontal carinae consisting of three longitudinal carinae which in most specimens run uninterruptedly from clypeus almost to occiput. In some the lateral pair of carinae are interrupted or broken and in most specimens other short carinae or rugulae are present upon the dorsum. Some anastomosis of the rugulae or carinae may occur occipitally, but reticulate sculpture is absent. Ground sculpture between the carinae or rugae is very faint and the surfaces are mostly shiny. Dorsal alitrunk rugose, predominantly longitudinally in some, but with pronotal or other reticulation in others. Petiole and postpetiole rugose, usually longitudinal on dorsum but reticulate on the sides, less commonly reticulate everywhere. Gaster unsculptured. Long, erect or suberect hairs present on all dorsal surfaces of head and body. Colour conspicuous, head and gaster blackish brown to black, alitrunk and all appendages yellow or very light yellow-brown. Some of the larger workers also show patches of yellowish colour around the occipital margins of the head.

Closely related to *pacificum*, *tricarinatum* is easily separated from that species by its distinct colour and reduced sculpture. It is one of three bicoloured black and yellow species of *Tetramorium* found on New Guinea. One of these, *diligens*, belongs to the *carinatum*-group and has 11 antennal segments and a spatulate sting appendage, the other, *bicolor*, is very closely related but much less strongly sculptured.

MATERIAL EXAMINED. NEW GUINEA: Maffin Bay (*E. S. Ross*); Kwa Riv., Laulaunung (*E. O. Wilson*); Ebabaang (*E. O. Wilson*), Tumnang (*E. O. Wilson*); Wamuki (*E. O. Wilson*); Nganduo (*E. O. Wilson*). NEW IRELAND: Kait Riv. (*J. L. Gressitt*).

Tetramorium validiusculum Emery

Tetramorium pacificum subsp. *validiusculum* Emery, 1897a : 585. Syntype workers, NEW GUINEA: Berlinhafen (*L. Biró*) (MHN, Geneva) [examined]. [Also described as new in Emery, 1897b : 568.] *Tetramorium validiusculum* Emery; Wilson & Taylor, 1967 : 73. [Raised to species; implied in text.]

Tetramorium longicarinum Donisthorpe, 1941 : 57. Holotype and paratype workers, NEW GUINEA: Papua, Mafulu, 4000 ft, xii.1933 (*L. E. Cheesman*) and Japen I., Mt Eiori, 2000 ft, x.1938 (*L. E. Cheesman*) (BMNH) [examined]. **Syn. n.**

WORKER. TL 3·7–4·6, HL 0·86–1·16, HW 0·74–1·10, CI 84–94, SL 0·62–0·84, SI 76–87, PW 0·56–0·74, AL 1·02–1·30 (20 measured).

Mandibles unsculptured, smooth except for pits from which hairs arise. Anterior clypeal margin with a weakly developed median impression or notch. Median portion of clypeus with three main longitudinal carinae, in some large specimens the anterior half of the clypeus feebly transversely concave. Frontal carinae strongly developed, extending back almost to the occipital margin. Eyes with maximum diameter *c.* 0·18–0·23. Propodeal spines long, acute, usually narrow and sometimes slightly upcurved along their length. Metapleural lobes triangular, acute and feebly upcurved. Petiole node in profile shaped as in *pacificum* (see Fig. 15), with the anterior face shorter than the posterior so that the convex dorsal surface slopes upwards posteriorly and the posterodorsal angle is higher than the anterodorsal. The last cannot accurately be called an angle as in this species the anterior face joins the dorsum through a curve. Dorsum of head sculptured with a series of spaced longitudinal carinae or rugulae, some of which may be short or broken. Cross-meshes are either completely absent or a few cross-meshes or anastomoses may be present occipitally, but there is never a strongly developed rugoreticulum behind the level of the eyes as is found in most species of this group, nor do cross-meshes occur in front of the level of the posterior margins of the eyes. Ground sculpture faint and inconspicuous so that spaces between rugulae and carinae on head are shiny and mostly quite smooth. Dorsal alitrunk, petiole and postpetiole usually reticulate-rugose but this is commonly reduced in density and intensity. Gaster unsculptured, smooth and shining. All dorsal surfaces of head and alitrunk with numerous long, erect or suberect hairs. Colour uniform very dark brown to black.

This species is a sibling of *pacificum*, differentiated from it by the strongly reduced cephalic sculpture found in *validiusculum*. In some respects it resembles *cynicum* of the Philippines (see there), another sibling of *pacificum* whose range does not appear to overlap that of *validiusculum*, which is restricted to New Guinea and Queensland, particularly the Cape York Peninsula.

MATERIAL EXAMINED. NEW GUINEA: Huon Pen., L. Busu Riv. (*E. O. Wilson*); Saruwaged Ra (*E. O. Wilson*); Bubia (*E. O. Wilson*); Lae, Didiman Ck (*E. O. Wilson*); Bisianumu (*E. O. Wilson*); Wamuki (*E. O. Wilson*); Butala (*E. O. Wilson*); Brown Riv., Karema (*E. O. Wilson*); Korop (*J. L. Gressitt*). AUSTRALIA: Cape York, Lockerbie (*Darlingtons*); C.Y., Rocky River (*Darlingtons*), C.Y., McIlwraith Range (*Darlingtons*); Cooktown, Shipton's Flat (*Darlingtons*).

The *ornatum*-group

Antennae with 12 segments. Sting appendage dentiform or pennant-shaped. Clypeus with the anterior margin usually entire but in one species (*wagneri*) a notch is present. Frontal carinae in this group generally reduced in length or are weakly developed, or both, usually they end just behind the level of the eyes. In one species they are very short (*politum*), and in one they are strongly developed (*rigidum*), but in some the shortness of the true frontal carinae may be masked by the strong longitudinal cephalic sculpture. Propodeal spines are characteristically long or very long and are downcurved or sinuate along their length (not in *deceptum*). Petiole with a long, curved anterior peduncle and usually with a low node (Figs 23–30). Sculpture on the head is basically of dense longitudinal carinae or rugae, generally without cross-meshes, but in one species (*politum*) the sculpture is very reduced. All dorsal surfaces of the head and body have numerous hairs which are fine and of varying length, but the hind tibiae have hairs which are short or very short and are generally decumbent or appressed.

This group is based upon New Guinea and eight of the twelve species included are restricted to that island. One species is endemic in the Solomon Is (*salomo*), two occur only in Queensland (*australe*, *deceptum*), but the final species, *ornatum* itself, is distributed in the Bismark Archipelago and Queensland, as well as being present in New Guinea.

Tetramorium basum sp. n.

(Fig. 30)

HOLOTYPE WORKER. TL 3·2, HL 0·74, HW 0·66, CI 89, SL 0·56, SI 85, PW 0·48, AL 0·90.

Mandibles striate, anterior clypeal margin convex and entire. Frontal carinae extending back beyond the posterior margin of the eyes but then broken or interrupted, their place taken by the coarse longi-

tudinal sculpture which is as strongly developed as the frontal carinae and which extends back to the occipital margin. Maximum diameter of eye *c.* 0.14. Occipital margin of head broadly but shallowly concave in full-face view, the sides of the head only very feebly convex. Propodeal spines very long, narrow and acute, elevated and downcurved along their length. Metapleural lobes broad basally but quickly narrowing to an elongate acute point. Petiole in profile with a long, downcurved anterior peduncle, shape of the node as shown in Fig. 30. Clypeus with five main longitudinal carinae and with other shorter, weaker carinae present. Dorsum of head densely sculptured with regular coarse longitudinal carinae without cross-meshes of any sort, the spaces between the carinae filled with a dense and very conspicuous reticulate-puncturation. Dorsal alitrunk with a rugoreticulum, the meshes small and the spaces which they enclose with some puncturation which is much weaker than that seen on the head. Petiole with longitudinal rugae which are oblique and spaced out on the sides but more close-packed dorsally. Postpetiole and gaster unsculptured, smooth and shining. Fine hairs present on all dorsal surfaces of head and body. Dorsal (outer) surfaces of hind tibiae with short subdecumbent or decumbent hairs which are much shorter than the maximum tibial width. Colour reddish brown, the appendages yellow or yellow-brown. First gastral tergite with the basal third yellow, the remainder blackish brown.

PARATYPE WORKER. As holotype but slightly smaller, TL 2.9, HL 0.70, HW 0.64, CI 91, SL 0.52, SI 81, PW 0.46, AL 0.84.

Holotype worker, NEW GUINEA: Mongi Watershed, Huon Pen., Wamuki, 19-20.iv.1955, 800 m, no. 846 (*E. O. Wilson*) (MCZ, Cambridge).

Paratype. 1 worker with same data as holotype (BMNH).

In the *ornatum*-group two species are presently known in which the spaces between the carinate cephalic sculpture are filled with dense puncturation. *T. basum* is one of these, the other being *rigidum*. The two are separable as in *rigidum* there are a number of conspicuous cross-meshes between the longitudinal carinae of the head, absent in *basum*, and the gaster is uniformly coloured in *rigidum*, without the basal yellow area seen in *basum*.

Tetramorium centum sp. n.

HOLOTYPE WORKER. TL 3.5, HL 0.80, HW 0.74, CI 92, SL 0.64, SI 86, PW 0.52, AL 0.96.

Mandibles striate, anterior clypeal margin entire and with a narrow but quite conspicuous apron or flange anteriorly. Frontal carinae no more strongly developed than the rugose sculpture on the head, meandering and irregular, broken in places (more sharply developed in some of the paratypes). Eyes moderate, maximum diameter *c.* 0.16. Propodeal spines long, narrow and acute, more or less straight. Metapleural lobes elongate-triangular and acute. Petiole with a long, downcurved peduncle, the node in profile roughly rectangular in shape, the dorsum feebly but evenly convex and slightly longer than the height of the tergal portion of the node. Postpetiole more narrowly convex, dome-shaped in profile. Dorsum of head with numerous long, irregular or meandering longitudinal rugae with scattered cross-meshes posteriorly. Spaces between the rugae showing vestigial traces of superficial sculpture but for the most part smooth and shining. Dorsal alitrunk with a loose, open rugulation, the large spaces enclosed by the meshes smooth. Dorsum of petiole with an unsculptured median longitudinal strip, the sides of the node sparsely and obliquely rugose. Postpetiole and gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs, those on the dorsal (outer) surfaces of the hind tibiae suberect to subdecumbent and much shorter than the maximum tibial width. Colour uniform dark brown, the appendages yellow-brown.

PARATYPE WORKERS. TL 3.3-3.5, HL 0.76-0.82, HW 0.70-0.74, CI 90-92, SL 0.60-0.64, SI 81-86, PW 0.50-0.54, AL 0.92-0.98. Maximum diameter of eye 0.14-0.16 (7 measured). Mostly as holotype but in some the frontal carinae more strongly developed, running almost to the occipital margin. Colour in some a lighter brown than seen in the holotype.

Holotype worker, NEW GUINEA: Mongi Watershed, Huon Pen., Joangeng, 7-8.iv.1955, 1500 m, no. 746 (*E. O. Wilson*) (MCZ, Cambridge).

Paratypes. 7 workers and 2 alate females, same data as holotype but no. 751 (MCZ, Cambridge; BMNH).

Tetramorium etiolatum sp. n.

(Fig. 29)

HOLOTYPE WORKER. TL 3.4, HL 0.76, HW 0.66, CI 87, SL 0.66, SI 100, PW 0.52, AL 0.96.

Mandibles striate. Anterior clypeal margin convex, entire, with a narrow anterior flange or apron. Frontal carinae extending back beyond the level of the posterior margins of the eyes but weak, no more strongly developed than the other sculpture on the dorsum of the head. Behind the level of the eyes the frontal carinae petering out, their place taken by other constituents of the sculpture or, in some of the type-series, interrupted or broken in places. Antennal scrobes scarcely noticeable, the antennal scapes relatively long (SI in entire type-series 96 or more). Maximum diameter of eye *c.* 0.14. Propodeal spines very long, narrow and acute, distinctly downcurved along their length. Metapleural lobes triangular. Petiole in profile with a long, curved anterior peduncle and a long, low node, the dorsal length of the node greater than the height of the tergal portion, the dorsum evenly but shallowly convex. Posteriorly the dorsum rounds evenly into the posterior face, the two not separated by an angle. Postpetiole in profile dome-shaped. Clypeus with five main longitudinal carinae and also with traces of other incomplete and more feebly developed carinae. Dorsum of head strongly sculptured with longitudinal carinate rugae, most of which are feebly sinuate or meandering. Cross-meshes are not developed and the ground sculpture between the rugae consists of very shallow superficial punctures which are inconspicuous. Dorsal alitrunk weakly reticulate-rugose, the reticulum broken down or disorganized in places. Petiole with scattered vestiges of rugose sculpture, postpetiole and gaster unsculptured. All dorsal surfaces of head and body with numerous fine soft hairs, those on the dorsal (outer) surface of the hind tibiae short and curved. Colour uniform blackish brown, the appendages lighter, mid-brown.

PARATYPE WORKERS. TL 3.2–3.7, HL 0.70–0.80, HW 0.62–0.68, CI 84–89, SL 0.60–0.68, SI 96–101, PW 0.48–0.54, AL 0.90–1.00. Maximum diameter of eye *c.* 0.14–0.16 (16 measured). As holotype but with variation in development of frontal carinae noted above. A few specimens have the legs a paler brown than in the holotype.

Holotype worker, NEW GUINEA: Mongi Watershed, Huon Pen., Gemeheng, 11–13.iv.1955, 1300 m, no. 785 (*E. O. Wilson*) (MCZ, Cambridge).

Paratypes. NEW GUINEA: 9 workers and 2 females (1 alate) with same data as holotype; 2 workers, 2 females (alate) and 2 males, Mongi Watershed, Huon Pen., Ebabaang, 16–18.iv.1955, 1300–1400 m, no. 817 (*E. O. Wilson*); 5 workers and 1 female (dealate) with same data as last but no. 838 (*E. O. Wilson*); 2 workers, Mongi Watershed, Huon Pen., Tumnang, 14–15.iv.1955, 1500 m, no. 798 (*E. O. Wilson*) (MCZ, Cambridge; BMNH).

The long, narrow, downcurved propodeal spines characteristic of most species of the *ornatum*-group are very well developed in *etiolum*, but this species is quickly differentiated from most of its relatives by the possession of relatively long antennal scapes, which in *etiolum* have SI range 96–101 compared with the usual range of about 80–90 in most of the group. The only species with SI outside this range is *politum* (SI 105) but here the head is mostly unsculptured whereas in *etiolum* the head is sculptured everywhere.

Tetramorium navum sp. n.

(Fig. 27)

HOLOTYPE WORKER. TL 3.3, HL 0.78, HW 0.74, CI 95, SL 0.58, SI 78, PW 0.52, AL 0.92.

Mandibles striate. Anterior clypeal margin extremely feebly concave (straight to feebly convex in paratype series). Frontal carinae long and strong, extending back almost to the occipital corners. Maximum diameter of eye *c.* 0.16. Occipital margin of head broadly and shallowly concave in full-face view, sides of head behind eyes feebly convex. Propodeal spines stout, long and acute, somewhat elevated but slightly downcurved along their length. Metapleural lobes elongate-triangular and acute. Petiole node in profile with a downcurved anterior peduncle. Dorsal surface of petiole node curving evenly into posterior face, the two not separated by an angle. Dorsal length of node in profile about equal to the height of the tergal portion of the node. Postpetiole in profile evenly convex, dome-like. Median portion of clypeus with five longitudinal carinae, the outermost very close to the concave edge of the clypeus just in front of the frontal carinal lobe. (In a few paratypes only the median and outer carinae are strongly developed, the inner pair being feeble.) Dorsum of head sculptured with strong, widely spaced longitudinal carinae, about seven in number between the frontal carinae at the level of the eyes. A few very weak cross-meshes present, much weaker than the carinae, and the ground sculpture between the carinae exceedingly feeble. Dorsal alitrunk with a loose rugoreticulum. Petiole sparsely and weakly rugulose, the dorsal postpetiole and gaster unsculptured but the sides of the postpetiole retaining vestigial sculpture basally. Fine erect or suberect hairs present upon all dorsal surfaces of head and body but hairs on scapes and dorsal (outer)

surfaces of hind tibiae very short, decumbent or appressed. Colour very dark brown, the appendages lighter.

PARATYPE WORKERS. TL 3.0–3.5, HL 0.74–0.84, HW 0.70–0.80, CI 92–95, SL 0.56–0.64, SI 76–81, PW 0.48–0.56, AL 0.84–0.98. Maximum diameter of eye 0.15–0.18 (10 measured). As holotype, with the variation noted above and also some paratypes with propodeal spines feebly sinuate (Fig. 27) as the downcurvature tends to flatten out or even be very slightly upcurved towards the apices.

Holotype worker, NEW GUINEA: Nadzab, 20–22.v.1955, no. 1101, dry evgr. for. (*E. O. Wilson*) (MCZ, Cambridge).

Paratypes. 2 workers with same data as holotype; 2 workers with same data but no. 1086; 6 workers with same data but no. 1093 (MCZ, Cambridge; BMNH).

Among the species of the *ornatum*-group in which the propodeal spines are downcurved, *navum* is distinguished by having strongly developed frontal carinae and sparse but strong carinate sculpture on the head. In other species showing very strong longitudinal cephalic sculpture the components are much more densely packed, with 10 or more between the frontal carinae at the level of the eyes, or the spaces between the longitudinal components are packed with coarse reticulate-punctate ground sculpture.

Tetramorium ornatum Emery

Tetramorium ornatum Emery, 1897a : 585, pl. 15, fig. 27. Syntype workers, NEW GUINEA: Berlinhafen (*L. Biró*) (MHN, Geneva) [examined].

Tetramorium ornatum var. *obscurius* Forel, 1901 : 11. Syntype workers, BISMARCK ARCHIPELAGO: Ralum, Lowon (*F. Dahl*) (MNHU, Berlin) [examined]. *Syn. n.*

WORKER. TL 3.0–3.8, HL 0.70–0.92, HW 0.60–0.84, CI 84–91, SL 0.50–0.68, SI 80–87, PW 0.46–0.62, AL 0.86–1.14 (46 measured).

Mandibles striate, anterior clypeal margin convex and entire. Frontal carinae feeble, usually no more strongly developed than the longitudinal sculpture of the head, but extending back beyond the level of the eyes, sometimes almost reaching the occipital margin but here virtually indistinguishable from the other sculpture. Antennal scrobes present but exceedingly feeble. Maximum diameter of eye *c.* 0.12–0.16. Propodeal spines usually weakly downcurved along their length but sometimes almost straight or very weakly sinuate, variation being present in single nest-series. Metapleural lobes elongate-triangular and acute. Petiole in profile with a long peduncle and a long, low node, the dorsal length of which is about equal to or slightly greater than the height of the tergal portion. Clypeus with five distinct longitudinal carinae of about equal strength, sometimes with another intercalary pair present which are usually weaker or incomplete. Dorsum of head strongly sculptured with regular, more or less parallel longitudinal rugae or carinae, without cross-meshes. These rugae are closely packed, with usually 12–15 between the frontal carinae at the level of the eyes (a few specimens are known with 10–11). Dorsal alitrunk with a coarse rugoreticulum which extends down the sides of the pronotum. Sides of nodes of petiole and postpetiole rugose but on the postpetiole dorsum this is usually weaker. Gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs, those on the dorsal (outer) surface of the hind tibiae short and curved. Colour varying from reddish brown to blackish brown.

This is the most widespread species of the group, occurring in the Bismarck Archipelago and in Queensland (where a closely related species, *australe*, is also present) as well as being relatively common in parts of New Guinea. The closest relative of *ornatum* in New Guinea is the somewhat larger *sculptatum*, in which the frontal carinae are even more reduced and in which the antennal scrobes are completely lacking.

MATERIAL EXAMINED. NEW GUINEA: Finschafen (*E. S. Ross*); Maffin Bay (*E. S. Ross*); Boingbongen (*E. O. Wilson*); Tumnang (*E. O. Wilson*); Yunzain to Joangeng (*E. O. Wilson*); Zinzingu (*E. O. Wilson*); Nganduo (*E. O. Wilson*); Lae, Didiman Ck (*E. O. Wilson*); L. Busu Riv., Huon Pen. (*E. O. Wilson*); W. Highlands, Baiyer R. (*S. Peck*); Wau (*S. Peck*). AUSTRALIA: Cape York, v. Tozer Gap (*Darlingtons*); C.Y., Rocky River (*Darlingtons*).

Tetramorium politum Emery (Fig. 23)

Tetramorium politum Emery, 1897b : 568. Holotype worker, NEW GUINEA: Moraka (*L. Loria*) (probably in MCSN, Genoa).

WORKER. TL 3.8, HL 0.88, HW 0.74, CI 84, SL 0.78, SI 105, PW 0.58, AL 1.08.

Mandibles feebly sculptured. Anterior clypeal margin entire, evenly convex. Frontal carinae short, extending back only to the level of the eyes. Occipital margin of head in full-face view rounded and evenly convex. Maximum diameter of eye *c.* 0.16. Antennal scapes long, SI > 100, the scapes surpassing the occipital margin when laid straight back along the head. Propodeal spines long, narrow and acute, slightly downcurved along their length. Metapleural lobes rounded, blunt. Petiole in profile with a long, curved anterior peduncle and a node which in profile is about as long as high, the dorsum feebly convex. Postpetiole in profile as high as petiole but narrower and more strongly convex dorsally (Fig. 23). Sculpture sparse, the integument mostly smooth. Clypeus with a strong median carina and with vestiges of others laterally. Head with median carina running from the clypeus to the level of the posterior margins of the eyes and with faint traces of other sculpture on each side of the carina, but otherwise the head unsculptured dorsally. Dorsal surfaces of alitrunk, petiole and postpetiole mostly smooth but with scattered faint rugulae present in places; sides of these areas more strongly sculptured than the dorsum but still only weakly marked. Gaster unsculptured. Very fine erect or suberect hairs present on all dorsal surfaces, those projecting from the dorsal (outer) surface of the hind tibiae short and curved, much shorter than the maximum tibial width. Colour uniform blackish brown, the legs and antennae lighter.

T. politum is the most specialized member of the *ornatum*-group in New Guinea and in its elongate scapes, rounded head and reduced sculpture it parallels the developments seen in *bicolor* (*bicarinatum*-group) and *diligens* (*carinatum*-group). However, the elongate petiole peduncle and downcurved propodeal spines characteristic of most species of the *ornatum*-group are retained. The tendency to shorten or reduce the frontal carinae in this group reaches its strongest expression in *politum* and the effect is enhanced by the extreme reduction in sculpture everywhere on the head. The frontal carinae are really no more strongly developed in such species as *sculptatum* but the appearance is not so striking here as the entire head is covered with close-packed longitudinal sculpture.

MATERIAL EXAMINED. NEW GUINEA: Japen I., Central Range (*L. E. Cheesman*).

Tetramorium rigidum sp. n.

(Fig. 28)

HOLOTYPE WORKER. TL 2.9, HL 0.70, HW 0.64, CI 91, SL 0.52, SI 81, PW 0.50, AL 0.86.

Mandibles striate; anterior clypeal margin entire. Frontal carinae long, extending back almost to the occipital margin. Antennal scrobes present but weak, consisting of a shallowly impressed area which extends back beyond the level of the eye in profile and is less strongly sculptured than remainder of head. Maximum diameter of eye *c.* 0.14. With the alitrunk in profile the propodeal dorsum strongly sloping downwards to the bases of the spines. Propodeal spines long, tapering and acute, feebly downcurved along their length. Metapleural lobes elongate-triangular and acute. Petiole in profile with a long, downcurved peduncle and a relatively high, angular node, the height of the tergal portion of the node greater than its dorsal length. Clypeus with five main longitudinal carinae and in places with traces of other, weaker rugulae between them. Dorsum of head densely longitudinally rugose with numerous conspicuous cross-meshes behind the level of the eyes. Spaces between the rugae packed with a very conspicuous reticulate-punctuation. Area of antennal scrobe reticulate-punctate with only faint traces of rugulae. Dorsal alitrunk reticulate-rugose, the spaces densely reticulate-punctate. Petiole similarly but much less strongly sculptured, both components faint. Sides of postpetiole even more faintly sculptured, the dorsum smooth or with vestiges of sculpture which are almost completely effaced. Gaster unsculptured. All dorsal surfaces of head and body with fine erect or suberect hairs. Dorsal (outer) surface of hind tibiae with very short hairs which are decumbent or appressed. Colour uniform very dark reddish brown, the appendages somewhat lighter.

PARATYPE WORKER. TL 2.8-3.0, HL 0.68-0.76, HW 0.62-0.70, CI 88-92, SL 0.48-0.54, SI 77-81, PW 0.48-0.54, AL 0.84-0.92. Maximum diameter of eye *c.* 0.13-0.15 (15 measured). As holotype but some paratypes teneral, without full adult coloration.

Holotype worker, NEW GUINEA: Papua, Karema, Brown R., 8-11.iii.1955, no. 564, lowl. rainfor. (*E. O. Wilson*) (MCZ, Cambridge).

Paratypes. 11 workers with same data as holotype; 3 workers with same data as holotype but no. 563; 2 workers as holotype but no. 546 (MCZ, Cambridge; BMNH).

The very distinctive reticulate-punctate sculpture which fills all the spaces between the rugose

sculpture is characteristic of this species and of *basum* in the *ornatum*-group. However, *basum* lacks cross-meshes in the cephalic dorsal sculpture, which are conspicuous in *rigidum*, and the gaster is basally yellow in *basum* but unicoloured in *rigidum*.

***Tetramorium salomo* Mann**
(Fig. 25)

Tetramorium salomo Mann, 1919 : 344. Holotype worker, SOLOMON IS: Malaita I., Auki, 1916 (*W. M. Mann*) (USNM, Washington) [examined].

WORKER. TL 3·2-3·5, HL 0·74-0·78, HW 0·70-0·76, CI 95-97, SL 0·60-0·64, SI 84-88, PW 0·54-0·58, AL 0·88-0·94 (3 measured).

Mandibles striate. Anterior clypeal margin entire, with a narrow flange or apron which projects over the basal margins of the mandibles. Frontal carinae weak, diverging strongly to the level of the posterior margins of the eyes then fading out or becoming indistinguishable from the surrounding sculpture. Antennal scrobes absent. Maximum diameter of eye *c.* 0·16-0·18. Outline of dorsal alitrunk in profile evenly convex. Propodeal spines very long, narrow and acute, feebly downcurved along their length. Metapleural lobes elongate-triangular, acute apically. Petiole with a long, downcurved anterior peduncle and a long, low node, the dorsal length of which is greater than the height of the tergal portion in profile. Dorsum of head with numerous longitudinal rugae which are irregular, either sinuate or meandering but without cross-meshes, although a few weak anastomoses may be present very close to the occipital margin. Spaces between rugae mostly unsculptured and shining but here and there a few very faint punctures may be seen. Dorsal alitrunk predominantly longitudinally rugose but with some sparse reticulation present, especially on the anterior pronotum. All surfaces of petiole and postpetiole covered with a very close, fine rugoreticulum, gaster unsculptured. All dorsal surfaces of head and body with abundant fine short hairs. Dorsal (outer) surfaces of hind tibiae with a dense coat of very short, curved hairs which are directed towards the apex of the segment. Colour uniform yellow to light yellow-brown.

This is the only species of the *ornatum*-group which is not known to occur in New Guinea, and is one of the two species of the group which are found in localities other than New Guinea (the other is *ornatum* which occurs in the Solomon Islands and in Queensland). Its size, colouring, strongly sculptured pedicel segments and very long, weakly downcurved spines should quickly distinguish *salomo* from any other *Tetramorium* species in the Solomon Islands.

MATERIAL EXAMINED. SOLOMON IS: Guadalcanal (*P. Greenslade*).

***Tetramorium sculptatum* sp. n.**
(Fig. 26)

HOLOTYPE WORKER. TL 4·1, HL 1·00, HW 0·90, CI 90, SL 0·76, SI 84, PW 0·68, AL 1·20.

Mandibles striate; anterior clypeal margin entire and weakly convex. Frontal carinae short, ending at the level of the posterior margins of the eyes, not more strongly developed than the surrounding longitudinal sculpture and quite inconspicuous. Antennal scrobes absent. Maximum diameter of eyes *c.* 0·18. Propodeal spines long and acute, feebly downcurved along their length. On the holotype the right hand spine more strongly curved than the left; in some paratypes the spines are very weakly sinuate. Metapleural lobes elongate and acute. Petiole in profile with a long peduncle; node shape showing considerable variation in type-series due to the variable obliteration of the anterodorsal angle. The limits of this variation as shown in the type-series are given in Fig. 26. Clypeus with seven carinae in holotype (in paratype series varying from 5-7, one pair of carinae being variably developed). Dorsum of head very coarsely, regularly and densely longitudinally carinate-rugose or appearing sulcate, with about 12 longitudinal components between the frontal carinae at the level of the eyes. Behind the level of the eyes the sculpture diverges strongly and runs off the dorsum of the head and down the sides, intersecting the lateral outline of the head (full-face view) in the posterior two-thirds or so of the sides behind the eyes. Dorsal alitrunk coarsely reticulate-rugose or reticulate-foveolate, the raised portions rounded and the reticulum itself very irregular. In some paratypes this sculpture is reduced and in one or two is almost effaced so that the surface is almost smooth but with irregular rounded elongate prominences. Petiole and postpetiole rugose, the dorsum of the postpetiole less strongly so than the sides. Gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs, those on the dorsal (outer) surface of the hind tibiae very short, much less than the maximum tibial width. Colour very dark blackish brown to black, the appendages somewhat lighter.

PARATYPE WORKERS. As holotype and with the variation mentioned above, but also in many the frontal carinae confluent with one component of the longitudinal sculpture on the dorsum of the head. Size range TL 3.8–4.4, HL 0.90–1.06, HW 0.84–0.96, CI 88–93, SL 0.70–0.82, SI 80–87, PW 0.62–0.74, AL 1.10–1.34. Maximum diameter of eye 0.14–0.18 (21 measured).

Holotype worker, NEW GUINEA: Papua, Wau, I.vii.1974, 4000 ft, for. litter (*S. Peck*) (MCZ, Cambridge).

Paratypes. NEW GUINEA: 8 workers with same data as holotype; 13 workers, Papua, Mt Hagen area, 5.vii.1974, c. 2000 m, no. B-280 (*S. Peck*) (MCZ, Cambridge; BMNH; NM, Basle; MHN, Geneva).

The very distinctive cephalic sculpture and lack of antennal scrobes distinguish this species from others of the group.

Tetramorium wagneri Viehmeyer
(Fig. 24)

Tetramorium wagneri Viehmeyer, 1914: 528, fig. 3. Holotype worker, NEW GUINEA: Papua, Wareo (MNHU, Berlin) [examined].

WORKER. TL 3.8–4.8, HL 0.90–1.06, HW 0.78–0.96, CI 86–92, SL 0.70–0.86, SI 86–92, PW 0.58–0.70, AL 1.06–1.28 (25 measured).

Mandibles coarsely striate. Clypeus with a median notch or impression of variable size, small in some individuals. Maximum diameter of eye c. 0.18–0.20. Frontal carinae stretching back beyond the level of the posterior margins of the eyes but behind this commonly broken or interrupted, their place taken by the very strong longitudinal carinate rugae of the head. In some specimens the carinae continue unbroken to close to the occipital margin. Occipital margin of head conspicuously concave in dorsal view. Propodeal spines very long, narrow, acute and slightly downcurved along their length. Metapleural lobes short, acute and triangular. Peduncle of petiole very long and downcurved, the node in profile high and quite narrow, the tergal portion of the node higher than the dorsal length. Clypeus with five or more longitudinal carinae of approximately equal strength, the dorsum of the head very strongly and coarsely sculptured with regular, sharp longitudinal carinae of which there are about 10 (number varies between individuals) between the frontal carinae at the level of the eyes. Cross-meshes between these carinae are completely absent. Ground sculpture between the carinae consists of faint superficial punctulation, which in many is almost effaced. Dorsal alitrunk reticulate-rugose. Sides of petiole and postpetiole with sparse longitudinal rugae but these are much fainter on the latter than on the former, vestigial in some. Dorsum of postpetiole unsculptured or at most with faint superficial shagreening or punctures. Gaster unsculptured. Fine hairs present on all dorsal surfaces of head and body but those on the dorsal (outer) surface of the hind tibiae short, much shorter than the maximum tibial width, and subdecumbent or decumbent. Colour dark reddish brown to blackish brown, the appendages lighter.

This is the only known species of the *ornatum*-group which has a notched or impressed anterior clypeal margin and because of this it runs out in the key close to the members of *bicarinatum*-group where such a notch is universally present. However, the sculpture, form of the propodeal spines and petiole identify *wagneri* as a member of the *ornatum*-group.

MATERIAL EXAMINED. NEW GUINEA: Madang Distr., Finisterre Mts (*M. E. Bacchus*); Saruwaged Ra, upper Bunbok Valley (*E. O. Wilson*); Nganduo (*E. O. Wilson*); Boana, Bunbok Valley (*E. O. Wilson*).

The *inglebyi*-group

Antennae with 12 segments. Appendage of sting triangular or dentiform. Frontal carinae absent or very short indeed, not reaching the level of the anterior margins of the eyes. Eyes small (*elisabethae*, *inglebyi*) or minute, reduced to a single facet in *myops*. Antennal scrobes absent. Base of first gastral tergite strongly concave in dorsal view, the anterolateral angles of the sclerite angular, produced as a short tubercle or tooth on each side of the posterolateral corners of the postpetiole (Fig. 35).

This small group of three pale-coloured species, apparently restricted to India, is easily characterized by the features given above. The strange modification of the base of the first gastral tergite is also seen in the *mixtum*-group, but here the frontal carinae reach back beyond the eyes, and the eyes themselves are not reduced as in the *inglebyi*-group.

Tetramorium elisabethae Forel

Tetramorium elisabethae Forel, 1904 : 20. Syntype workers, INDIA: Sind Valley, Kashmir (*Wroughton*) (MHN, Geneva; MCZ, Cambridge; BMNH) [examined].

WORKER. TL 2.9-3.1, HL 0.68-0.74, HW 0.60-0.64, CI 86-90, SL 0.50-0.52, SI 80-83, PW 0.44-0.50, AL 0.78-0.84 (5 measured).

Mandibles feebly striate; true anterior clypeal margin entire but the narrow lamellate apron or flange indented medially, the intensity of the indentation variable. Frontal carinae very short, ending before or at the level of the anterior margins of the eyes. Antennal scrobes absent. Eyes very small, with only about seven facets, the maximum diameter c. 0.06. Propodeal spines short and triangular, dentiform and feebly upcurved. Metapleural lobes broad and rounded. Petiole node relatively high in profile, the height of the tergal portion greater than the dorsal length. In dorsal view both nodes distinctly broader than long, rounded and without angles. Base of first gastral tergite strongly concave and accommodating the posterior margin of the postpetiole. On each side of this the anterolateral portions of the tergite are angular and project forwards. Dorsum of head with very fine but quite dense, predominantly longitudinal rugulation, and with faint reticulation on the sides above the eyes. Dorsal alitrunk somewhat more conspicuously rugulose than the head, feebly reticulate in places. Petiole, postpetiole and gaster unsculptured. All dorsal surfaces of head and body with quite dense short, fine hairs, the majority of which are suberect to subdecumbent. On the scapes and hind tibiae the hairs are shorter and subdecumbent to decumbent. Colour uniform pale yellow.

T. elisabethae does not have any known close relatives, but the reduced eyes, short frontal carinae and the specialized shape of the gaster seem to indicate relationship with *inglebyi* and *myops*, although in other aspects such as the short propodeal spines and broad node its affinities lie in the direction of the *caespitum*-group.

Tetramoriuminglebyi Forel

(Fig. 35)

Tetramoriuminglebyi Forel, 1902a : 233. Holotype worker, INDIA: Travancore (*Ingleby*) (MHN, Geneva) [examined].

WORKER. TL 2.8, HL 0.74, HW 0.64, CI 86, SL 0.46, SI 72, PW 0.46, AL 0.76.

Clypeus very strongly downcurved in its apical half so that the true median anterior border cannot be seen in full-face view. Frontal carinae very short, not extending to level of eyes, terminating just behind the expanded lobes over the antennal insertions. Antennal scrobes absent. Eyes small, maximum diameter c. 0.10 or about 0.16 × HW. Propodeal spines short and stout, abruptly upcurved at the extreme apices. Metapleural lobes broadly triangular and acute, feebly upcurved. Petiole node in dorsal view approximately as long as broad, postpetiole subglobular, slightly broader than long. First gastral tergite in dorsal view with the anterolateral corners rounded and extended forwards to surround the articulation with the postpetiole, the margin of the tergite between the corners strongly concave. Dorsum of head with fine, predominantly longitudinal and somewhat uneven rugulation which grades into a reticulum posteriorly and on the sides. Dorsal alitrunk with sparse rugosity, the mesonotum predominantly unsculptured. Petiole and postpetiole dorsally mostly unsculptured, with faint rugulation towards the sides; gaster unsculptured. All dorsal surfaces of head and body with numerous fine erect hairs. Colour uniform yellow-brown.

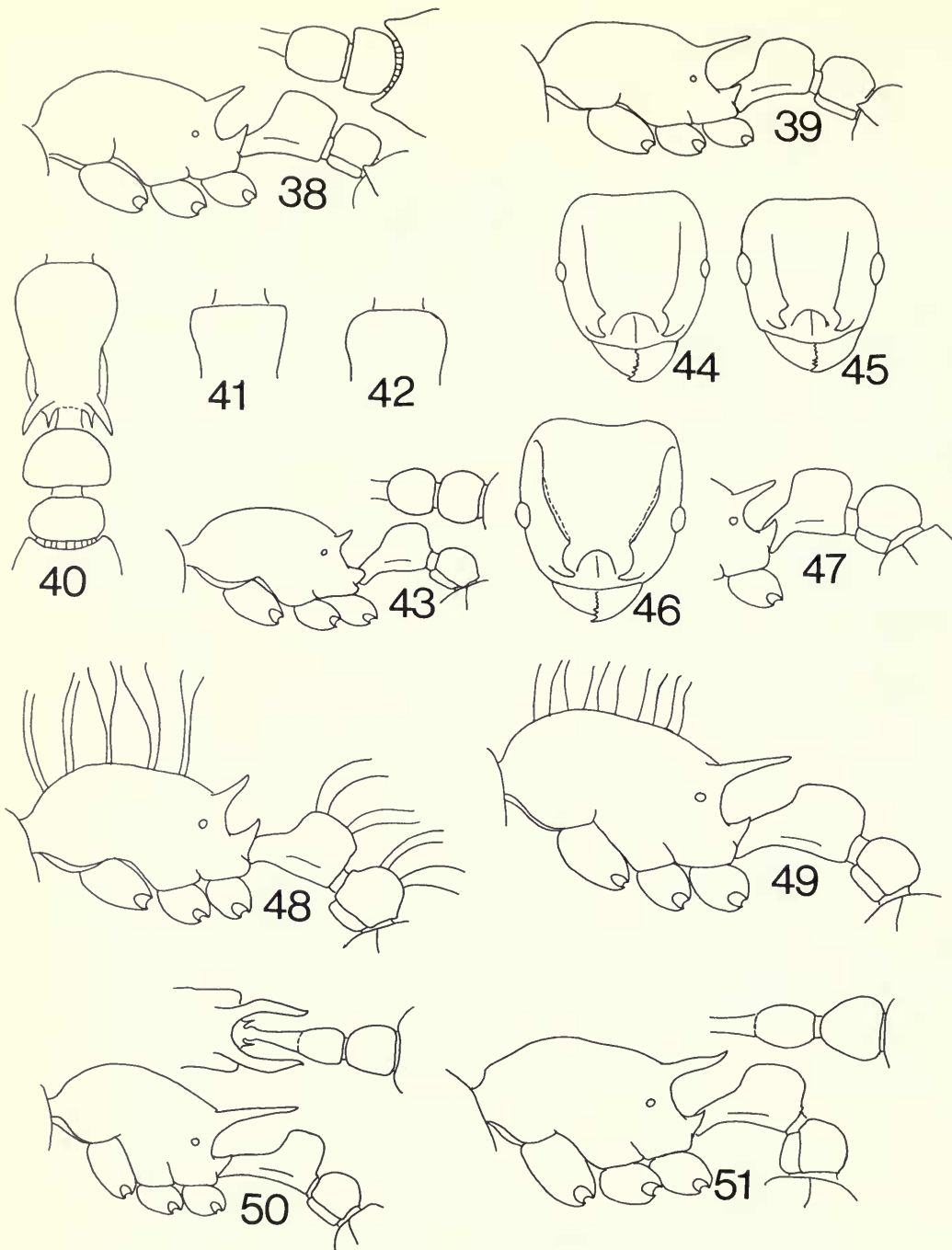
The closest relative of *inglebyi* is *myops*, also from India, but in this latter species the eyes are reduced to a single facet and the clypeus does not show the abrupt curvature which characterizes *inglebyi*. Other species in which the frontal carinae are very short, namely *elisabethae*, *fergusoni*, *nursei* and *politum*, may be separated by the characters given in the key.

Tetramoriummyops sp. n.

(Figs 36, 37)

HOLOTYPE WORKER. TL 2.8, HL 0.68, HW 0.62, CI 91, SL 0.48, SI 77, PW 0.44, AL 0.74.

Mandibles striate; anterior clypeal margin impressed medially. Frontal carinae very short, ending in front of the level of the eyes. Eyes themselves minute, consisting of only a single facet, not easily visible in full-face view. Propodeal spines stout, moderately long, slightly upcurved along their length. Metapleural lobes long, triangular and acute, roughly three-quarters as long as the propodeal spines. Peduncle



Figs 38-51. *Tetramorium* workers. 38, 39. Alitrunk and pedicel of (38) *mixtum*, (39) *rugigaster*. 40. Dorsal alitrunk and pedicel of *transversarium*. 41, 42. Pronotal angle shape in (41) *scabrosum*, (42) *pulchellum*. 43. Alitrunk and pedicel of *pulchellum*. 44-46. Heads of (44) *curtulum*, (45) *kraepelini*, (46) *chapmani*. 47. Propodeum and pedicel of *chapmani*. 48-51. Alitrunk and pedicel of (48) *flagellatum*, (49) *ciliatum*, (50) *curvispinosum*, (51) *zypidum*. Sculpture and pilosity omitted except in 48, 49 where only part of pilosity is shown.

of petiole with a large rounded, convex lamella ventrally, the tergal portion of the node higher than the dorsal length in profile. Base of first gastral tergite strongly concave medially behind the post-petiole, the anterolateral portions of the tergite produced anteriorly, forming a short tooth to either side of the posterior margin of the post-petiole. Dorsum of head with spaced-out, quite distinctive longitudinal rugulae, the dorsal alitrunk similarly sculptured but with some reticulation anteriorly. Petiole with some rugulation on sides and dorsum but post-petiole dorsum mostly smooth. Base of first gastral tergite with vestiges of superficial sculpture, very difficult to see. Dorsal surfaces of head and body with numerous erect or suberect hairs, but those on the scapes and tibiae short and decumbent or subdecumbent. Colour yellowish brown.

PARATYPE WORKERS. As holotype but with range of dimensions: TL 2.6–2.8, HL 0.66–0.68, HW 0.58–0.62, CI 86–91, SL 0.48–0.50, SI 77–83, PW 0.40–0.44, AL 0.70–0.74 (3 measured).

Holotype worker, INDIA: M.P. 11 mi. SW. Dhamtari, 340 m, 31.i.1962 (*E. S. Ross & D. Cavagnaro*) (CAS, San Francisco).

Paratypes. 3 workers with same data as holotype (CAS, San Francisco; BMNH; MCZ, Cambridge).

The minute eyes of *myops* make this species immediately recognizable. In fact, the eyes here are the smallest known for any species outside of the Ethiopian region where at least one species with reduced eyes is known. The affinities of *myops* lie with *inglebyi*, but in this latter species the eyes are larger and the anterior portion of the median clypeus is abruptly downcurved.

The *mixtum*-group

Antennae with 12 segments. Sting appendage triangular or dentiform. Frontal carinae reaching back beyond the level of the eyes but only weakly defined in some species. Eyes of moderate size. Base of first gastral tergite concave and the anterodorsal angles of the sclerite projecting as a pair of blunt teeth or horns on each side of the posterolateral postpetiolar corners (Fig. 38).

A small group of Oriental region species with one in Sri Lanka, two in India and one in Taiwan.

Tetramorium amium Forel stat. n.

Tetramorium mixtum st. *amiam* Forel, 1912 : 53. Syntype workers, TAIWAN: Pilam (*H. Sauter*) (types not found, presumed lost).

In the description of this form Forel implies that it is similar to *mixtum* but smaller (TL 2.3–2.4) and with the clypeus more strongly carinate. The antennal scrobes are more strongly developed, with much finer sculpture, the limits of the scrobe delimited by a margin posteriorly and laterally which may be weak but is distinct. The eyes situated almost at the midlength of the sides of the head, further back than in *mixtum* where they are in front of the midlength. Petiole node not longer than broad in dorsal view. Propodeal spines narrower and less divergent than in *mixtum*, the basal border of the first gastral tergite less concave.

Forel states that *amium* may be a different species from *mixtum*, and on the strength of the characters above, extracted from the original description, I am inclined to agree with him.

Tetramorium mixtum Forel (Fig. 38)

Tetramorium mixtum Forel, 1902a : 236. Syntype workers, INDIA: Coonoor (*Wroughton*), and Utakamand (*Wroughton*) (MHN, Geneva; MCZ, Cambridge) [examined].

WORKER. TL 3.1–3.5, HL 0.76–0.88, HW 0.72–0.86, CI 92–97, SL 0.50–0.56, SI 65–72, PW 0.48–0.56, AL 0.86–0.96 (12 measured).

Mandibles striate; anterior clypeal margin with a feeble median impression, virtually absent in some specimens. Frontal carinae weak, no more strongly developed than the remaining cephalic sculpture. Antennal scrobes very poorly developed, almost absent, their boundary not delimited posteriorly or ventrally. Eyes situated in front of middle of sides of head, their maximum diameter *c.* 0.14–0.16. Propodeal spines stout and acute, the metapleural lobes elongate-triangular and acute. Petiole in profile blocky and massive, shape as in Fig. 38. Postpetiole in profile almost flat dorsally. In dorsal view the petiole

node is usually slightly longer than broad but about as long as broad in some individuals. Base of first gastral tergite very concave behind the postpetiole, the anterolateral corners prominent and projecting forward as a pair of blunt teeth or horns which go round the sides of the posterior portion of the postpetiole (Fig. 38). Dorsum of head longitudinally rugulose, with some reticulation posteriorly. Dorsal alitrunk finely reticulate-rugulose and some trace of rugulose sculpture is also present on the petiole dorsum. Postpetiole dorsum with superficial punctulation. Gaster usually smooth and shining but in some specimens there are traces of faint shagreening close to the basal margin of the first tergite. Erect or suberect fine hairs present on all dorsal surfaces of head and body, but on the scapes and hind tibiae all the hairs are short and subdecumbent to decumbent. On the hind tibiae the longest hairs are less than half the maximum width of the tibia. Colour uniform medium to dark brown, the appendages lighter.

The modification of the base of the gaster seen in this species and its relatives also occurs in *inglebyi* and *myops*, but in these last-named species the frontal carinae are not developed. Amongst the close relatives of *mixtum*, both *rugigaster* and *transversarium* have the gaster distinctly sculptured, and *amium* has the antennal scrobes delimited by a margin posteriorly and ventrally, whereas in *mixtum* the gaster is at most exceedingly feebly sculptured and the limits of the scrobes are not defined. Finally, *rugigaster* and *transversarium* have long, erect hairs on the hind tibiae, absent in *mixtum* (presumably absent in *amium* also).

MATERIAL EXAMINED. INDIA: no loc. (ex coll. Bingham); Kerala State, W. Ghats, Silent Valley Reserve (*A. B. Soans & W. L. Brown*); Peria Reserve (*A. B. Soans & W. L. Brown*); Madras State (*A. B. Soans & W. L. Brown*).

Tetramorium rugigaster sp. n.

(Fig. 39)

HOLOTYPE WORKER. TL 3.4, HL 0.78, HW 0.76, CI 97, SL 0.52, SI 68, PW 0.56, AL 0.92.

Mandibles striate; anterior clypeal margin entire. Frontal carinae long and strong, extending back well beyond the eye. The area constituting the scrobe distinctly less strongly sculptured than the remainder of the head and its boundaries well defined so that the scrobe is quite distinct. Eyes of moderate size, maximum diameter 0.16. Dorsal alitrunk evenly but shallowly convex in profile, metanotal groove absent. Propodeal spines in profile of moderate length, stout and acute. Metapleural lobes triangular and acute. Petiole blocky and massive, its shape in profile as in Fig. 39. In dorsal view the node distinctly broader than long, massive. Basal border of first gastral tergite in dorsal view with the lateral angles prominent and projecting forwards as a pair of blunt tubercles or teeth. Dorsum of head predominantly longitudinally rugulose anteriorly but from about the level of the eyes the rugulae becoming disorganized and the number of cross-meshes increases posteriorly so that a ruguloreticulum is present occipitally. Dorsal surfaces of alitrunk, petiole and postpetiole reticulate-rugulose. Basal half of first gastral tergite finely but conspicuously longitudinally rugulose with some anastomosis of the rugulae basally, first gastral sternite similarly sculptured. All dorsal surfaces of head and body with abundant long fine hairs. Leading edge of antennal scapes with a row of projecting hairs which are longer than the maximum width of the scape. Dorsal (outer) surfaces of hind tibiae with numerous erect or suberect hairs, the longest of which are distinctly longer than the maximum tibial width. Colour uniform deep reddish brown, the appendages yellowish brown.

PARATYPE WORKERS. As holotype but some lighter in colour. Size range TL 3.0-3.4, HL 0.72-0.82, HW 0.70-0.78, CI 92-97, SL 0.48-0.54, SI 68-73, PW 0.50-0.60, AL 0.80-0.94 (12 measured). Maximum diameter of eye *c.* 0.16-0.18.

Holotype worker, INDIA: Kerala State (W. Ghats), Kottiyoor, Wynaad Taluk 650 m, 7.iv.1969, evgrn forest (*A. B. Soans & W. L. Brown*) (MCZ, Cambridge).

Paratypes. INDIA: 4 workers with same date as holotype; 13 workers, 1 alate female and 4 males, Kerala State (W. Ghats), Silent Valley Reserve, 16 km W. of Mukkali, 9.iv.1969, moist evgrn for., 1200 m, litter, rot. wood M244 (*A. B. Soans & W. L. Brown*) [parts of data on undersides of labels] (MCZ, Cambridge; BMNH).

This species is very close to *transversarium* but is larger, more strongly sculptured and has the petiole node less massively developed. More distantly *rugigaster* is related to *mixtum* but in this species the tibiae lack long erect hairs, all which are present being short.

Tetramorium transversarium Roger
(Fig. 40)

Tetramorium transversarium Roger, 1863a : 181. Syntype workers, SRI LANKA (location of types not known).

WORKER. TL 3.0, HL 0.68, HW 0.64, CI 94, SL 0.46, SI 72, PW 0.48, AL 0.80.

Mandibles striate; anterior clypeal margin entire. Frontal carinae reaching back well beyond the level of the posterior margins of the eyes and forming the dorsal margins of the broad, shallow but conspicuous antennal scrobes. Eyes of moderate size, maximum diameter 0.14, about $0.22 \times$ HW. Pronotal corners rounded in dorsal view. Propodeal spines strongly divergent in dorsal view, feebly curved; in profile appearing straight and acute, longer than the elongate-triangular metapleural lobes. Petiole node in profile massive, much larger than postpetiole. Anterior face of node vertical, the anterior half of the dorsum flat, behind this the dorsum sloping to the short, straight posterior face. In dorsal view the petiole node massively transverse, its maximum width *c.* 0.40, almost as broad as the pronotum, its shape in dorsal view as shown in Fig. 40. Anterolateral angles of first gastral tergite produced forwards as a pair of low, rounded, blunt tubercles, not nearly so conspicuous as in other members of the group. Dorsum of head irregularly weakly rugulose, the spaces between rugulae with superficial punctulate ground-sculpture. Dorsal surfaces of alitrunk, petiole and postpetiole irregularly and finely reticulate-rugulose. Basal one-third of first gastral tergite feebly rugulose and with traces of superficial punctulation. All dorsal surfaces of head and body with numerous elongate, fine hairs which are also present on the leading edge of the scape and the dorsal (outer) surface of the hind tibiae. Colour reddish brown.

It seems probable that the types of *transversarium* have been lost or destroyed, and I base my interpretation of this distinctive species upon a single specimen from SRI LANKA: Hakgalam, 1700 m, Hargala (*Mussard, Besuchet, Löbl*) at present housed in NM, Basle. It is certainly most closely related to the Indian *rugigaster* but in that species the petiole is much less massively developed.

The *scabrosum*-group

Small to minute species with 12-segmented antennae. Sting appendage triangular or dentiform. Anterior clypeal margin entire. Frontal carinae quite strongly developed throughout the group, always reaching back beyond the level of the eyes (Figs 44, 45). Antennal scrobes moderately developed, usually quite distinct even if shallow. Gaster not modified as in *inglebyi*- and *mixtum*-groups. Antennal scapes with a spaced-out row of longer hairs projecting beyond the pubescence or other pilosity, usually arising dorsally on the leading edge of the scape and very commonly directed vertically. Dorsal (outer) surface of hind tibiae with numerous or abundant elongate hairs which are erect or suberect and freely projecting.

The eight species of this group are widely distributed over the Oriental and Indo-Australian regions. One species, *kraepelini*, extends its range into the southern parts of the eastern Palae-arctic and one, *tanakai*, is endemic in Japan. All members of the group are small or minute, with a maximum size of TL about 3.0 in the larger species. No members of this group are known from Australia but three occur in New Guinea.

The group appears to be closely related to the *tonganum*-group but in these the frontal carinae tend to be less strongly developed and the scapes and tibiae always lack standing elongate hairs.

Tetramorium aptum sp. n.

HOLOTYPE WORKER. TL 2.6, HL 0.60, HW 0.58, CI 97, SL 0.40, SI 69, PW 0.42, AL 0.70.

Mandibles striate; anterior clypeal margin entire. Frontal carinae distinct, extending back well beyond the level of the eyes but occipitally becoming confused with the reticulate sculpture. Antennal scrobes broad and shallow but easily discernible. Eyes relatively small, maximum diameter *c.* 0.12 so that the diameter of the eye is about $0.20 \times$ HW. Propodeal spines moderate, quite stout, acute apically; metapleural lobes long, acute and triangular, about $0.66 \times$ propodeal spine length. Petiole in profile with the node relatively long and low, the dorsal length of the node greater than the height of the tergal portion. In dorsal view the petiole node about as broad as long, narrowest in front and broadening posteriorly, and more narrowly rounded in front than behind. Dorsum of head weakly longitudinally rugulose to the level of the posterior margins of the eyes, behind this with increasingly numerous cross-meshes and the occipital region finely reticulate-rugulose. Spaces between the rugulae with fine, superficial punctulation,

not conspicuous. Dorsal alitrunk finely reticulate-rugulose, most strongly developed on pronotum. Dorsal surfaces of both petiole and postpetiole covered with rugulose or reticulate-rugulose sculpture and with some punctulation. Gaster unsculptured. All dorsal surfaces of head and body with numerous erect or suberect hairs of varying length. On the head the longest hairs arise from the frontal carinae and on the alitrunk the longest hairs arise in a line along the sides of the dorsum. Antennal scapes with very short, curved pubescence and with a sparse series of longer, stouter hairs which are erect and project vertically. Dorsal (outer) surfaces of hind tibiae with erect or suberect short, stout hairs. Colour uniform light brown, and appendages yellowish.

PARATYPE WORKERS. As holotype but TL 2.6–2.7, HL 0.60–0.62, HW 0.56–0.60, CI 93–96, SL 0.38–0.40, SI 66–68, PW 0.42–0.44, AL 0.70–0.72 (2 measured). Maximum diameter of eye varies *c.* 0.12–0.13 which gives an eye diameter about 0.20–0.23 × HW.

Holotype worker, THAILAND: Nong Hoi, 21.vii.1975 (*D. Jackson*) (BMNH).

Paratypes. 2 workers with same data as holotype (BMNH; MCZ, Cambridge).

This species is also known from three specimens collected in WEST MALAYSIA: Malaya, Salangor, Kepong Waterworks Reserve, 22.viii.67 (*R. Crozier*) (MCZ, Cambridge; BMNH). These match the description above but the extreme apices of the propodeal spines are somewhat upcurved.

Amongst the species of the *scabrosum*-group *aptum* is easily distinguished as it is the only species having both petiole and postpetiole completely sculptured. In one or two other species of the group the postpetiole may be faintly sculptured, but here the petiole is either broader than long or the relative size of the eye is outside the above range, or both.

Tetramorium curtulum Emery
(Fig. 44)

Tetramorium curtulum Emery, 1894 : 471. Syntype workers, BURMA: Palon (*L. Fea*) (probably in MCSN, Genoa).

WORKER. TL 2.8–3.1, HL 0.64–0.74, HW 0.58–0.70, CI 90–94, SL 0.40–0.50, SI 70–75, PW 0.42–0.50, AL 0.68–0.80 (16 measured).

Mandibles striate; anterior clypeal margin arcuate and entire. Frontal carinae long and conspicuous, extending back well behind the eyes. Antennal scrobes quite well developed, distinctly concave. Eyes small, maximum diameter *c.* 0.10–0.14, about 0.16–0.19 × HW. Dorsal alitrunk evenly convex in profile. Propodeal spines quite short, narrow and acute, as long as or only slightly longer than the metapleural lobes which are broad, triangular and acute. Petiole in profile with the dorsal length about equal to the height of the tergal portion of the node. In dorsal view the petiole node is usually as broad as long, but in some specimens it is slightly longer than broad. Dorsum of head to behind level of eyes predominantly or entirely sculptured with spaced-out longitudinal rugulae with few or no cross-meshes, the spaces between the rugulae with faint superficial punctulation. A fine ruguloreticulum is present on the occiput. Dorsal alitrunk with a fine, dense reticulate-rugulation, the same sculpture present on the petiole dorsum but varying from almost as strong as on the alitrunk to very faint. Postpetiole often with faint traces of sculpture on dorsum, more rarely with rugulae developed. Gaster unsculptured. All dorsal surfaces of head and body with numerous hairs; the antennal scapes with a spaced row of longer, stouter hairs projecting beyond the short pubescence and the dorsal (outer) surfaces of the posterior tibiae with numerous erect or suberect quite long hairs. Colour usually uniform yellowish brown but in some darker, reddish brown.

In the *scabrosum*-group this species is recognizable by its reduced eyes, which are fairly conspicuous in the group as most other species have a maximum eye diameter of >0.20 × HW (compare Figs 44 and 45).

I have not been able to see the types of *curtulum* and I am not truly convinced that the material noted below, upon which the above description is based, is really referable to *curtulum* in the sense which Emery originally described it. Whether this doubt is justified or not must await a re-examination of the *curtulum* types.

MATERIAL EXAMINED. WEST MALAYSIA: Malaya, Selangor, Gombak (*R. Crozier*); Gombak (*B. Bolton*). BORNEO: Sarawak, Mt Matang (*G. E. Bryant*); SE. Borneo, 17–46 km W. Batulitjin (*W. L. Brown*).

Tetramorium kraepelini Forel
(Fig. 45)

Tetramorium kraepelini Forel, 1905 : 15. Holotype worker, JAVA: Bogor (= Buitenzorg), 24.ii–12.iii.1904 (*K. Kraepelin*) (MHN, Geneva) [examined].

Tetramorium yanoi Santschi, 1937 : 376, figs 8–10. Syntype workers, JAPAN: Kagoshima-ken, no. 710 (*M. Yano*) (NM, Basle) [examined]. **Syn. n.**

Tetramorium eidmanni Menozzi, 1941 : 21. Nomen nudum [specimens examined, in IE, Bologna]. **Syn. n.**

WORKER. TL 2·1–2·3, HL 0·52–0·64, HW 0·46–0·58, CI 87–93, SL 0·34–0·40, SI 68–74, PW 0·34–0·44, AL 0·56–0·72 (16 measured).

Mandibles striate, anterior clypeal margin entire, arched. Frontal carinae distinct to well behind the level of the eyes but occipitally tending to merge with the other sculpture. Antennal scrobes moderately developed, forming conspicuous though quite shallow and broad impressions on the side of the head. Eyes relatively large, maximum diameter *c.* 0·13–0·17, about 0·26–0·30 × HW. Propodeal spines longer than metapleural lobes, acute, in some populations with a tendency to be slightly upcurved apically. Metapleural lobes triangular and acute. Petiole node in profile with the dorsal length less than the height of the tergal portion, the node tending to become narrower dorsally. In dorsal view the petiole node usually broader than long, less commonly about as broad as long. Dorsum of head predominantly or completely finely longitudinally rugulose to the level of the posterior margins of the eyes, behind which a reticulum is present. Ground sculpture of head a weak, superficial punctulation. Dorsal alitrunk finely reticulate-rugulose. Petiole and postpetiole nodes usually both unsculptured, but in some specimens the petiole may show traces of feeble sculpture. Gaster unsculptured. All dorsal surfaces of head and body with fine standing hairs, the alitrunk with some hairs which are distinctly elongate. Antennal scapes with numerous short hairs and with a spaced row of longer, more conspicuous hairs on the leading edge. Dorsal (outer) surfaces of hind tibiae with elongate erect or suberect hairs. Colour varying from uniform yellowish brown to light mid-brown, sometimes the gaster slightly darker than the alitrunk.

A widespread but apparently not very common species, *kraepelini* shows some variation over its range. Collections are not complete enough as yet to decide if any of these variations are of significance and in consequence I have retained all the samples under a single species. Specimens from the Philippines approach the holotype most closely as in these the peduncle of the petiole is relatively narrow and the node of the petiole in profile narrows dorsally quite conspicuously. In specimens from Japan and China the peduncle of the petiole tends to be broader and the node less narrowed above. In these specimens also the petiole node in dorsal view tends to be more globular and less distinctly transverse than in specimens from elsewhere. Closely related species occur in Japan and Java (*tanakai* and *parvum* respectively); these are best separated by the characters given in the key.

MATERIAL EXAMINED. JAPAN: Kagoshima (*M. Azuma*). CHINA: Foochow (*H. H. Chung*); Mo Man Shan (*W. L. Brown*); Shwangliu (*W. L. Brown*); Szechwan Prov., Chengtu (*W. L. Brown*). PHILIPPINES: Dumaguete (*J. W. Chapman*). JAVA: Karimon (*Dammermann*); Depok (*Dammermann*).

Tetramorium parvum sp. n.

HOLOTYPE WORKER. TL 2·7, HL 0·60, HW 0·54, CI 90, SL 0·40, SI 74, PW 0·42, AL 0·72.

Mandibles striate, anterior clypeal margin arcuate and entire, with a narrow but quite conspicuous anterior apron or flange. Frontal carinae weakly developed, only slightly stronger than the cephalic longitudinal sculpture, but extending back well beyond the posterior margins of the eyes and forming the dorsal margins of the shallow but broad antennal scrobes. Maximum diameter of eye *c.* 0·16, about 0·29 × HW. Propodeal spines short, stout and straight, only slightly longer than the broad, triangular metapleural lobes. Peduncle of petiole downcurved, the node narrowing from base to apex in profile and with the dorsal surface about as long as the tergal portion of the node is high. In dorsal view the petiole node about as broad as long, slightly broader behind than in front. Dorsum of head with irregular, feeble longitudinal rugulae to the level of the posterior margins of the eyes but behind this cross-meshes become numerous and a reticulum is present on the occiput. Ground sculpture of superficial punctulation is quite conspicuous and on the whole the cephalic sculpture has a disorganized appearance. Dorsal alitrunk with a rugoreticulum, the components of which are low and blunted on the promesonotum.

Petiole dorsally with weak but fairly conspicuous rugulae present, the postpetiole and gaster unsculptured. All dorsal surfaces of head and body with numerous fine erect or suberect hairs. Antennal scapes with a spaced row of long hairs projecting dorsally and dorsal (outer) faces of hind tibiae with numerous stout erect or suberect hairs. Colour uniform blackish brown, the legs yellowish brown.

PARATYPE WORKER. As holotype but slightly lighter in colour, uniform dark brown, with measurements TL 2.6, HL 0.60, HW 0.56, CI 93, SL 0.40, SI 71, PW 0.42, AL 0.72. Maximum diameter of eye *c.* 0.16.

Holotype worker, JAVA: Tjibodas, 23.x.73 (*B. Bolton*) (BMNH).

Paratype. JAVA: 1 worker, Tjibodas, 1500 m, 8.vii.1920, Mus. Btzg. no. 30 (MCZ, Cambridge).

This small species is a sibling of *kraepelini*, separated from it by the darker colour and weaker, more disorganized sculpture seen in *parvum*.

Tetramorium pulchellum Emery (Figs 42, 43)

Tetramorium pulchellum Emery, 1897a : 586, pl. 15, fig. 28. Syntype workers, NEW GUINEA: Berlinhafen and Friedrich-Wilhelshafen (*L. Biró*) (probably in MCSN, Genoa).

WORKER. TL 2.8–3.0, HL 0.64–0.68, HW 0.58–0.62, CI 88–91, SL 0.48–0.54, SI 80–85, PW 0.46–0.50, AL 0.82–0.86 (6 measured).

Mandibles striate, anterior clypeal margin entire. Frontal carinae strong, extending back well beyond the level of the posterior margins of the eyes but not reaching the occiput. Antennal scrobes conspicuous. Maximum diameter of eye *c.* 0.14–0.16, about 0.23–0.26 × HW. In dorsal view the pronotal corners broadly rounded, not at all angular. Propodeal spines short, broad and acute, elevated and slightly upcurved. Metapleural lobes generally broad and more or less rounded or very bluntly rounded-triangular. Petiole in profile with the dorsal surface as long as or slightly longer than the height of the tergal portion of the node, in dorsal view the node slightly broader than long. Head quite coarsely and very conspicuously reticulate-rugulose dorsally, the rugular cross-meshes occurring from the level of the anterior margins of the eyes at least, and usually with some in front of this level. Ground sculpture a feeble and inconspicuous punctulation. Dorsal alitrunk strongly reticulate-rugulose, this sculpture extending onto the petiole and postpetiole though weaker on the former and yet weaker on the latter; gaster unsculptured. All dorsal surfaces of head and body with abundant fine hairs of varying length which are erect, suberect or subdecumbent. Dorsal (outer) surfaces of hind tibiae with numerous long hairs, predominantly suberect; the antennal scapes also with erect but shorter hairs. Colour uniform brown, the legs yellowish.

In the *scabrosum*-group two of the New Guinean species, *pulchellum* and *scabrosum*, are conspicuous by their relatively coarse reticulate-rugulose cephalic sculpture. The two are easily separable as in *scabrosum* the pronotal corners are distinctly angular whilst in *pulchellum* they are rounded (compare Figs 41, 42). In the remainder of the group (not New Guinean species) the sculpture of the head tends to be predominantly or entirely longitudinal to the level of the posterior margins of the eyes, any strong reticulation which is present being restricted to the occipital region.

MATERIAL EXAMINED. NEW GUINEA: Wau (*S. Peck*).

Tetramorium punctiventre Emery

Tetramorium punctiventre Emery, 1887 : 453. Holotype female, NEW GUINEA: Hatam (*Beccari*) (probably in MCSN, Genoa).

I have not seen the holotype of this species, nor have I been able to find any material matching the original description. From that description it is not possible to decide whether *punctiventre* is correctly placed in *Tetramorium* or should go into *Triglyphothrix*, and Emery's comparison of this species with *Tr. lanuginosa* does little to settle the matter. For the present and with some misgivings I tentatively place *punctiventre* in the *scabrosum*-group, fully realizing that this may prove to be incorrect.

The principal characters of this enigmatic species are as follows. First gastral tergite basally punctate and with longitudinal rugulae. Propodeal spines long. Petiole node in dorsal view transversely ovate. Frontal carinae produced back beyond the level of the eyes, the antennal scrobes broad. Mandibles striate. Dominant sculpture on head and alitrunk a dense rugose-punctation.

In *Tetramorium* species of these regions gastral sculpture of the form described is very rare, but in *Triglyphothrix* gastral sculpture is reasonably common (Bolton, 1976), though of these species only the very conspicuous *fulviceps* is known to occur in New Guinea and this is certainly not equatable with *punctiventre*.

Tetramorium scabrosum (F. Smith)
(Fig. 41)

Myrmica scabrosa F. Smith, 1859 : 147. LECTOTYPE worker, ARU IS (*A. R. Wallace*) (UM, Oxford), here designated [examined].

Tetramorium scabrosum (F. Smith) Donisthorpe, 1932 : 455 (see note below).

Tetramorium papuanum Emery, 1887 : 452. Syntype workers, NEW GUINEA: Sorong, v.1872 (*L. M. D'Albertis*) (MHN, Geneva) [examined]. Syn. n.

NOTE. Donisthorpe (1932) stated that two workers of this species were present in UM, Oxford collection, but at present only one can be found. There is a second specimen of this species in BMNH which may represent one of the two seen by Donisthorpe, but this has no data-cards attached to it.

WORKER. TL 2.7–2.8, HL 0.62–0.64, HW 0.56–0.58, CI 90, SL 0.44–0.46, SI 78–79, PW 0.44–0.46, AL 0.68–0.72 (3 measured).

Mandibles striate, anterior clypeal margin entire. Frontal carinae reaching back well beyond the level of the eyes but not much more strongly developed than the other cephalic sculpture. Antennal scrobes weakly developed, broad and shallow but quite easily discernible. Maximum diameter of eye c. 0.16, about 0.27–0.28 × HW. With the alitrunk in dorsal view the pronotal corners angular, giving a square-shouldered appearance. Propodeal spines quite short, stout and acute, slightly longer than the broadly triangular metapleural lobes. Node of petiole in profile with the dorsal length less than the height of the tergal portion; in dorsal view the node broader than long. Dorsum of head distinctly reticulate-rugulose from the level of the anterior margins of the eyes to the occiput, ground sculpture between the rugulae very inconspicuous. Dorsal alitrunk similarly sculptured but the petiole dorsum with only weak, very scattered rugulae and the postpetiole virtually without sculpture dorsally. Gaster unsculptured. All dorsal surfaces of head and body with numerous fine, erect or suberect hairs which are also present on the leading edges of the scapes and the outer surfaces of the hind tibiae. Colour uniform dark brown or dark reddish brown, the gaster blackish brown. Appendages lighter, yellowish brown.

Like *pulchellum* this small species has rather coarse cephalic sculpture, but differs from it as the pronotal corners are angular in *scabrosum*, rounded in *pulchellum*, as indicated in Figs 41 and 42.

Tetramorium tanakai sp. n.

HOLOTYPE WORKER. TL 2.6, HL 0.62, HW 0.56, CI 90, SL 0.40, SI 71, PW 0.42, AL 0.70.

Mandibles striate, anterior clypeal margin entire. Frontal carinae more strongly developed than remaining cephalic sculpture, reaching back beyond the level of the posterior margin of the eyes but occipitally becoming confused with the other sculpture. Antennal scrobes very shallow, fairly conspicuous but broad and not very strongly defined. Eyes of moderate size, maximum diameter 0.14, about 0.25 × HW. Propodeal spines tapering and acute, longer than the broadly triangular metapleural lobes. Petiole in profile with the length of the dorsum greater than the height of the tergal portion of the node, in dorsal view as broad as long, roughly subglobular in shape and somewhat narrower in front than behind. Dorsum of head finely longitudinally rugulose to behind the level of the posterior margins of the eyes, with few or no cross-meshes; occipital area with a fine ruguloreticulum. Ground sculpture of head inconspicuous. Dorsal alitrunk finely reticulate-rugulose, the petiole dorsally retaining some faint traces of sculpture but the postpetiole and gaster unsculptured. All dorsal surfaces of head and body with numerous fine erect or suberect hairs of varying length. Dorsal (outer) surfaces of hind tibiae and the antennal scapes with projecting prominent hairs. Head and gaster dark brown or blackish brown, the alitrunk, pedicel and legs much lighter, yellow to pale yellowish brown so that the ant has a distinctly bicoloured appearance.

PARATYPE WORKERS. As holotype but in some the metapleural lobes are blunted and rounded apically. Range of dimensions TL 2.4–2.6, HL 0.58–0.62, HW 0.52–0.56, CI 89–91, SL 0.36–0.40, SI 69–73, PW 0.38–0.42, AL 0.66–0.70 (23 measured). Maximum diameter of eye c. 0.14 so that the ocular diameter is about 0.25–0.27 × HW.

Holotype worker, JAPAN: Okinawa, Ishigaki I., Mt Omoto, 1.iii.1975 (*M. Tanaka*) (BMNH). Paratypes. 58 workers and 1 female with same data as holotype (BMNH; MCZ, Cambridge; NM, Basle; private coll. Tanaka).

This small species is closely related to *kraepelini* but is separable by its distinct colour pattern and differently shaped node. In *kraepelini* the colour is usually uniform, light yellowish brown to light mid-brown, not distinctly bicoloured as *tanakai*. The petiole node shows some variation in shape in *kraepelini* but in profile the dorsal length is always less than the height of the tergal portion of the node, whereas in *tanakai* the dorsal length is greater than the height of the tergal portion.

The *ciliatum*-group

Antennae with 12 segments. Sting appendage triangular or dentiform. Anterior clypeal margin entire, not notched or indented medially. Frontal carinae extending back well beyond the level of the posterior margins of the eyes, ranging in development from feeble in *curvispinosum* to very strong in *ciliatum*. Propodeal spines long and usually strongly developed, never downcurved along their length. Gaster without modification as shown in *mixtum*-group.

This is very much a convenience-group, formed of the larger, stout, stockily built and usually quite hairy species which remain of *Tetramorium* outside the *ornatum*- and *bicarinatum*-groups. In general the sculpture in these species is coarse and distinctive. Within the group the species-complex *ciliatum*-*flagellatum*-*tylinum* are closely related, as is the species pair *chapmani*-*khnum*, but the two remaining species (*curvispinosum* and *zypidum*) are not obviously related to any other known species.

The constituent species are distributed in the Oriental and Indo-Australian regions; no species are known from Australia or from New Guinea.

Tetramorium chapmani sp. n.

(Figs 46, 47)

HOLOTYPE WORKER. TL 3.5, HL 0.80, HW 0.76, CI 95, SL 0.56, SI 74, PW 0.58, AL 0.96.

Mandibles striate; anterior clypeal margin entire. Frontal carinae long and strongly developed, reaching back almost to the occipital corners and surmounted by a narrow but quite distinct raised ridge or flange to behind the level of the eyes. Antennal scrobes conspicuous, extending back almost to the occipital corners. Maximum diameter of eye *c.* 0.14, the eyes situated in front of the middle of the sides of the head. Sides of head weakly convex, the occipital margin strongly impressed medially. Dorsum of alitrunk evenly convex in profile, the propodeal spines of moderate length, narrow, straight and acute. Metapleural lobes broadly triangular, acute apically. Shape of petiole and postpetiole, in profile as shown in Fig. 47. In dorsal view the petiole node globular. Entire dorsum of head from posterior clypeal margin to occiput covered with a dense, quite coarse rugoreticulum, the meshes of which are sharply defined and raised; the spaces enclosed by the meshes mostly smooth, at most with only vestigial ground sculpture. Area of antennal scrobes predominantly punctulate, with very reduced rugulae, contrasting strongly with the dorsum. Entirety of dorsal alitrunk, petiole and postpetiole sculptured as dorsum of head, but the pedicel segments rather less conspicuously so. Basal half of first gastral tergite densely and strongly longitudinally striate, the spaces between the striae with superficial punctulation. First gastral sternite sculptured but less strongly than the tergite. Relatively short, fine hairs numerous on all dorsal surfaces of head and body but hairs on scapes and dorsal (outer) surfaces of hind tibiae universally short, decumbent. Colour uniform orange-brown but the tibiae yellow-brown, distinctly lighter in colour than the femora.

PARATYPE WORKERS. As holotype but showing colour variations from orange-yellow to light reddish brown but always with the contrasting femoral-tibial colours. Range of dimensions are TL 3.2-3.5, HL 0.74-0.80, HW 0.72-0.78, CI 95-98, SL 0.54-0.60, SI 72-79, PW 0.54-0.60, AL 0.90-0.96 (13 measured).

Holotype worker, PHILIPPINES: Dumaguete, Silliman University, xii.1950 (*Domingo Empeso*) (MCZ, Cambridge).

Paratypes. 13 workers with same data as holotype (MCZ, Cambridge; BMNH; NM, Basle).

A very conspicuous species, *chapmani* is closely related to *khnum*, also of the Philippines. The two are easily distinguished as *khnum* lacks the gastral sculpture characteristic of *chapmani*.

Tetramorium ciliatum sp. n.

(Fig. 49)

HOLOTYPE WORKER. TL 3·9, HL 0·88, HW 0·86, CI 98, SL 0·68, SI 79, PW 0·62, AL 1·08.

Mandibles striate, anterior clypeal margin entire. Frontal carinae very strongly developed, approaching the occipital corners and composed throughout their length of a low but conspicuous flange or raised rim. Antennal scrobes well developed, distinct, extending back beyond the level of the eyes and not as strongly sculptured as the remainder of the head. Eyes slightly in front of the middle of the feebly convex sides of the head, their maximum diameter c. 0·18. Occipital margin broadly but shallowly concave. Propodeal spines long, narrow and acute, the metapleural lobes low and triangular, acute apically. Node of petiole in profile long and low, the length of the dorsum greater than the height of the tergal portions. Anterior and posterior faces of the node short, the dorsum long and convex (Fig. 49). Postpetiole in profile low and evenly rounded. Petiole in dorsal view fractionally longer than broad, subglobular in shape. Entire dorsum of head covered with a fine, wide-meshed but very conspicuous rugoreticulum, the spaces enclosed by the meshes mostly smooth, with some vestigial ground-sculpture. Dorsal surfaces of alitrunk, petiole and postpetiole with an open, loose but strongly marked rugoreticulum, less strongly developed on the pedicel segments than on the alitrunk. Gaster unsculptured. All dorsal surfaces of head and body with abundant erect hairs, some of which are long. Anterior (leading) edges of antennal scapes with a spaced row of long, erect hairs which are longer than the maximum width of the scape; dorsal (outer) surfaces of hind tibiae with a number of long, erect hairs, the longest of which are at least equal to the maximum tibial width. Colour midbrown, the gaster darker brown, the legs lighter, dark yellowish brown.

PARATYPE WORKERS. As holotype, showing some variation in shade of colour and in size, TL 3·6–4·2, HL 0·80–0·96, HW 0·80–0·94, CI 97–100, SL 0·60–0·70, SI 71–79, PW 0·58–0·70, AL 0·98–1·14 (25 measured). Maximum diameter of eye c. 0·15–0·18.

Holotype worker, THAILAND: Nong Hoi (Chieng Mai), 27.vii.1975 (*D. Jackson*) (BMNH).

Paratypes. 90 workers with same data as holotype and 15 workers, 3 queens as holotype but collected 19.viii.1975 (BMNH; MCZ, Cambridge; NM, Basle; MHN, Geneva; IE, Bologna; MNHU, Berlin; CAS, San Francisco). The species is also present in VIETNAM: between Phong Tho and Bac tan trac (*R. E. Wheeler*), specimens in BMNH and MCZ, Cambridge.

The closest known relative of *ciliatum* appears to be *flagellatum* of Borneo, but in this latter species the hairs are incredibly long and the pedicel segments are differently shaped, compare Figs 48 and 49.

Tetramorium curvispinosum Mayr

(Fig. 50)

Tetramorium curvispinosum Mayr, 1897 : 430. Holotype worker, SRI LANKA: Kalawewa (*Madarasz*) (location of type not known).

WORKER. TL 3·2–3·6, HL 0·72–0·80, HW 0·66–0·72, CI 88–93, SL 0·52–0·58, SI 78–83, PW 0·48–0·52, AL 0·88–0·94 (13 measured).

Mandibles striate; anterior clypeal margin entire. Frontal carinae extending back behind the level of the eyes but the carinae themselves irregular and feeble, in the posterior half of their length scarcely or not more strongly developed than the other cephalic sculpture. Antennal scrobes very weak, scarcely recognizable. Eyes of moderate size, maximum diameter c. 0·14–0·16. Propodeal spines exceptionally long, stout but acute apically (Fig. 50). In dorsal view the spines are strongly bowed, their apical halves converging posteriorly. Metapleural lobes short, triangular and acute. Propodeum in profile with a long anterior peduncle and a short, high node, the dorsal length of which is distinctly less than the height of the tergal portion. Node of petiole in dorsal view as long as or slightly longer than broad. Dorsum of head irregularly longitudinally rugose with very few cross-meshes to the level of the posterior margins of the eyes, behind this level with a rugoreticulum. Dorsal alitrunk with a loose, open rugoreticulum, the meshes of which are broad. Petiole and postpetiole unsculptured or at most with some faint rugulation. Gaster unsculptured. All dorsal surfaces of head and body with numerous long, fine hairs. Anterior (leading) edge of scapes and dorsal (outer) surfaces of hind tibiae with long erect or suberect hairs, the longest of which are at least subequal to the maximum width of the appendage from which they arise, usually longer. Head and alitrunk orange-brown; pedicel, gaster and appendages yellowish or yellowish brown.

The form of the propodeal spines in this species appears to be unique in the genus and serves quickly to distinguish the species. *T. curvispinosum* does not appear to have any immediate relatives but the long spines and elongate peduncle of the petiole are more reminiscent of members of the *tortuosum*-group. However, the 12-segmented antennae and dentiform sting appendage of *curvispinosum* exclude it from that group and I have placed it in *ciliatum*-group for the time being.

MATERIAL EXAMINED. SRI LANKA: Kandy (*E. O. Wilson*).

Tetramorium flagellatum sp. n.

(Fig. 48)

HOLOTYPE WORKER. TL 3.9, HL 0.90, HW 0.82, CI 91, SL 0.66, SI 80, PW 0.62, AL 1.04.

Mandibles striate; anterior clypeal margin entire. Frontal carinae reaching back almost to occiput but irregular, and in their posterior halves only as strongly developed as the other cephalic sculpture. Antennal scrobes long and broad but shallow, easily discernible. Eyes in front of middle of sides of head, maximum diameter *c.* 0.18. Sides of head weakly convex, the occipital margin broadly concave in full-face view. Propodeal spines elevated, of moderate length, feebly upcurved and acute apically. Metapleural lobes triangular basally, spiniform and acute apically. Node of petiole in profile with the dorsal length greater than the height of the tergal portion; postpetiole narrowly dome-like. In dorsal view the petiole node slightly broader than long. Dorsal surfaces of head, alitrunk, petiole and postpetiole covered with a distinct, irregular rugulation, reticulate in places and finer and denser on the head than on the alitrunk. Gaster unsculptured. All dorsal surfaces of head and body with numerous exceptionally long, very conspicuous fine hairs, the majority of which are curved (Fig. 48). The longest of these hairs measure 0.45–0.50, well over half the length of the scape. Long, erect hairs present on dorsal (outer) surfaces of hind tibia which are longer than the maximum tibial width but such hairs absent from the scapes where all hairs are shorter than the maximum width of the scape and fine. Colour uniform dark brown, the appendages yellowish.

PARATYPE WORKERS. As holotype but many not showing any apical upcurvature in the propodeal spines, which in some paratypes are also more strongly acute apically. Size range of paratypes TL 3.6–4.2, HL 0.88–0.98, HW 0.80–0.90, CI 90–95, SL 0.62–0.70, SI 75–80, PW 0.60–0.68, AL 1.02–1.16 (6 measured). Maximum diameter of eye in paratypes *c.* 0.18–0.20.

Holotype worker, BORNEO: N., Kiduk Arok, Trus Madi Massif, 1500 m, ix.1956, Cambridge N. Borneo Exped. no. 49 (*P. W. Bryant*) (MCZ, Cambridge).

Paratypes. 5 workers with same data as holotype and 1 worker with same data but no. 78 (MCZ, Cambridge; BMNH).

A further specimen of this species is known, BORNEO: N., Mt Musud (*F. Mjoberg*) (MCZ, Cambridge). This agrees perfectly with the above description but the head and alitrunk are a much lighter brown than in any of the type-series.

The outstanding long pilosity and its distribution on the appendages immediately characterize this exceptional species. It shows relationship with *ciliatum* of Thailand and Vietnam and also with *tylinum*, also of Borneo. However, neither of these species has the remarkable pilosity of *flagellatum*.

Tetramorium khnum sp. n.

(Fig. 52)

HOLOTYPE WORKER. TL 3.1, HL 0.74, HW 0.70, CI 94, SL 0.48, SI 69, PW 0.54, AL 0.84.

Mandibles striate; anterior clypeal margin entire. Frontal carinae long and strongly developed, reaching well beyond the posterior margins of the eyes, almost to the occipital corners. Antennal scrobes long and broad, moderately deep, conspicuous, their reticulate-punctulate sculpture contrasting strongly with the rugosity of the remainder of the head. Eyes of moderate size, maximum diameter *c.* 0.16. Propodeal spines acute, narrow and relatively short, only as long as or slightly longer than the broad, somewhat upcurved metapleural lobes. Petiole in profile with the dorsal length of the node greater than the height of its tergal portion, the anterior face slightly higher than the posterior (Fig. 52). Node in dorsal view broader than long. Dorsum of head covered by a coarse dense, close rugoreticulum, the meshes of which are small and appear reticulate-foveolate in places. Dorsal surfaces of alitrunk, petiole and postpetiole similarly sculptured; gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs

of varying length. Leading edge of antennal scapes with numerous short hairs and also with a spaced row of longer, stouter hairs which are subequal in length to the maximum width of the scape. Dorsal (outer) surface of hind tibiae with outstanding fine, erect or suberect hairs. Colour reddish brown, the gaster lighter in shade than the alitrunk, and with the legs yellowish.

PARATYPE WORKERS. As holotype but range of measurements TL 2.8–3.2, HL 0.70–0.76, HW 0.66–0.74, CI 92–97, SL 0.46–0.50, PW 0.52–0.58, AL 0.74–0.86 (16 measured). Maximum diameter of eye *c.* 0.14–0.16.

Holotype worker, PHILIPPINES: Dumaguete, 23.iv.1925 (*J. W. Chapman*) (MCZ, Cambridge).

Paratypes. 10 workers with same data as holotype and 13 workers with same locality data but 'Camp', 6.iv.1931, no. 1 (*J. W. Chapman*) (MCZ, Cambridge; BMNH; NM, Basle).

More material of this species is present in the Chapman collection, housed in MCZ, Cambridge, but it is in rather poor condition. All specimens originate from Dumaguete, the type-locality.

Two other species of this group occur in the Philippines besides *khnum*. These are *chapmani*, which is easily distinguished as the first gastral tergite is strongly sculptured basally, and *zypidum* in which the petiole and postpetiole are almost or entirely unsculptured.

Tetramorium tylinum sp. n.

(Fig. 53)

HOLOTYPE WORKER. TL 3.7, HL 0.84, HW 0.80, CI 95, SL 0.62, SI 77, PW 0.60, AL 0.98.

Mandibles striate; anterior clypeal margin entire. Frontal carinae long, extending back almost to the occipital corners, but only weakly developed. Over most of their length the frontal carinae are no more strongly developed than the other cephalic sculpture. Antennal scrobes poorly developed, very shallow but still quite easily visible. Eyes situated well in front of the midlength of the sides of the head in full-face view, their maximum diameter *c.* 0.18. Occipital margin of head strongly concave medially in full-face view. Alitrunk in profile evenly convex, the propodeal spines straight, strongly tapered apically and very sharp. Metapleural lobes acutely triangular, somewhat upcurved. Petiole in profile shaped as in Fig. 53, without a defined posterodorsal angle so that the dorsum rounds into the posterior face. In dorsal view the petiole node is slightly broader than long. Dorsum of head with a fine, dense and somewhat irregular rugoreticulum, the area of the antennal scrobes more finely and more densely sculptured, having a rough appearance. Dorsal surfaces of alitrunk and petiole finely reticulate-rugose, the latter less strongly so than the former. Dorsum of postpetiole unsculptured centrally and mostly so elsewhere, but with some traces of rugulae around the sides of the dorsum. Gaster unsculptured. All dorsal surfaces of head and body with abundant fine, erect or suberect hairs of varying length. Longest hairs on scapes not equal to the width of the scape, without a spaced row of elongate hairs. Dorsal (outer) surfaces of hind tibiae with abundant short hairs but without long prominent hairs. Colour dark reddish brown, the appendages yellowish.

PARATYPE WORKERS. As holotype: TL 3.6–3.7, HL 0.84–0.86, HW 0.80–0.82, CI 95–97, SL 0.60–0.64, SI 74–80, PW 0.58–0.62, AL 0.96–1.00 (5 measured). Maximum diameter of eye *c.* 0.18 in all paratypes.

Holotype worker, BORNEO: N., Kiduk Arok, Trus Madi Massif, 1500 m, ix.1956, no. 21, Cambridge N. Borneo Exped. (*P. W. Bryant*) (MCZ, Cambridge).

Paratypes. 5 workers with same data as holotype but no. 34A (MCZ, Cambridge; BMNH).

The closest known relative of *tylinum* is *flagellatum*, which is also known from the same locality in Borneo. *T. flagellatum* is quickly separable from *tylinum* by its exceptionally long pilosity and the presence of long, erect hairs on the outer surface of the hind tibiae.

Tetramorium zypidum sp. n.

(Fig. 51)

HOLOTYPE WORKER. TL 3.8, HL 0.90, HW 0.84, CI 93, SL 0.62, SI 74, PW 0.58, AL 1.04.

Mandibles striate; anterior clypeal margin entire but exceedingly shallowly concave medially. Frontal carinae extending back almost to occipital corners but behind level of eyes becoming very weak, scarcely or not more strongly developed than the other cephalic sculpture. Antennal scrobes shallow and broad, only feebly developed. Occipital margin of head distinctly concave medially in full-face view. Eyes moderate, maximum diameter *c.* 0.19, the eyes situated in front of the middle of the sides of the head. Dorsal alitrunk evenly, shallowly convex in profile, the propodeal spines long, thick, acute and feebly sinuate

along their length, the apices very weakly upcurved. Metapleural lobes narrowly triangular and acute. Shape of petiole in profile as shown in Fig. 51; in dorsal view the node distinctly longer than broad. Dorsum of head predominantly longitudinally rugose with very few cross-meshes to the level of the posterior margins of the eyes, behind this a strong reticulum is developed. Dorsal alitrunk reticulate-rugose. Sides of petiole node with some weak rugosity but the dorsum with an unsculptured median longitudinal strip. Postpetiole and gaster unsculptured. All dorsal surfaces of head and body with quite short erect or suberect hairs. Leading (anterior) margin of antennal scapes with pubescence and also with a spaced row of short, erect hairs. Dorsal (outer) surfaces of hind tibiae with short erect or suberect hairs. Colour reddish brown, the legs dull orange-brown.

PARATYPE WORKERS. AS holotype but some slightly lighter in colour, dull orange-brown. Measurements TL 3.3-4.0, HL 0.80-0.98, HW 0.72-0.90, CI 90-94, SL 0.54-0.64, SI 69-75, PW 0.52-0.64, AL 0.90-1.12 (21 measured).

Holotype worker, PHILIPPINES: Dumaguete, Camp, 14.iv.1931 (*J. W. Chapman*) (MCZ, Cambridge).

Paratypes. PHILIPPINES: 3 workers with same data as holotype; 6 workers as holotype but 3.iv.1931, no. 11; 3 workers as holotype but iv.1928; 3 workers as holotype but 1.iv.1931; 3 workers as holotype but 20.iv.1931; 3 workers, Negros Oriental, Camp, 30.viii.1930 (*F. del Rosario*) (MCZ, Cambridge; BMNH; NM, Basle).

The *tonganum*-group

Antennae with 12 segments. Sting appendage triangular or dentiform. Anterior clypeal margin entire, not notched or indented medially. Frontal carinae extending back beyond the level of the posterior margins of the eyes but usually only weakly developed, often no more strongly defined than the remaining cephalic sculpture. Propodeal spines varying from absent (*infraspinum*) to moderately long (*seneb*) but usually only about as long as the metapleural lobes. First gastral tergite not modified as in *mixtum*-group. Dorsal surfaces of head and body with numerous fine hairs but the antennal scapes and dorsal (outer) surfaces of the hind tibiae only with short subdecumbent to appressed pubescence (in *vandalum* this pubescence may be erect or suberect), these surfaces devoid of elongate hairs.

The members of this group of small to medium-sized species are very widespread in the Oriental and Indo-Australian regions but do not occur in Australia. In most species the known range is relatively small but the distribution area of *tonganum* is wide and the species has been known to occur in hothouses in the temperate zones.

The group is centred upon a complex of more or less closely related species including *christiei*, *difficile*, *laparum*, *tonganum* and *vandalum*, the remaining species tending to be more isolated. One species, *infraspinum*, may not truly belong to this group but for the present it is left here to avoid a proliferation of groups containing only a single species. However, should the need arise to isolate *infraspinum* it is easily accomplished as it lacks propodeal spines. I have decided for the present that this character is of secondary importance to that of the distribution of hairs (or lack of them) on the appendages, the main character separating *tonganum*-group from *scabrosum*-group.

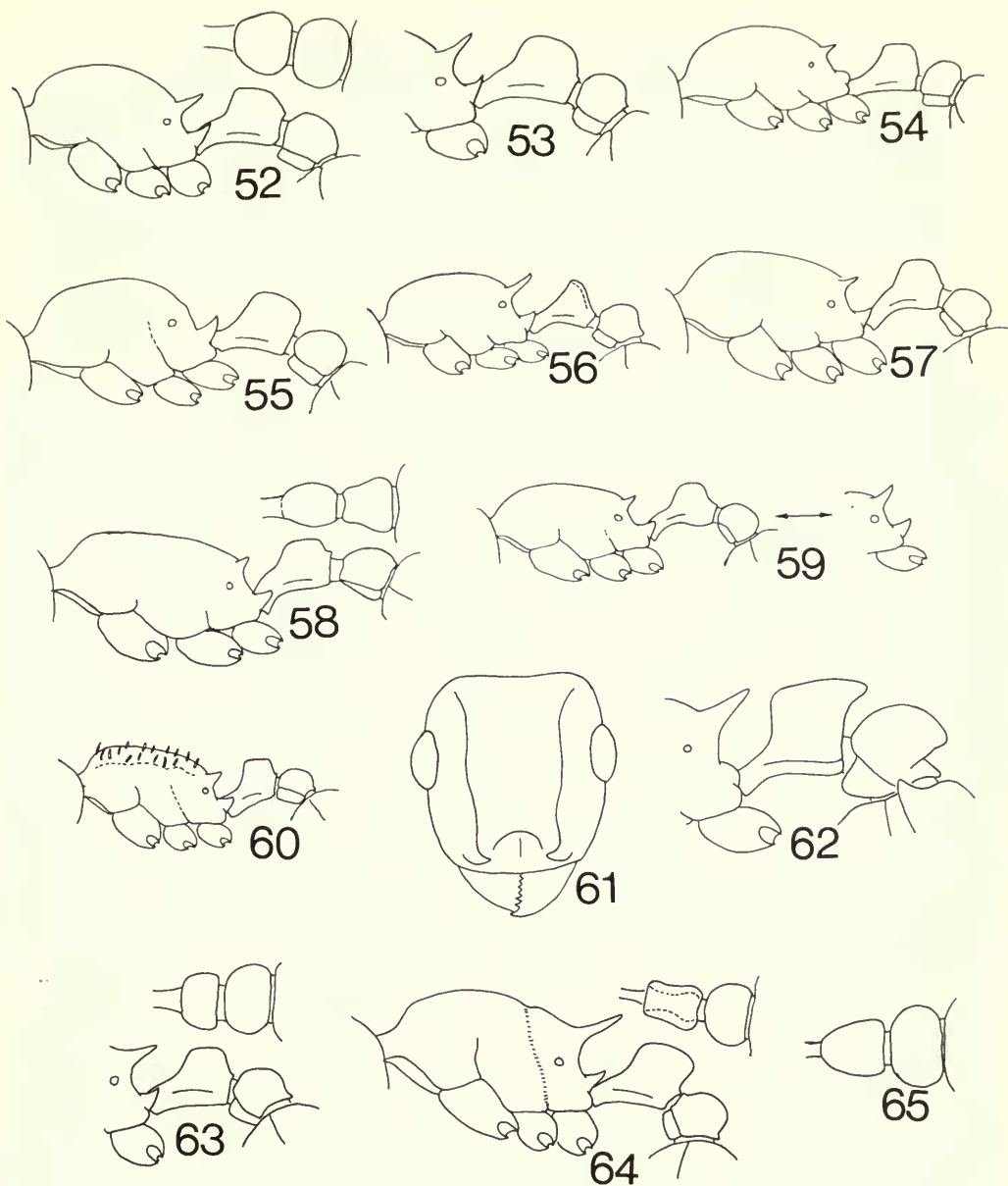
Tetramorium christiei Forel

(Fig. 58)

Tetramorium christiei Forel, 1902a : 232. Syntype workers, INDIA: Darjeeling (*Christie*) (MHN, Geneva; BMNH) [examined].

WORKER. TL 3.4-3.5, HL 0.78-0.80, HW 0.70-0.72, CI 87-90, SL 0.62-0.64, SI 87-91, PW 0.50-0.52, AL 0.94-0.98 (4 measured).

Mandibles striate; anterior clypeal margin entire. Frontal carinae reaching back almost to occiput but only weakly developed, only a little stronger than the remaining cephalic sculpture. Antennal scrobes feeble but distinct, their ventral margins not at all demarcated. Eyes of moderate size, maximum diameter c. 0.16. Antennal scapes narrow and relatively long (SI above). Anterolateral pronotal angles rounded in dorsal view. Propodeal spines dentiform, acute, usually much shorter than the triangular metapleural lobes (but in the Bhutan specimen slightly longer). Petiole in profile with an elongate, feebly downcurved peduncle anteriorly, the node itself with rounded angles (Fig. 58). In dorsal view the petiole node varies



Figs 52–65. *Tetramorium* workers. 52–60. Alitrunk and pedicel of (52) *khnum*, (53) *tylinum*, (54) *salvatum*, (55) *infraspinosum*, (56) *cuneinode*, (57) *vandalum*, (58) *christiei*, (59) *tonganum*, (60) *simillimum*. 61. Head of *megalops*. 62, 63. Propodeum and pedicel of (62) *spininode*, (63) *confusum*. 64. Alitrunk and pedicel of *strictum*. 65. Dorsal pedicel of *turneri*. Sculpture and pilosity omitted in all but 60.

from as broad as long to slightly broader than long. Rugulation of head predominantly longitudinal to region of occiput, with few or no cross-meshes, but with some feeble reticulation on the occiput itself. Dorsal alitrunk finely reticulate-rugulose, the petiole, postpetiole and gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs of varying length but the scapes and hind tibiae only with short, decumbent pubescence. Colour uniform black or blackish brown.

This species is known only from the type-series and from the single specimen mentioned below. The propodeal spines are longer in the Bhutan specimen than in the types and the sculpture is somewhat more conspicuous, but the similarities far outweigh the differences and I have no doubt that the Bhutan specimen represents a variant within the limits of *christiei*. The species is related to *tonganum* and its allies but is separated by its relatively long scapes and uniformly dark colouring.

MATERIAL EXAMINED. BHUTAN: Phuntsholing (*C. Baroni Urbani*).

Tetramorium cuneinode sp. n.

(Fig. 56)

HOLOTYPE WORKER. TL 2.5, HL 0.56, HW 0.54, CI 96, SL 0.36, SI 67, PW 0.38, AL 0.68.

Mandibles striate; anterior clypeal margin entire. Frontal carinae weak, scarcely more strongly developed than the remaining cephalic sculpture; extending back beyond the level of the eyes but posteriorly blending with the other cephalic sculpture. Antennal scrobes feeble but discernible, scapes short. Eyes of moderate size, maximum diameter 0.14, about $0.26 \times$ HW. Propodeal spines in profile quite long, slightly upcurved at the extreme apex. Metapleural lobes elongate-triangular and acute. Node of petiole wedge-shaped in profile, broadest below and narrowing strongly above (Fig. 56), the dorsal and posterior faces fused into a single steep surface which is feebly convex. Postpetiole rounded and normal. In dorsal view the petiole node much broader than long. Dorsum of head predominantly longitudinally rugulose to level of posterior margins of eyes, behind this finely reticulate-rugulose. Dorsal alitrunk reticulate-rugulose. Petiole, postpetiole and gaster unsculptured. Dorsal surfaces of head and body with numerous fine hairs but antennal scapes and dorsal (outer) surfaces of hind tibiae with only short, subdecumbent to decumbent pubescence, without long hairs. Colour uniform yellow-brown, the appendages lighter than the body.

PARATYPE WORKERS. TL 2.3-2.6, HL 0.54-0.58, HW 0.50-0.56, CI 92-96, SL 0.34-0.38, SI 67-69, PW 0.36-0.40, AL 0.62-0.70 (4 measured). Maximum diameter of eye *c.* 0.13-0.14. Otherwise as holotype.

Holotype worker, THAILAND: Nong Hoi, 19.vii.1975 (*D. Jackson*) (BMNH).

Paratypes. 3 workers with same data as holotype and 1 worker with same data but collected 20.vii.1975 (BMNH; MCZ, Cambridge).

The shape of the petiole seen in this small species is unique in the regions at present under discussion. It resembles most closely the shape found in some members of the African *squaminode*-group, but in these the sting appendage is spatulate, not dentiform as in *cuneinode*. The closest relative of *cuneinode* appears to be *seneb*, a species known from Malaya and Java, but here the petiole is nodiform and not modified as described above.

Tetramorium difficile sp. n.

HOLOTYPE WORKER. TL 2.4, HL 0.56, HW 0.52, CI 93, SL 0.40, SI 77, PW 0.38, AL 0.64.

Mandibles striate; anterior clypeal margin entire and the median portion with a narrow anterior flange or apron. Frontal carinae well developed, reaching back well beyond the level of the eyes and forming the upper borders of the shallow but quite distinct antennal scrobes. Maximum diameter of eye *c.* 0.12, about $0.23 \times$ HW. Propodeal spines short and dentiform, slightly shorter than the short, bluntly triangular metapleural lobes. Petiole in profile with a slightly downcurved anterior peduncle, the node itself has rounded anterodorsal and posterodorsal angles and the tergal portion is slightly higher than the length of the dorsum. Postpetiole in profile evenly convex. In dorsal view the petiole node is slightly broader than long and the postpetiole is only slightly broader than the petiole. Dorsum of head weakly longitudinally rugulose, with some feeble reticulation occipitally. Dorsal alitrunk finely reticulate-rugulose, the petiole node with faint traces of rugulation dorsally. Postpetiole and gaster unsculptured and shining. All dorsal surfaces of head and body with numerous fine hairs of varying length but the scapes and dorsal (outer) surfaces of the hind tibiae only with short, decumbent or appressed pubescence, without longer hairs. Colour uniform yellowish brown.

PARATYPE WORKER. As holotype, TL 2.3, HL 0.54, HW 0.50, CI 93, SL 0.38, SI 76, PW 0.36, AL 0.62. Maximum diameter of eye 0.12, about 0.24 × HW.

Holotype worker, NEPAL: Tamur R., Dobhan, 1.ii.1962, forest litter (*K. Hyatt*) (BMNH).
Paratype. 1 worker with same data as holotype (MCZ, Cambridge).

A series from BHUTAN: Phuntsholing, 1972, 2/400 m (*Baroni Urbani*) in NM, Basle, compares well with the type-series but the individuals are somewhat darker in colour (mid-brown) and in some the propodeal spines are slightly but definitely longer than the metapleural lobes. The metapleural lobes themselves are somewhat more acute than in the types. Despite these (relatively minor) differences I feel sure that this series from Bhutan represents part of the normal variation of *difficile*.

T. difficile shows affinity with *tonganum* but is smaller than that species and has relatively shorter antennal scapes. Also, the pronotal corners in *tonganum* are very broadly rounded, whilst those of *difficile* are more angular (though not sharply so).

Tetramorium infraspinum Forel (Fig. 55)

Tetramorium infraspinum Forel, 1905 : 14. Holotype worker, JAVA: Tjibodas, iii.1904 (*K. Kraepelin*) (MHN, Geneva) [examined].

WORKER. TL 3.3, HL 0.70, HW 0.62, CI 90, SL 0.48, SI 77, PW 0.50, AL 0.84.

Anterior clypeal margin entire; mandibles striate. Antennal scrobes broad but shallow, extending back well beyond the level of the eye. Maximum diameter of the eye *c.* 0.14. Occipital margin feebly concave in full-face view, the sides of the head more or less straight. Alitrunk convex in profile; propodeum unarmed, with only an obtuse angle separating the sloping dorsum from the declivity. Metapleural lobes long, broadly triangular and very conspicuous. Petiole in profile with anterior and posterior faces roughly parallel, the dorsum feebly convex. In dorsal view petiole subglobular, about as broad as long; post-petiole broader than long. Dorsal surfaces of head, alitrunk and pedicel segments finely reticulate-rugulose, the median clypeal carina more strongly developed than the surrounding sculpture. Head and alitrunk with a fine superficial punctulation between the rugulae. Gaster unsculptured but with some enlarged hair-pits in the basal half. Fine, dense, relatively short hairs abundant on all dorsal surfaces but the antennal scapes and dorsal (outer) surfaces of the middle and hind tibiae only with short, dense, strongly curved hairs, without elongate straight erect or suberect stouter hairs. Colour uniform blackish brown, the appendages mid-brown.

One of the two species of the Indo-Australian region to lack propodeal armament, *infraspinum* is quickly separated from *tenuicrinis*, the other species with unarmed propodeum, by the fact that the antennae are 11-segmented in *tenuicrinis* and the body is mostly unsculptured.

Tetramorium laparum sp. n.

HOLOTYPE WORKER. TL 3.0, HL 0.68, HW 0.64, CI 94, SL 0.52, SI 81, PW 0.46, AL 0.78.

Mandibles striate; anterior clypeal margin entire, the median portion with an anterior narrow, translucent flange or apron. Frontal carinae weak but quite distinctive, being more strongly developed than the other cephalic sculpture, reaching back well beyond the eyes but occipitally merging into the other sculpture. Antennal scrobes feeble, broad but only shallowly impressed. Eyes prominent, their maximum diameter *c.* 0.15, about 0.25 × HW. Occipital margin in full-face view virtually straight, only exceedingly shallowly concave across the width of the head. Pronotal corners in dorsal view broadly rounded. Petiolar spines quite short but longer than metapleural lobes, the spines strongly elevated, acute and feebly up-curved along their length. Metapleural lobes broad, roughly triangular, acute apically. Node of petiole in profile narrowing slightly from base to apex so that the dorsal length is less than the height of the tergal portion of the node. Anterodorsal and posterodorsal angles of node rounded, the anterior peduncle of the petiole feebly downcurved along its length. Petiole node in dorsal view distinctly broader than long. Dorsum of head weakly longitudinally rugulose with some reticulation occipitally but everywhere on the head the dominant sculpture is a fine, dense, blanketing reticulate-punctulation so that the surfaces appear matt and granular. Dorsal alitrunk finely reticulate-rugulose, the spaces filled with dense punctulation which is, however, not as strongly developed as on the head. Petiole node with traces of sculpture but postpetiole and gaster unsculptured. Dorsal surfaces of head and body with numerous erect or

suberect hairs, but antennal scapes and dorsal (outer) surfaces of hind tibiae only with decumbent or appressed pubescence, without longer hairs of any description. Colour uniform yellowish brown.

PARATYPE WORKER. TL 3.0, HL 0.70, HW 0.66, CI 94, SL 0.52, SI 79, PW 0.46, AL 0.80. Maximum diameter of eye *c.* 0.15; as holotype.

Holotype worker, PHILIPPINES: Dumaguete, 28.iv.1948 (*J. W. Chapman*) (MCZ, Cambridge).

Paratype. 1 worker with same data as holotype (BMNH).

The shape of the pedicel segments, lack of long hairs on the legs and scapes and relatively elongate, narrow scapes relate this species to *tonganum* and its allies, but the very distinctive sculpture immediately separates *laparum*.

Apart from the types one other specimen is known; it bears only the data, PHILIPPINES: Los Banos, in house, and is deposited in MCZ, Cambridge.

Tetramorium salvatum Forel

(Fig. 54)

Tetramorium salvatum Forel, 1902a : 235. Syntype workers, INDIA: 'Inde septentrionale' (*Wroughton*) and 'Nord-ouest de l'Himalaya' (*Smithies*) (MHN, Geneva) [examined].

WORKER. TL 2.8–2.9, HL 0.64–0.66, HW 0.58–0.60, CI 90–91, SL 0.46, SI 76–79, PW 0.42–0.44, AL 0.70–0.74 (2 measured).

Anterior clypeal margin entire. Frontal carinae extending back beyond the level of the eyes, forming the dorsal margins of shallow but quite broad scrobes. Frontal carinae divergent to level of eyes then roughly parallel, only diverging very slightly. Eyes of moderate size, *c.* 0.14, about 0.23 × HW. Propodeal spines in profile short and narrow, only slightly longer than the bluntly rounded metapleural lobes. Petiole in profile with a short, stout, straight anterior peduncle. Height of tergal portion of petiole node in profile distinctly greater than the dorsal length of the node, the node itself tending to taper slightly from base to apex. In dorsal view the node of the petiole is slightly broader than long. Dorsum of head with fine longitudinal rugulae which are well spaced out and somewhat irregular; spaces between rugulae with feeble superficial sculpture. Occipital region of head and entire dorsal alitrunk finely reticulate-rugulose. Dorsal surfaces of petiole and postpetiole mostly smooth, with vestigial traces of sculpture in places; gaster smooth and unsculptured. All dorsal surfaces of head and body with numerous elongate fine hairs, but antennal scapes and middle and hind tibiae with only dense, short, decumbent or subdecumbent pubescence, without longer hairs. Colour yellow-brown, the gaster dark brown.

T. salvatum appears to be closely related to *difficile* of Nepal and Bhutan, but the petiolar peduncle is short, stout and straight in *salvatum* and the metapleural lobes are rounded, whereas in *difficile* the peduncle is long, quite slender and downcurved and the metapleural lobes are triangular.

Tetramorium seneb sp. n.

HOLOTYPE WORKER. TL 2.3, HL 0.56, HW 0.54, CI 96, SL 0.36, SI 67, PW 0.40, AL 0.64.

Mandibles striate; anterior clypeal margin entire and the median portion with a narrow anterior flange or apron. Frontal carinae reaching back well beyond the level of the eyes, anteriorly distinctly more strongly developed than the other cephalic sculpture but near the occipital area becoming much weaker and blending in with the sculpture. Antennal scrobes broad, quite shallow but conspicuous. Occipital margin of head concave medially in full-face view. Eyes situated in front of middle of sides, maximum diameter *c.* 0.12, about 0.22 × HW. Pronotal corners bluntly angular in dorsal view, giving a square-shouldered appearance. Propodeal spines long, tapering and acute, much longer than the broadly triangular, acute metapleural lobes. Petiole in profile with a relatively high node, the length of the dorsum less than the height of the tergal portion of the node; postpetiole evenly convex. Node of petiole in dorsal view as long as broad, the node slightly broader behind than in front. Dorsum of head longitudinally irregularly rugulose with few or no cross-meshes, but with a fine ruguloreticulum occipitally. Dorsal alitrunk irregularly reticulate-rugulose, the petiole dorsum with traces of rugulation towards the sides. Postpetiole and gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs, the majority of which are short, but the antennal scapes and dorsal (outer) tibial surfaces without such hairs, only with dense, short, erect or suberect pubescence. Colour light brown, the appendages yellowish.

PARATYPE WORKERS. As holotype but some show a slight upcurving of the apex of the propodeal spines. Range of dimensions TL 2.1–2.3, HL 0.54–0.56, HW 0.50–0.54, CI 91–96, SL 0.34–0.36, SI 63–71, PW 0.38–0.40, AL 0.62–0.64 (14 measured).

Holotype worker, WEST MALAYSIA: Malaya, Kuala Lumpur, 13.x.1973 (*B. Bolton*) (BMNH).

Paratypes. 14 workers with same data as holotype (BMNH; MCZ, Cambridge; NM, Basle; MHN, Geneva).

The type-series was retrieved from a Berlese funnel extraction of leaf litter taken by the side of a small stream on a densely overgrown embankment.

The specimens mentioned under material examined fit the above description very well but show some variation in colour, ranging from light brown to yellow. CI and SI of these series fall within the range given above but some specimens from Java are slightly larger than the type-series. The combined size-range of the specimens is HL 0.54–0.60, HW 0.52–0.56, SL 0.34–0.40, PW 0.38–0.44, AL 0.62–0.68.

MATERIAL EXAMINED. WEST MALAYSIA: Malaya, Selangor, Kepong Waterworks Reserve (*R. Crozier*); Selangor, Ulu Gombak (*R. Crozier*). JAVA: Kaliurang (*G. Imadate*); Depok (*Dammermann*).

Tetramorium tonganum Mayr

(Fig. 59)

Tetramorium tonganum Mayr, 1870 : 972, 976. Syntype workers, TONGA: Tongtabu (*Godeffroy*) (NM, Vienna) [examined].

Tetramorium magitae Forel, 1911 : 224. Syntype workers, SRI LANKA: Peradiniya, jungle, 2.iii (*Escherich*) (MHN, Geneva) [examined]. **Syn. n.**

WORKER. TL 2.6–3.1, HL 0.62–0.72, HW 0.56–0.64, CI 85–91, SL 0.46–0.54, SI 80–87, PW 0.40–0.48, AL 0.70–0.84 (36 measured).

Mandibles striate; anterior clypeal margin entire and the median portion of the clypeus with a narrow but fairly conspicuous anterior flange or apron. Frontal carinae extending back well beyond the level of the eyes, usually approaching the occipital margin, the carinae themselves not strongly developed but always more conspicuous than any other cephalic sculpture. Scapes relatively long (see SI above), if laid back in the rather shallow scrobes the apex of the scape just fails to reach the occipital corner. Eyes moderate in size, maximum diameter *c.* 0.14–0.16, about 0.24–0.27 × HW. Pronotum in dorsal view with the anterolateral angles broadly rounded. Propodeal spines relatively short, at most only marginally longer than the broadly triangular metapleural lobes, the spines narrow and acute. In some samples the propodeal armament is reduced to a pair of acute triangular teeth. Petiole in profile with an elongate, narrow peduncle anteriorly which in most is downcurved along its length. In some individuals the curvature appears reduced but the ventral surface of the peduncle always passes through a rounded angle before its junction with the node (Fig. 59). Shape of petiole and postpetiole in profile are as shown in Fig. 59; in dorsal view the petiole node subglobular. Dorsum of head predominantly longitudinally rugulose, with few or no cross-meshes before the level of the posterior margins of the eyes; behind this cross-meshes become more conspicuous, and a reticulum is usually present occipitally. Dorsal alitrunk finely reticulate-rugulose. Petiole and postpetiole predominantly smooth, completely unsculptured in some but often with at least traces of sculpture on the petiole, less commonly with traces on postpetiole also. Gaster unsculptured. All dorsal surfaces with numerous fine hairs of varying length but scapes and hind tibiae only with decumbent short pubescence, without erect pilosity of any description. Colour varying from light yellowish brown to mid-brown, often with the gaster somewhat darker than the head and alitrunk.

The distribution of this species in Polynesia has been covered in some detail by Wilson & Taylor (1967) but the range of the species extends from Japan in the north to New Guinea in the south. The east–west distribution is more difficult to ascertain as the species is capable of being transported by human commerce, but it is probably safe to say that Java and Sumba represent the western limits of *tonganum*. The Malayan record noted below was made in the Botanical Gardens of Kuala Lumpur and I suspect that it may represent an introduction. Similarly with the collection from Sri Lanka which makes up the type-series of the synonymous *magitae*.

The closest relative of *tonganum* is certainly the species *difficile* from Nepal and Bhutan, but this is smaller, with relatively shorter antennal scapes. The legs of *difficile* are shorter and the

pronotal corners are more sharply angulate in dorsal view. Also in *difficile* the propodeum is usually armed with only a pair of minute, acute denticles. A second closely related species, *vandalum*, occurs in New Guinea, but this is blackish brown in colour and has erect and suberect pubescence upon the dorsal (outer) hind tibial surface. To some extent *vandalum* may exclude *tonganum* from New Guinea, as collections of the latter species are rare from that island.

MATERIAL EXAMINED. WEST MALAYSIA: Malaya, Kuala Lumpur, Bot. Gdns (*B. Bolton*). JAVA: Bogor (*Dammermann*). SUMBA: Kananggar (*Dammermann*). JAPAN: Ogasahara I. (*M. Tanaka*). PHILIPPINES: Dumaguete (*J. W. Chapman*). NEW GUINEA: Maffin Bay (*E. S. Ross*). BISMARCK ARCHIPELAGO: no loc. (*Dahl*). SOLOMON IS: Guadalcanal (*E. S. Brown*); Repi I. (*E. S. Brown*); Rennell I. (*J. D. Bradley*); Rendova, Baraboni (*H. T. Pagden*). NEW HEBRIDES: Malekula (*L. E. Cheesman*); Vila Efate (*L. E. Cheesman*); Togabé (*P. Cochereau*). FIJI IS: Suva (*W. M. Wheeler*); Lasema (*W. M. Mann*); Waiyanitu (*W. M. Mann*). WALLIS & FUTUNA IS: several series (*G. Hunt*). SAMOAN IS: Upolu, Vailima (*P. A. Buxton & G. H. Hopkins*); Upolu, Tanumalala (*T. E. Woodward*); Upolu (*E. C. Zimmermann*); Tutuila, Amouli (*E. C. Zimmermann*); Tutuila, Fagatogo (*E. C. Zimmermann*); Tutuila, Pango Pango (*E. C. Zimmermann*); Savaii, Puapua (*N. L. H. Krauss*). SOCIETY IS: Moorea I. (*A. M. Adamson*); Huahine I. (*E. C. Zimmermann*). MARQUESAS IS: Nuka-hiva (*L. E. Cheesman*); Aimoa, Hiva Oa (*Mumford & Adamson*). CAROLINE IS: Yap I. (*J. L. Gressitt*); Truk, Moen I. (*J. L. Gressitt*). TONGA IS: Tongatabu I. (ex coll. *F. Smith*). GREAT BRITAIN: London, Kew Gardens (*H. Donisthorpe*).

Tetramorium vandalum sp. n.

(Fig. 57)

HOLOTYPE WORKER. TL 3·1, HL 0·72, HW 0·64, CI 89, SL 0·58, SI 90, PW 0·50, AL 0·90.

Mandibles striate; anterior clypeal margin entire and convex, the anterior apron or flange narrow and inconspicuous. Frontal carinae extending back beyond the level of the eyes but no more strongly developed than the rugular sculpture of the cephalic dorsum, the carinae fading and becoming inseparable from the remaining cephalic sculpture before reaching the occiput. Impressions of antennal scrobes shallow, only feebly developed. Eyes of moderate size, maximum diameter *c.* 0·14, about 0·22 × HW. Occipital margin shallowly concave in full-face view. Pronotal corners in dorsal view very broadly rounded. Propodeal spines short, about as long as the metapleural lobes, the spines themselves narrow and acute, slightly elevated; metapleural lobes broadly triangular. Petiole in profile with a narrow, down-curved anterior peduncle, the node shaped as in Fig. 57. Petiole node in dorsal view slightly broader than long. Dorsum of head strongly rugulose, the rugulae irregular and meandering, with numerous cross-meshes; occipital region with a disorganized ruguloreticulum. Dorsum of alitrunk reticulate-rugulose. Sides of petiole and postpetiole sculptured and the dorsal surfaces of these segments with traces of sculpture which are better developed on the petiole than the postpetiole. Gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs of varying length but antennal scapes only with quite dense, short pubescence of about uniform length. Dorsal (outer) surfaces of hind tibiae equipped with a dense coat of short hairs which are erect, suberect or subdecumbent. Colour uniform blackish brown, the appendages pale yellow-brown.

PARATYPE WORKERS. As holotype but showing variation in thickness and length of propodeal spines. In some the spines are slightly longer than the metapleural lobes, in others distinctly shorter. In one specimen the spines are almost as broad basally as they are long, whereas in the others the spines are obviously longer than their basal width. Postpetiole is almost unsculptured in some individuals. Range of dimensions of paratype workers: TL 2·9–3·2, HL 0·68–0·72, HW 0·58–0·64, CI 84–89, SL 0·52–0·58, SI 87–93, PW 0·46–0·52, AL 0·84–0·90 (10 measured). Maximum diameter of eye *c.* 0·13–0·14, about 0·22–0·24 × HW.

Holotype worker, NEW GUINEA: Papua, Wau, 4000 ft, 1.vii.1974, for. litter (*S. Peck*) (MCZ, Cambridge).

Paratypes. 15 workers and 5 dealate females with same data as holotype (MCZ, Cambridge; BMNH; NM, Basle).

Related to *tonganum* and its allies, *vandalum* is separated from them by its dark colour and the presence of standing hairs on the dorsal surfaces of the hind tibiae.

The *simillimum*-group

Antennae with 12 segments. Sting appendage triangular or dentiform. Anterior clypeal margin entire. Frontal carinae reaching back beyond the level of the eyes, usually approaching the occipital region and usually distinct, reduced only in one or two African species. Antennal scrobes feeble to moderate, but generally conspicuous. Petiole node in dorsal view broader than long, even if only slightly so. Gaster not modified as in *mixtum*-group. Propodeal spines short, triangular. Hairs on dorsal alitrunk short, stout, blunt and sparse. Appendages with pubescence which is usually sparse, fine and appressed, never with hairs. Sculpture predominantly of fine rugulae, the spaces between which are packed with dense punctulation, reduced only in some African species.

This group is strictly African in origin and all its component species appear to be restricted to that continent except for *simillimum*, which is a very successful pantropical tramp species. At the present time *simillimum* has been recorded from all major land masses and a great number of islands. It is sporadically introduced into the temperate zones but here is only capable of surviving in hothouses or other permanently heated buildings.

The diagnosis of the group given above should be regarded as provisional, as the projected study of the Ethiopian and Malagasy species may require its modification in some aspects.

Tetramorium simillimum (F. Smith)

(Fig. 60)

Myrmica simillima F. Smith, 1851 : 118. Syntype workers, GREAT BRITAIN: England, Dorset (types lost, presumed destroyed) [see note below].

Tetramorium simillimum (F. Smith) Mayr, 1861 : 15, 61.

Tetrogmus caldarius Roger, 1857 : 12. Syntype worker, GERMANY: Prussia 'Ananashause in Rauden' (BMNH) [examined]. [Synonymy by Roger, 1862 : 297.]

Myrmica parallela F. Smith, 1859 : 147. Holotype worker, INDONESIA: Aru Is (*A. R. Wallace*) (UM, Oxford) [examined]. **Syn. n.**

Tetramorium parallelum (F. Smith) Donisthorpe, 1932 : 455.

Tetramorium simillimum subsp. *denticulatum* Forel, 1902a : 235. Holotype worker, INDIA: Barrakpur (*Rothney*) (MHN, Geneva) [examined]. **Syn. n.**

Tetramorium simillimum var. *opacior* Forel, 1913 : 81. Syntype workers, SRI LANKA: Peradeniya (MNHU, Berlin) [examined]. **Syn. n.**

Tetramorium antipodum Wheeler, 1927b : 143. Syntype workers, females, males, NORFOLK I.: 1915 (*A. M. Lea*) (location of types not known) (provisional synonym).

Tetramorium simillimum var. *insulare* Santschi, 1928 : 69. Syntype workers, FIJI Is: Lau, Latei Tonga, 6.ix.24 (*Bryan*); Tuvutha, 11.ix.24 (*Bryan*); Avea, 22.ix.24 (*Bryan*) (NM, Basle) [examined]. [Junior secondary homonym of *Tetramorium insulare* (Menozzi), 1924 : 223.] **Syn. n.**

Wasmannia auropunctata subsp. *brevispinosa* Borgmeier, 1928 : 36, figs 4, 5. Syntype workers, BRAZIL: Cabo Fria, viii.1926 (*T. Borgmeier*) (in Brazil Nat. Mus.). [Synonymy by Borgmeier, 1937 : 240.]

NOTE. Although the types of this species have almost certainly been lost or destroyed at some time in the past (they are not in Smith's material at BMNH, nor are they at UM, Oxford), the identity of the species does not appear to have ever been in doubt. It is this traditional interpretation which I take as my basis for defining *simillimum*, and as the species is very widespread and quite well known I can see no obvious reason for designating a neotype.

WORKER. TL 2.1-2.5, HL 0.54-0.60, HW 0.48-0.54, CI 88-93, SL 0.36-0.42, SI 74-80, PW 0.34-0.40, AL 0.58-0.68 (45 measured).

Mandibles finely and usually weakly sculptured, appearing usually as feeble striation or weak shagreening but sometimes more or less dully shining with only superficial sculpture. Anterior clypeal margin entire. Frontal carinae distinct, extending back almost to the occiput and very shallowly, evenly convex along their length. Antennal scrobes broad and quite shallow, but distinct. Eyes moderate in size, maximum diameter c. 0.11-0.14, about 0.22-0.26 × HW. Occipital margin in full-face view broadly and shallowly concave, the sides of the head behind the eyes sometimes roughly parallel but usually weakly convex; occipital corners evenly rounded. Propodeum armed with a pair of short, triangular acute teeth which are usually shorter than the metapleural lobes, rarely very slightly longer. Metapleural lobes broad, roughly triangular in shape. Petiole in profile with a stout anterior peduncle, the outline shape of the node as shown in Fig. 60, but in some populations the node tending to narrow very slightly from base to apex. In dorsal view the node always slightly broader than long, somewhat variable in shape but always

broadened posteriorly before narrowing to the postpetiolar junction. Dorsum of head finely and quite densely longitudinally rugulose, the spaces between the rugulae filled with a fine, dense conspicuous reticulate-punctulation or granulation. Area of antennal scrobes densely and finely reticulate-punctulate. Dorsal alitrunk finely, often faintly longitudinally rugulose, with traces of reticulation on pronotum, the spaces between the rugulae densely punctulate. Dorsal petiole and postpetiole similarly but less strongly sculptured, the sculpture sometimes reduced but never completely absent, always with traces of punctulation and nearly always with traces of faint rugulation. Sides of alitrunk densely and conspicuously reticulate-punctate. Gaster unsculptured. All dorsal surfaces of head and body with scattered short hairs, generally longer on the gaster than elsewhere. Hairs on alitrunk conspicuous, short, stout and blunt (Fig. 60). Antennal scapes and dorsal (outer) surfaces of hind tibiae only with very short, fine, appressed pubescence. Colour yellow to yellowish brown, usually with the gaster darker brown but some populations uniformly coloured.

T. simillimum is a small, quite common pantropical tramp species of African origin which is also found as an introduction in hothouses and zoological gardens in the temperate zone. A number of related species are known from the Ethiopian region but none of these occurs outside Africa. The distinctive sculpture and short, stout pilosity will differentiate *simillimum* from other species in the regions at present under consideration. The list of material examined is concerned only with the Oriental, Indo-Australian and Australian regions and regions where *simillimum* has been introduced. The African continental records are omitted as the limits of some of its closest relatives have not yet been determined. For its known distribution in South America see Kempf (1972; 1975), in North America see Creighton (1950) and for detailed distribution in Polynesia see Wilson & Taylor (1967).

MATERIAL EXAMINED. SRI LANKA: Yakkala (*K. L. A. Perera*); Peradeniya (*N. K. Jardine*). INDIA: Assam, Gauhat (CIE Coll.); N. Punjab (*M. S. Saini*). SEYCHELLES: Albatross I. (*U. Müller*); Big Sister I. (*U. Müller*). MAURITIUS: (*J. E. M. Brown*); Rose Hill (*R. Mamet*). WEST MALAYSIA: Malaya, Sg. Patani (*G. H. Lowe*). JAVA: Bogor (*B. Bolton*); Tjibodas (*B. Bolton*); Semarang (*L. G. E. Kalshoven*). BORNEO: Moaretra I. (*Mjoberg*). PHILIPPINES: Dumaguete (*J. W. Chapman*). SOLOMON IS: Guadalcanal (*E. S. Brown*); Ontong Java (*E. S. Brown*). NEW GUINEA: Finschafen (*E. S. Ross*); Maffin Bay (*E. S. Ross*). TIMOR: Oenasi (*W. L. Brown*). AUSTRALIA: Cape York, Silver Plains (*Darlington*); Rocky River (*Darlington*). CHRISTMAS I. (no data). HAWAII: Oahu, Honolulu (no data). FIJI IS: Viti Levu (*W. L. Brown*). SOCIETY IS: Tahiti (*L. E. Cheesman*). JAPAN: Ishigaki I. (*M. Tanaka*). GREAT BRITAIN: London, Kew Gardens (*H. Donisthorpe*). AMIRANTE IS: Darras I. (Sladen Trust Exped.). CAPE VERDE IS: Bravo Nova Cintro (*Lindberg*); S. Antão Pombas (*Lindberg*). PRINCIPE IS: (*G. R. Gradwell & D. Snow*). PUERTO RICO: Tres Hermanos (*M. R. Smith*); Mayaguez (*M. R. Smith*). TRINIDAD: Curepe (*J. Noyes*).

Nomen dubium

Tetramorium infraspinosum Karaviev

Tetramorium infraspinosum Karavaiev, 1935 : 104. Holotype worker, VIETNAM (= Cochinchine): Cauda, 10.x.1930, no. 5788 (*K. Davydov*) (location of type not known).

I have not been able to find the holotype and only known worker of this species. The notes below are abstracted from the original description.

WORKER. TL about 2.0. Head 1.16 times longer than broad (i.e. CI c. 86). Anterior clypeal margin entire. Occipital margin feebly concave, sides of head parallel, occipital corners moderately rounded. Frontal carinae directed to occipital corners [presumably reaching beyond level of eyes]. Scape failing to reach occiput by 2 × apical width. Eyes moderately large, in front of midlength of head. Propodeal spines triangular, acute, somewhat elevated; in dorsal view about as long as the distance separating them. Metapleural lobes twice as long as spines, triangular and acute. Petiole in profile with node rectangular, in dorsal view the node longer than broad. Postpetiole about 1.5 × broader than petiole in dorsal view. Head and alitrunk sharply and extensively reticulate-rugose. Dorsum of head longitudinally rugose with about 10–11 components, the spaces between them punctate. Alitrunk reticulate-rugose dorsally, punctate laterally. Petiole punctate with some weak rugae, postpetiole coarsely and irregularly longitudinally rugose. Gaster unsculptured. Erect hairs short, moderately developed. Yellow-rust coloured, gaster and appendages paler, yellowish.

The description is very reminiscent of *simillimum* and for some time I had *infraspinosum* listed under the synonymy of that species. Although no single character given in the original description appears to differentiate *infraspinosum* from *simillimum* I am still reticent about taking the final step and formerly synonymizing it, as I feel sure that Karavaiev must have been acquainted with *simillimum*. So for the present I am leaving *infraspinosum* as a nomen dubium, an unsatisfactory state of affairs but one which I am sure can be quickly cleared up if ever the holotype of *infraspinosum* is found.

Australian species

The Australian species of *Tetramorium* have not been monographed previously and all information about them is scattered through the various original descriptions of new forms.

At present 23 species are known to occur in Australia, of which 17 are endemic, including a single endemic species-group of 10 species. The remaining 6 species are either wide-ranging tramp species such as *simillimum*, or are shared with the Indo-Australian region. Of the 23 Australian species 9 are described here as new. Only a single new synonym is recorded and that is of a form given as a variety.

It seems probable that many more species of this genus await discovery in Australia.

As far as New Zealand is concerned, Brown (1958) records only a single established species, *T. grassii* Emery. This is strictly a South African species and has most probably been introduced into New Zealand by human commerce. I do not doubt that *bicarinatum* and *simillimum* will also be found established in New Zealand at some time, but *grassii* is easily distinguished from these as it combines 12-merous antennae with a spatulate sting appendage. This species will be considered in the section of the revision dealing with the Ethiopian region.

Synonymic list of species

(Species shared with other regions marked*)

striolatum-group

- capitale* (McAreavey) comb. n.
- fuscipes* (Viehmeyer) comb. et stat. n.
- impressum* (Viehmeyer) comb. n.
- laticephalum* sp. n.
- megalops* sp. n.
- sjostedti* Forel
- spininode* sp. n.
- striolatum* Viehmeyer
- thalidum* sp. n.
- viehmeyeri* Forel
- viehmeyeri* var. *venustus* Wheeler syn. n.

tortuosum-group

- andrynicum* sp. n.
- confusum* sp. n.

splendidior (Viehmeyer) comb. et stat. n.

strictum sp. n.

turneri Forel

bicarinatum-group

**bicarinatum* (Nylander)

**insolens* (F. Smith)

**pacificum* Mayr

**validiusculum* Emery

ornatum-group

australe sp. n.

deceptum sp. n.

**ornatum* Emery

simillimum-group

**simillimum* (F. Smith)

Key to Australian species (workers)

- | | | |
|---|--|---------------------------|
| 1 | Antennae with 11 segments | 2 |
| - | Antennae with 12 segments | 16 |
| 2 | With the petiole in profile the posterodorsal angle drawn out into a stout, blunt spine (Fig. 62).
Basal angles of first gastral tergite with a narrow projecting semi-translucent flange which is continued as a margination down the sides of the basal third of the tergite. (Western Australia, Northern Territories) | <i>spininode</i> (p. 140) |
| - | With the petiole in profile the posterodorsal angle not projecting as a blunt spine. Basal angles of first gastral tergite without a flange, not marginate down the basal third of the sides of the tergite | 3 |
| 3 | Large species, HW > 1.20 | 4 |
| - | Smaller species, HW < 1.20, usually much less than this but rarely with HW up to c. 1.10 | 5 |

- 4 Mandibles smooth and highly polished, with scattered small pits. Base of first gastral tergite finely reticulate-punctate. Anterior clypeal margin with a deep median notch. Dorsal alitrunk without erect hairs. (Victoria) *laticephalum* (p. 139)
- Mandibles longitudinally striate. Base of first gastral tergite sharply but finely striate, the interstices reticulate-punctate. Anterior clypeal margin without a median notch. Dorsal alitrunk with erect hairs. (N. Western Australia) *sjostedti* (p. 140)
- 5 Anterior half to two-thirds of median portion of clypeus descending very steeply, almost vertical, this descending portion conspicuously transversely concave. Median clypeal carina absent from descending portion which is unsculptured, the carina present only on the posterior third of the clypeus and the curve where it rounds into the steep anterior section. (Western Australia) *viehmeyeri* (p. 142)
- Anterior half to two-thirds of median portion of clypeus not shaped as above. Median clypeal carina usually running the length of the clypeus or stopping just short of the anterior margin; anterior half of clypeus usually with other sculpture beside the median carina 6
- 6 Node of petiole in dorsal view transverse and roughly transversely rectangular in shape (Figs 63, 72), distinctly broader than long 7
- Node of petiole in dorsal view not transverse, usually about as long as or longer than broad; in either case the node not roughly transversely rectangular in shape 8
- 7 Dorsum of petiole and postpetiole densely punctulate with a few longitudinal rugulae. Spaces between rugulae on dorsal alitrunk densely microscopically punctate. (New South Wales) *capitale* (p. 136)
- Dorsum of petiole and postpetiole smooth and highly polished or at most the petiole with traces of sculpture at the extreme lateral edges, the centre shining. Spaces between rugulae on dorsal alitrunk shining, at most with very faint superficial reticulation or vestigial punctulation. (New South Wales, Queensland) *confusum* (p. 143)
- 8 Eyes large and situated well back on the sides of the head (Fig. 61). HW *c.* 0.78, maximum diameter of eye *c.* 0.24 so that ocular diameter at maximum is about 0.32 × HW. (Western Australia) *megalops* (p. 139)
- Eyes smaller and situated at or close to the midlength of the sides of the head. Maximum diameter of eye always less than 0.30 × HW. In larger species where ocular diameter approaches 0.24 the HW is always much greater than 0.85 9
- 9 Spaces between rugulae on dorsum of head unsculptured or at most with faint, superficial reticulation or punctation, the surfaces shining. Sides of head between eyes and frontal carinae not reticulate-punctate although some sculpture may be present. Disc of postpetiole usually smooth, rarely sculptured 10
- Spaces between rugulae on dorsum of head completely filled with a dense, very conspicuous reticulate-punctation, the surfaces matt and generally quite dull. Sides of head between eyes and frontal carinae densely reticulate-punctate, sometimes with other sculpture also. Disc of postpetiole usually completely sculptured, rarely smooth 13
- 10 Dorsal alitrunk mostly unsculptured and smooth, with only one or two low, very indistinct, almost effaced rugulae. Metanotal groove very strongly impressed, the propodeal dorsum distinctly humped between the groove and the spines (Fig. 67). (Queensland) *andrynicum* (p. 143)
- Dorsal alitrunk strongly rugulose or reticulate-rugulose, the sculpture raised and conspicuous. Metanotal groove at most only weakly impressed (Fig. 64) 11
- 11 Petiole node in dorsal view with the sides flat to feebly concave and the median sections of each side compressed towards one another so that the true dorsum has a pinched-in median section (Fig. 64). (Queensland) *strictum* (p. 144)
- Petiole node in dorsal view with the sides convex and the median sections of each side not compressed towards one another. Dorsum of node narrowest in front, becoming considerably broader posteriorly (Fig. 65) 12
- 12 Head and alitrunk dark brown to blackish brown. Dorsum of petiole node with an unsculptured, shining median longitudinal strip. Eyes distinctly shorter than the lengths of antennal segments 9 and 10 taken together. (New South Wales, Queensland) *turneri* (p. 145)
- Head and alitrunk bright orange-red. Dorsum of petiole node sculptured, without an unsculptured shining median longitudinal strip. Eyes as long as the lengths of antennal segments 9 and 10 taken together. (New South Wales) *splendidior* (p. 144)
- 13 With the petiole in profile the dorsal length of the node greater than the height of the tergal portion so that the node appears relatively long and low (Fig. 71). (Victoria, South Australia) *striolatum* (p. 141)

-	With the petiole in profile the dorsal length of the node less than the height of the tergal portion so that the node appears relatively high and narrow (Fig. 69)	14
14	Hairs on promesonotum very short, thick and blunt (Fig. 70), many of them strongly expanded toward the apex. (Queensland)	<i>thalidum</i> (p. 141)
-	Hairs on promesonotum long, slender, often acute apically but if blunted they are not expanded apically (Fig. 69)	15
15	Dorsal surface of postpetiole always strongly sculptured with rugulae and dense puncturation. Frontal carinae differentiated only to level of the eyes, behind this they are suppressed or indistinguishable from the surrounding sculpture. Head approximately same colour as alitrunk. (South Australia, New South Wales, Queensland)	<i>impressum</i> (p. 138)
-	Dorsal surface of postpetiole usually smooth, rarely with faint puncturation. Frontal carinae strongly developed, reaching almost to the occiput. Head always considerably darker in colour than alitrunk. (New South Wales, Queensland)	<i>fuscipes</i> (p. 138)
16	Anterior clypeal margin with the median portion convex and notched or sharply indented medially	17
-	Anterior clypeal margin with the median portion entire, not notched or sharply indented medially	20
17	Head and alitrunk yellow or orange-brown, the gaster either darker or lighter in colour than the head and alitrunk	18
-	Entire body uniform dark brown to blackish brown	19
18	Mandibles finely and densely striate. Longest hairs projecting dorsally from frontal carinae behind level of antennal insertions shorter than maximum diameter of eye (Fig. 21). Gaster always much darker in colour than head and alitrunk. (Widespread in Australia)	
		<i>bicarinatum</i> (p. 94)
-	Mandibles smooth except for scattered hair-pits. Longest hairs projecting dorsally from frontal carinae behind level of antennal insertions longer than maximum diameter of eye (Fig. 22). Gaster generally lighter in colour than head and alitrunk, only rarely the same or slightly darker (see p. 100).	<i>insolens</i> (p. 99)
19	Dorsum of head sculptured with sparse but strong, regular longitudinal carinae or rugae, without any cross-meshes except for a few very close to the occiput, but often absent even here. Ground sculpture between carinae on head very inconspicuous or absent, the surfaces smooth. Basigastral costulae absent. (Queensland)	<i>validiusculum</i> (p. 103)
-	Dorsum of head sculptured with rather irregular longitudinal rugae with numerous cross-meshes and with a conspicuous rugoreticulum posteriorly. Ground sculpture between rugae on head superficial but fairly obvious. Basigastral costulae generally present, sometimes very weak but rarely absent. (Northern Territory)	<i>pacificum</i> (p. 102)
20	Hairs on dorsal alitrunk sparse, short, stout and blunt apically (Fig. 60). Head and alitrunk (sometimes also gaster) yellow or yellowish brown. (Pantropical tramp species of African origin)	<i>simillimum</i> (p. 131)
-	Hairs on dorsal alitrunk numerous, of varying length, fine and generally acute apically. Head and alitrunk dark brown, dark reddish brown or blackish brown	21
21	Lateral portions of pronotum very coarsely, sometimes irregularly, longitudinally or obliquely sulcate or exceptionally strongly rugose, the remainder of the sides of the alitrunk similarly sculptured, without reticulate-punctate interspaces. Propodeal spines elongate, more than twice longer than the metapleural lobes, downcurved along their length (Fig. 68). (Queensland)	<i>australe</i> (p. 146)
-	Lateral portions of pronotum reticulate-rugose or sides of alitrunk with reticulate-punctate sculpture present, or both. Propodeal spines shorter, distinctly less than twice the length of the metapleural lobes, usually straight or feebly sinuate, only rarely downcurved	22
22	Mesopleuron with strong reticulate-punctate sculpture, any rugulae present are shallow and weakly defined. Node of petiole in dorsal view slightly broader than long. Dorsum of head with spaced-out low longitudinal rugulae, the spaces between them with conspicuous reticulate-punctate ground sculpture. (Queensland)	<i>deceptum</i> (p. 146)
-	Mesopleuron coarsely rugose or sulcate, without or only with faint patches of punctulate sculpture. Node of petiole in dorsal view distinctly longer than broad. Dorsum of head with close-packed, sharply defined, high longitudinal rugulae, the spaces between them unsculptured or at most with very faint traces of punctures. (Queensland, New Guinea, Bismarck Archipelago)	<i>ornatum</i> (p. 107)

The species-groups

Australia has a single endemic species-group (the *striolatum*-group), the remaining four groups represented on the continent being shared with the Indo-Australian and Oriental regions. In the synonymic list of species those shared with these other zoogeographical regions are marked *. As can be seen, all representatives of the *tortuosum*-group in Australia are endemic, as are two of the three species of the *ornatum*-group. The species shared with other regions and the definitions of the groups to which they belong are discussed under the section of this paper dealing with the Oriental and Indo-Australian regions. The discussion of the *ornatum*- and *tortuosum*-groups is also included in that part of the paper because the majority of the species in these groups occur outside Australia.

The *striolatum*-group

Antennae with 11 segments, sting appendage generally spatulate but pennant-shaped or dentiform and acute apically in some species (e.g. *viehmeyeri*, *spininode*). Petiole nodiform and usually distinctly sculptured (weak in *fuscipes*), the postpetiole strongly sculptured in all but *fuscipes*. Base of first gastral tergite usually sculptured but this may be weak or absent in a few species. Mandibles striate except in *laticephalum*. Dorsum of head with rugose or rugulose sculpture, the spaces between the rugae filled with a fine, dense and generally very conspicuous reticulate-punctuation.

The 10 species included in this group constitute a relatively loose assemblage of Australian endemic species related to the members of the *tortuosum*-group but generally more densely sculptured. Some of the most strongly specialized species of *Tetramorium* in the regions at present under discussion occur in this group, for example *spininode*, *megalops*, *laticephalum* and *viehmeyeri*. These specialized forms are grouped around a core of relatively less specialized (as regards morphological peculiarities) species which appear to be closely related, this core including *capitale*, *impressum*, *striolatum* and *thalidum*.

Amongst the *Tetramorium* species with 11-segmented antennae the members of this group are much more widely distributed in Australia than those of the *tortuosum*-group which are more or less restricted to New South Wales and Queensland.

Tetramorium capitale (McAreavey) comb. n.

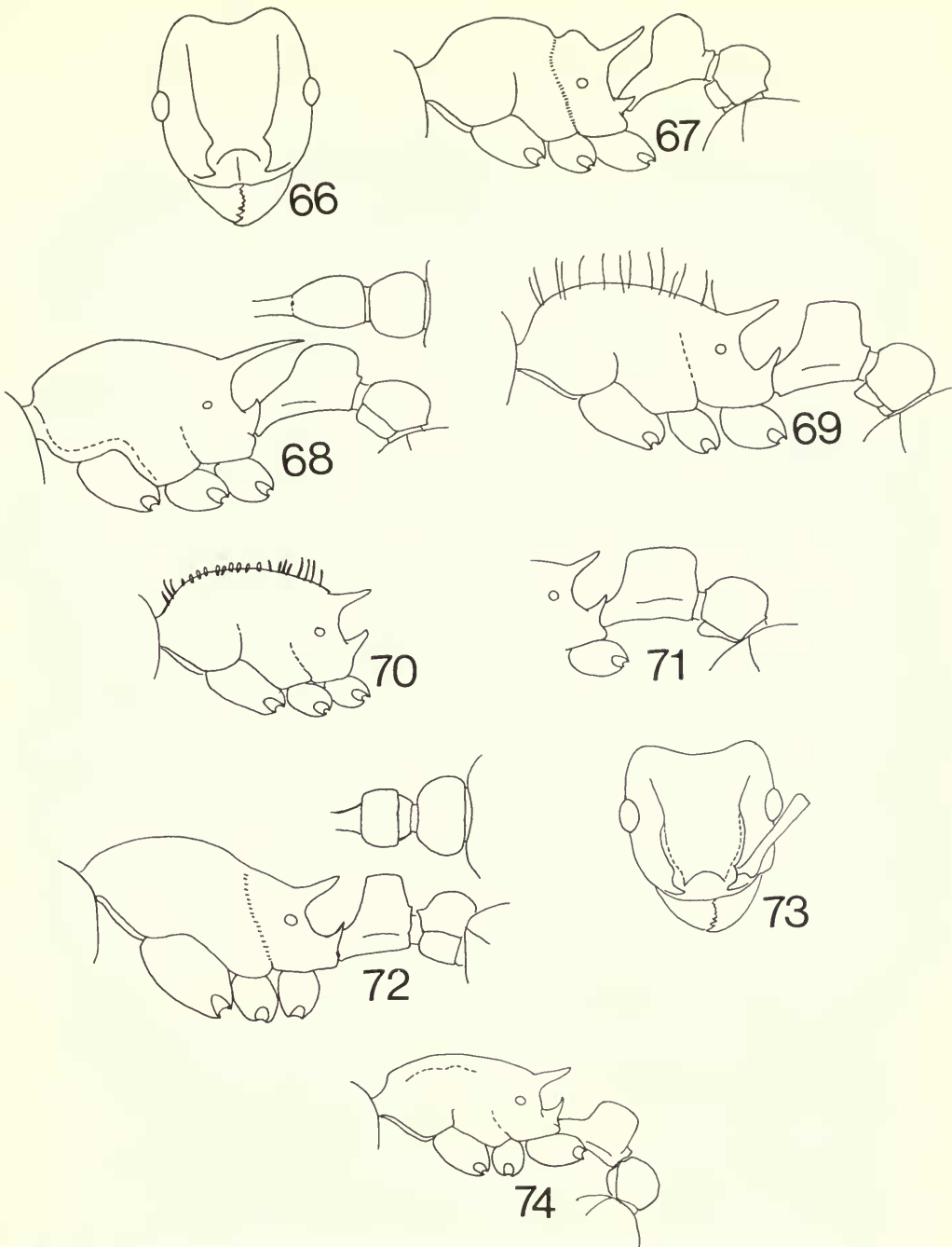
(Fig. 72)

Xiphomyrmex capitalis McAreavey, 1949 : 6, figs 20–25. Holotype worker and paratype workers and females, AUSTRALIA: New South Wales, Bogan R., Nyngan (*J. W. T. Armstrong*) (ANIC, Canberra) [holotype examined].

REDESCRIPTION OF HOLOTYPE WORKER. TL 3.8, HL 0.86, HW 0.82, CI 95, SL 0.60, SI 73, PW 0.72, AL 1.18 (measurements of HW and AL are approximate as specimen is obscured by glue).

Mandibles finely longitudinally striate, the anterior clypeal margin without a median notch. Frontal carinae extending back to level of posterior margin of eye but behind this merging into the other rugulose sculpture of the head. Eyes of moderate size, the maximum diameter *c.* 0.21. Occipital margin of head somewhat concave medially, not 'almost straight' as in the original description. Promesonotum broad and broadly convex both longitudinally and transversely. In profile the promesonotum forming a single convexity and with the propodeum considerably depressed below the level of the promesonotum (Fig. 72) and sloping downwards posteriorly. Propodeal spines acute, metapleural lobes triangular, very narrow apically and somewhat upcurved. Node of petiole in profile with the tergal portion distinctly higher than its dorsal length. In dorsal view the petiole node transverse, distinctly broader than long, with parallel anterior and posterior faces, and the sides slightly divergent posteriorly. Head and dorsal alitrunk predominantly longitudinally rugulose with scattered cross-meshes, the spaces between the rugulae very finely punctulate. Petiole and postpetiole rugulose dorsally and finely, densely punctate; the basal one-third of the first gastral tergite superficially finely punctate. All dorsal surfaces of head and body with numerous erect or suberect hairs. Colour a light orange-brown, with the gaster slightly lighter in shade than the alitrunk and the head considerably darker.

In the original description McAreavey points out that the colour of the type-series is variable. Most specimens are coloured as the holotype but in some individuals he states that the alitrunk and nodes are darker, almost as dark as the head.



Figs 66–74. *Tetramorium* workers. 66. Head of *andrynicum*. 67–72. Alitrunk and pedicel of (67) *andrynicum*, (68) *australe*, (69) *impressum*, (70) *thalidum*, (71) *striolatum*, (72) *capitale*. 73. Head of *sjostedti*. 74. Alitrunk and pedicel of *sjostedti*. Sculpture and pilosity omitted except in 69, 70 where part of pilosity is shown.

Tetramorium fuscipes (Viehmeyer) comb. et stat. n.

Xiphomyrmex turneri subsp. *fuscipes* Viehmeyer, 1925 : 29. Syntype workers, AUSTRALIA: New South Wales, Liverpool (NM, Basle) [examined].

NOTE. The published name of this species is as above but the name on the det. label of the syntypes is *fusciceps*, which is more appropriate as the head is dark and is probably the name originally intended by Viehmeyer. However, the above published name must stand, despite the fact that the legs are yellow and not infuscated.

WORKER. TL 2·8–3·1, HL 0·64–0·72, HW 0·58–0·68, CI 90–94, SL 0·44–0·50, SI 72–78, PW 0·46–0·56, AL 0·76–0·88 (10 measured).

Mandibles weakly longitudinally striate, the anterior clypeal margin without a notch medially. Frontal carinae strong and extending back almost to the occiput, forming the dorsal margins of the broad but shallow scrobes. Scrobes as long as the antennal scapes but not deep enough to accommodate them fully. Eyes at the midlength of the sides of the head. Alitrunk in profile with the metanotal groove variously impressed, in most specimens not or only feebly marked but in a few very distinctly impressed. This feature shows much variation in the single nest-series in which it was found (Queensland, Sunnybank). Propodeal spines moderately long, acute; metapleural lobes long, narrow-triangular, acute and feebly upcurved. Petiole in dorsal view at least as long as broad, usually longer than broad. Dorsum of head regularly and quite densely longitudinally rugulose, the spaces between the rugulae packed with a dense, conspicuous reticulate-punctuation. Cephalic rugulae anastomosing or with reticulation on the occipital surface. Dorsal alitrunk reticulate-rugulose, most coarsely so on the pronotum, the spaces filled with punctuation as on the head. Dorsum of petiole unsculptured medially or with a few fine rugulae, the punctuation usually absent; the postpetiole usually smooth and polished, rarely with faint shagreening or punctuation. Gaster smooth and shining. All dorsal surfaces of the head and body with numerous erect to suberect long hairs, those of the alitrunk and pedicel generally blunted apically. Colour yellowish brown, the legs and sometimes also the gaster lighter than the alitrunk. Head always much darker than the remainder, brown to dark brown, this colour contrast distinct to the naked eye.

Although originally described as a subspecies of *turneri* this species is distinct and consistently smaller, lighter in colour and more densely sculptured.

This is one of the Australian species which I suspect may be an aggregate, with two or more sibling species concealed by a mass of variable characters. Variation within *fuscipes* as defined above relates to size, sculpture, impression of metanotal groove, spine length and slight differences in petiole shape. Many of these features do not appear to have any geographical significance (at least not among the few series examined) but one character may be significant, that is the sculpturation, or lack of it, upon the postpetiole. It appears that specimens from the northern end of the range usually have traces of postpetiolar sculpture whilst more southerly samples do not.

MATERIAL EXAMINED. AUSTRALIA: New South Wales, Southerland (*W. M. Wheeler*); N.S.W., Gosford (*W. M. Wheeler*); N.S.W., Hornsby (*W. M. Wheeler*); N.S.W., Leura (*W. M. Wheeler*); Queensland, Cairns (*W. M. Wheeler*); Q., Townsville (*F. P. Dodd*); Q., Brisbane (*W. M. Wheeler*); Q., Sunnybank (*W. M. Wheeler*); Q., Rockhampton (*Darlingtons*).

Tetramorium impressum (Viehmeyer) comb. n.

(Fig. 69)

Xiphomyrmex impressus Viehmeyer, 1925 : 30. Holotype worker, AUSTRALIA: New South Wales, Trial Bay (MNHU, Berlin) [examined].

WORKER. TL 2·9–4·1, HL 0·76–1·02, HW 0·72–1·00, CI 92–98, SL 0·52–0·68, SI 69–77, PW 0·54–0·72, AL 0·90–1·22 (15 measured).

Mandibles with varying sculpture, usually weakly striate but more rarely almost smooth. Frontal carinae weak and short, the anterior portion with a narrow, raised flange which extends back to the level of the eyes at most. Behind the level of the eyes the frontal carinae are absent or are in no way separable from the remainder of the cephalic sculpture. Antennal scrobes shallow and very weak or virtually absent, in larger individuals much less distinct than in smaller. Propodeal spines stout and acute, the metapleural lobes acute, elongate-triangular in shape. Petiole in profile relatively high and narrow (Fig. 69), with the dorsal length less than the height of the tergal portion of the node. Dorsal head finely and usually quite regularly longitudinally rugulose, the spaces between rugulae reticulate-punctate. Dorsal alitrunk predominantly longitudinally rugulose but with some cross-meshes, which are usually conspicuous on the

pronotum. Spaces between rugulae punctate. Dorsal surfaces of petiole and postpetiole coarsely sculptured with a mixture of rugosity and puncturation, the base of the first gastral tergite often feebly reticulate or punctulate but smooth in some specimens. All dorsal surfaces of head and body with numerous erect or suberect hairs. Colour ranging from yellow-brown to mid-brown, usually with the gaster lighter in shade than the alitrunk.

This is one species which I strongly suspect may be a composite, with more than one sibling species concealed in it. The variation in size, development of frontal carinae and antennal scrobes, and the variation of sculptural intensity all suggest that this species needs closer attention than I can give it at the present time. The holotype of *impressum* lies at the lower end of the size range given above.

MATERIAL EXAMINED. AUSTRALIA: South Australia, Adelaide (*A. M. Lea*); Victoria, Sea Lake (*J. C. Goudie*); New South Wales, Uralla (*W. M. Wheeler*); Queensland, Kenilworth (*Darlingtons*); Q., W. of Ravenshoe (*Darlingtons*).

Tetramorium laticephalum sp. n.

HOLOTYPE WORKER. TL 4·8, HL 1·26, HW 1·30, CI 103, SL 0·72, SI 55, PW 0·88, AL 1·32.

Mandibles smooth and very shining, with scattered minute pits. Anterior clypeal margin with a conspicuous deep notch or impression medially. Frontal carinae not more strongly developed than other sculpture and indistinguishable from it. Antennal scrobes absent. Maximum diameter of eye *c.* 0·26, moderate for so large a species in that ocular diameter is only 0·20 × HW. Head slightly broader than long, CI > 100. Pronotal corners angular in dorsal view. Propodeal spines stout and acute, the metapleural lobes short-spiniform, about half the length of the propodeal spines. Petiole in dorsal view slightly broader than long and slightly broader behind than in front. Postpetiole distinctly broader than long, in dorsal view roughly hemispherical in outline. In profile the petiole blocky with the surfaces well separated by near right-angles, the postpetiole broadly rounded. Dorsum of head densely and quite finely longitudinally rugulose, the spaces between the rugulae superficially punctulate. Dorsum of alitrunk densely rugose, the rugosity disorganized and the spaces with faint superficial punctures. Petiole and postpetiole rugose, the spaces densely and distinctly punctulate. Basal half of first gastral tergite densely but finely reticulate-punctate. Dorsal surfaces of head, alitrunk, pedicel and first gastral tergite without hairs. Head, alitrunk and pedicel blackish brown to black; gaster, legs, antennae and mandibles clear yellow.

Holotype worker, AUSTRALIA: Victoria, Patho, 1.xi.1943 (*H. A. Potter*) (MCZ, Cambridge).

This large and distinctive species is the only one known from Australia to the present to combine the characters of hairlessness, smooth mandibles, lack of antennal scrobes and very broad head with the 11-segmented antennal condition. It is thus very well characterized and should not be confused with any other species known. Large individuals of *impressum* and *sjostedti* approach the size of *laticephalum* but these have hairs, striate mandibles and generally a head with CI 100 or less.

As only a single specimen of *laticephalum* is known, too much emphasis should not be placed on the difference in alitrunk and gastral colour, which is known to vary in other species (*turneri*, *confusum*), nor in the presence of gastral puncturation which is variable amongst different series of at least one other species (*impressum*).

Tetramorium megalops sp. n.

(Fig. 61)

HOLOTYPE WORKER. TL 4·1, HL 0·90, HW 0·78, CI 87, SL 0·66, SI 84, PW 0·66, AL 1·18.

Mandibles distinctly longitudinally striate; anterior clypeal margin without a median notch. Median clypeal carina absent from anterior (descending) face of clypeus, not reaching anterior margin but fading out just below the clypeal curve. Frontal carinae strong, consisting of a raised, narrow, semitranslucent flange which runs back to the occipital corners where it merges with the sculpture. Scrobe a shallow groove below the carinae capable of partially accommodating the scape. Eyes relatively large, maximum diameter *c.* 0·24, about 0·32 × HW; the eyes situated well back on the sides of the head (Fig. 61). Propodeal spines in profile short (length *c.* 0·16) but acute; metapleural lobes elongate-triangular and acute. Node of petiole in dorsal view slightly longer than broad, broader behind than in front. In profile the

tergal portion of the node is longer than high and the dorsum is very shallowly convex. Postpetiole in profile dome-shaped, as high as the petiole. Dorsum of head longitudinally rugose, with some anastomoses in the occipital region. Sides of head except for scrobe finely reticulate-rugose. Spaces between rugae and area of scrobe finely, densely but distinctly reticulate-punctate. Pronotal dorsum with a fine rugoreticulum but on mesonotum the cross-meshes are reduced so that the sclerite is predominantly longitudinally rugose. Petiole and postpetiole finely reticulate-rugulose everywhere, spaces between rugae on both alitrunk and pedicel filled with dense, fine punctation. Gaster unsculptured. All dorsal surfaces of body with short, quite stout, blunted hairs. Colour light yellow-brown, the gaster lighter in shade than the head.

Holotype worker, AUSTRALIA: Western Australia, c. 60 km NW. Balladonia, 13.ii.1955, no. 440 (*E. O. Wilson & A. Douglas*) (MCZ, Cambridge).

The most conspicuous character of this species is without doubt the eyes, which are both relatively and absolutely large. The maximum eye diameter of 0.24 is approached in general only by species with HW considerably greater than 0.80 so that the maximum diameter is $< 0.30 \times HW$, usually markedly less. The position of the eyes, behind the centre of the sides, may indicate some affinity to *viehmeyeri*, but the unique form of the clypeus will quickly differentiate that species.

Tetramorium sjostedti Forel

(Figs 73, 74)

Tetramorium (Xiphomyrmex) sjostedti Forel, 1915 : 48. LECTOTYPE worker, AUSTRALIA: N. Western Australia, Kimberley Distr. (*Mjöberg*) (NR, Stockholm), here designated [examined].

LECTOTYPE WORKER. TL 5.6, HL 1.42, HW 1.34, CI 94, SL 0.92, SI 69, PW 0.94, AL 1.54.

Mandibles longitudinally striate, the anterior clypeal margin without a median notch. Eyes large, maximum diameter c. 0.30 (about $0.22 \times HW$), situated slightly behind the midlength of the sides. Frontal carinae strongly developed to just behind the level of the eyes, then fading into the surrounding sculpture. Scapes relatively short and stout, dorsoventrally compressed basally so that in dorsal view the scapes are distinctly broader basally than at their midlength and the anterior margin turns through a sharp angle to meet the basal constriction (Fig. 73). Occipital margin of head strongly impressed. Pronotum and mesonotum marginate laterally, propodeum not marginate. Metanotal groove completely absent, the dorsal alitrunk evenly convex in profile. Anterior pronotal corners acute in dorsal view. Propodeal spines long, stout and acute, the metapleural lobes elongate, acute and directed upwards (Fig. 74). Petiole in profile with the tergal portion higher than the dorsal length, in dorsal view the node very slightly broader than long, broader behind than in front. Entire dorsum of head and space between eyes and frontal carinae regularly and strongly longitudinally rugose, the spaces between the rugae densely reticulate-punctate. Sides and dorsum of alitrunk similarly sculptured, the declivity of the propodeum transversely rugose. Petiole and postpetiole coarsely but less regularly rugose, with some reticulation. Basal half of the first gastral tergite finely longitudinally striate, the spaces between the striae densely punctulate. Long stout hairs present on all dorsal surfaces of head and body.

One of the larger *Tetramorium* species, *sjostedti* is approached in size only by *laticepalum* in the Australian fauna but is easily separated from that species by the characters given in the key. Apparently this rather spectacular species remains known only from the original collection.

Tetramorium spininode sp. n.

(Fig. 62)

HOLOTYPE WORKER. TL 4.3, HL 0.98, HW 0.92, CI 94, SL 0.76, SI 82, PW 0.76, AL 1.32.

Mandibles coarsely striate; anterior clypeal margin straight to very feebly concave medially but without a notch or distinct impression, the median carina extending to the clypeal margin. Frontal carinae elongate and forming the dorsal margins of a narrow and shallow scrobe which is as broad as the scape and which has no defined posterior margin. Eyes moderate, maximum diameter c. 0.24. Propodeal spines elongate and acute, the metapleural lobes low and rounded (Fig. 62), not triangular or dentiform. Petiole in profile with the posterodorsal portion of the node drawn out into a broad, blunt, subconical process resembling a thick spine which overhangs the posterior face. Postpetiole in profile with a similar but less well-developed structure, the projecting posterodorsal angle overhanging the posterior face. In dorsal view the petiole longer than broad, broadest at about the midlength, narrowed and truncated anteriorly, more strongly narrowed and narrowly rounded posteriorly at the apex of the prominence. Basal angles of gaster with a narrow, rounded, prominent, semitranslucent flange which goes around the corner on each

side and along the tergite as a carina on each side for about one-third the length of the sclerite, the carina narrowing posteriorly. Head rugose dorsally, the rugae spaced out, predominantly longitudinal but with a number of cross-meshes, especially posteriorly. Spaces between rugae finely and densely punctulate. Alitrunk dorsally predominantly longitudinally rugose but with scattered branches and cross-meshes, most common on the anterior pronotum. Petiole and postpetiole rugose, the spaces between rugae finely punctulate both here and on the alitrunk. Basal half of first gastral tergite densely finely costulate, a few reaching to the posterior margin of the sclerite. Stout, blunted hairs present on all dorsal surfaces of head and body. Head, alitrunk and petiole blackish brown, postpetiole red-brown, gaster and legs yellow.

PARATYPE WORKERS. As holotype, range TL 4.2-4.5, HL 0.94-1.00, HW 0.88-0.94, CI 93-96, SL 0.70-0.76, SI 80-82, PW 0.72-0.78, AL 1.26-1.34 (10 measured). Generally as holotype but the immature workers are much lighter in colour, being approximately the same shade of yellow everywhere. The costulae of the first tergite often fade out on the posterior half of the sclerite.

Holotype worker, AUSTRALIA: Western Australia, Winjana Gorge, 100 m, 17.x.1962 (*E. S. Ross & D. Cavagnaro*) (CAS, San Francisco).

Paratypes. 24 workers, 3 females (2 alate), with same data as holotype (CAS, San Francisco; BMNH; MCZ, Cambridge; NM, Basle).

The most distinctive and spectacular tetramoriine yet described from anywhere in the world, *spininode* cannot be confused with any other species in the tribe. The combination of the uniquely formed petiole node and flanged/carinate base to the first gastral tergite are characteristic and unmistakable and, also, this is one of the few *Tetramorium* species known which combines 11-merous antennae with an acute sting appendage situated apicodorsally on the sting shaft.

Apart from the type-series a single further specimen has been seen from MCZ, Cambridge, collected by C. Barrett at Newcastle Waters, Northern Territory. This specimen agrees with the description but has the head, alitrunk and pedicel segments pale orange-yellow, the gaster and legs yellow.

Tetramorium striolatum Viehmeyer

(Fig. 71)

Tetramorium (*Xiphomyrmex*) *viehmeyeri* var. *striolatus* Viehmeyer, 1913 : 39. Syntype workers,

AUSTRALIA: South Australia, Killalpaninna (MNHU, Berlin) [examined].

Xiphomyrmex striolatus (Viehmeyer) Viehmeyer, 1925 : 28. [Raised to species.]

WORKER. TL 3.2-3.7, HL 0.76-0.90, HW 0.70-0.82, CI 91-94, SL 0.54-0.64, SI 73-78, PW 0.54-0.68, AL 0.92-1.08 (10 measured).

Mandibles longitudinally striate, anterior clypeal margin without a notch or impression. Frontal carinae extending back almost to occiput as a narrow raised flange, forming the upper margins of the very feeble, shallow scrobe area. Propodeal spines long, stout and acute, the metapleural lobes narrow, triangular, long and acute. Node of petiole in profile relatively long (Fig. 71), the dorsal length greater than the height of the tergal portion of the node. In dorsal view the node is broader behind than in front and is slightly broader than long. Dorsum of head finely longitudinally rugulose, the spaces between the rugulae finely and densely reticulate-punctate. Dorsal alitrunk densely longitudinally rugulose with some cross-meshes, particularly on the pronotum, the spaces densely punctate. Petiole and postpetiole densely and quite coarsely sculptured with reticulate rugulation and dense puncturation; base of first gastral tergite feebly punctulate or shagreened. All dorsal surfaces of head and body with numerous erect or suberect stout hairs. Colour orange-brown.

This species is closely related to *impressum* but is separated by its longer and more strongly developed frontal carinae and by the shape of the petiole node in profile, compare Figs 69 and 71.

MATERIAL EXAMINED. AUSTRALIA: Victoria, Sea Lake (*J. C. Goudie*).

Tetramorium thalidum sp. n.

(Fig. 70)

HOLOTYPE WORKER. TL 3.2, HL 0.80, HW 0.72, CI 90, SL 0.54, SI 75, PW 0.58, AL 0.92.

Mandibles longitudinally striate, median portion of anterior clypeal margin without a notch. Frontal carinae extending back almost to the occiput but becoming indistinguishable from the surrounding sculpture before reaching it. Antennal scrobes long, broad and shallow but their limits clearly defined

and the area which they occupy shallowly concave. Eyes of moderate size, maximum diameter *c.* 0.18, about 0.25 × HW and with a few minute hairs projecting from between the facets (easily abraded away). Eyes situated approximately at the midlength of the sides of the head, the occipital margin very broadly concave. Metanotal groove not impressed, scarcely or not visible in profile. Propodeal spines stout and acute, metapleural lobes elongate, narrowly triangular and feebly upcurved. Node of petiole in profile with anterior and posterior faces parallel and more or less vertical, the dorsal surface evenly, gently convex. Dorsum of head evenly and quite regularly longitudinally rugulose, the spaces between rugulae densely but finely reticulate-punctate. Dorsal alitrunk predominantly longitudinally rugulose with densely punctate spaces except on the pronotum where a rugoreticulum is present. Petiole and postpetiole finely but irregularly rugulose and densely finely punctate. Base of first gastral tergite with fine superficial punctation or shagreening. All dorsal surfaces of head and body with numerous erect or suberect hairs which are very short, stout and usually blunted on the alitrunk. Colour orange-brown, the head somewhat darker in shade than the remainder.

PARATYPES. As holotype, with dimensions TL 2.9–3.2, HL 0.74–0.80, HW 0.70–0.76, CI 90–95, SL 0.52–0.58, SI 74–77, PW 0.54–0.62, AL 0.90–0.98 (5 measured).

Holotype worker, AUSTRALIA: N. Queensland, Kuranda-Mareeba Rd, Davies Creek, 30.x.1950, dry open forest (*W. L. Brown*) (MCZ, Cambridge).

Paratypes. 5 workers with same data as holotype (MCZ, Cambridge; BMNH).

Tetramorium viehmeyeri Forel

Tetramorium (Xiphomyrmex) viehmeyeri Forel, 1907 : 275. Holotype female, AUSTRALIA: S. Western Australia, Day Dawn, Stat. 76 (*Michaelsen & Hartmeyer*) (location of type not known).

Xiphomyrmex viehmeyeri var. *venustus* Wheeler, 1934 : 147. Holotype female, AUSTRALIA: Western Australia, Rottneest I., nr Government House, 22.x.1931 (*W. M. Wheeler*) (location of type not known).

Syn. n.

WORKER. TL 3.5–4.0, HL 0.78–0.90, HW 0.72–0.84, CI 90–93, SL 0.60–0.70, SI 83–86, PW 0.56–0.64, AL 0.92–1.12 (9 measured).

Mandibles striate. Anterior clypeal margin with a distinct median notch or impression. Anterior half to two-thirds of median portion of clypeus descending very steeply, almost vertical, this descending portion conspicuously transversely concave. Median clypeal carina absent from descending portion, short, present on the posterior portion and curve of the clypeus only, sometimes very faint. Frontal carinae with a raised, semi-translucent narrow flange which is distinct to the level of the posterior margins of the eyes, behind this the frontal carinae being scarcely stronger than the other sculpture. Scrobes narrow and shallow, for scape only. Eyes large and strongly convex, the maximum diameter *c.* 0.20–0.24 at HW 0.72–0.84 respectively. Propodeal spines narrow and acute; metapleural lobes triangular, dentiform. Node of petiole in profile angular, the tergal portion about as long as high. In dorsal view the node as broad as or slightly broader than long. Dorsum of head with spaced-out fine longitudinal rugulae, the spaces between them finely and densely reticulate-punctate. Scrobes reticulate-punctate. Dorsal alitrunk with a disorganized rugoreticulum on the pronotum, the constituents of which are sharply defined. Elsewhere on dorsal alitrunk cross-meshes are reduced in number or absent. Petiole and postpetiole finely rugulose, the spaces here and on the alitrunk densely punctulate, but much more conspicuously so on the alitrunk. Gaster smooth or with a very faint shagreening near the base of the first tergite. Hairs numerous on all dorsal surfaces of head and alitrunk, and with shorter subdecumbent hairs on scapes and legs. Colour yellow-brown, the gaster and appendages yellow.

The clypeal structure immediately characterizes this species. As far as I am aware, the only series of workers of this species collected are those mentioned by Wheeler (1934a) the female of which he describes as 'typical', and which form the basis of the above description. This series (in MCZ, Cambridge) lacks the queen which was originally present but the workers match the original description of Forel very well indeed.

MATERIAL EXAMINED. AUSTRALIA: Western Australia, Meekatharra (*W. M. Wheeler*).

The *tortuosum*-group

(For discussion see p. 78.)

Tetramorium andrynicum sp. n.

(Figs 66, 67)

HOLOTYPE WORKER. TL 3.4, HL 0.78, HW 0.68, CI 87, SL 0.64, SI 94, PW 0.52, AL 0.92

Mandibles finely and faintly longitudinally striate. Head in full-face view narrowing behind the eyes, the occipital margin strongly impressed medially (Fig. 66). Eyes small, maximum diameter *c.* 0.16, about 0.23 × HW. Anterior clypeal margin with a shallow median impression. Antennal scrobes feebly developed and shallow, not capable of accommodating the scape, the latter long. Alitrunk in profile with metanotal groove deeply impressed, the dorsum of the propodeum humped between the groove and the bases of the spines (Fig. 67). Propodeal spines long, narrow and acute; metapleural lobes low, triangular and acute. Petiole in profile with dorsum strongly convex (Fig. 67), in dorsal view longer than broad. Dorsum of head weakly sculptured; with median carina distinct and with a strong ruga on each side of the median carina about mid-way between it and the frontal carinae and running back to the level of the posterior margin of the eyes. Apart from this the dorsal head is smooth and shining with only a few feeble, disorganized, meandering and widely scattered rugulae posteriorly. Dorsal alitrunk more weakly sculptured than head, with only traces of feeble, widely spaced rugulae separated by wide smooth, shining areas. Petiole, postpetiole and gaster completely smooth, unsculptured. Hairs numerous on all dorsal surfaces of head and body. Colour dark brown, the appendages yellowish brown.

PARATYPE WORKERS. As holotype, with dimensions TL 3.2–3.3, HL 0.74–0.76, HW 0.66, CI 87–89, SL 0.60–0.64, SI 91–97, PW 0.46–0.50, AL 0.88 (2 measured).

Holotype worker, AUSTRALIA: Queensland, Mt Bartle Frere, W. slope, 3000–5000 ft, xii.1957 (*Darlingtons*) (MCZ, Cambridge).

Paratypes. 2 workers and 2 queens with the same data as holotype (MCZ, Cambridge; BMNH).

The construction of the petiole in this species is remarkably similar to that of *noratum* of Malaysia and Borneo but whether this represents a true relationship or a convergence is not known. I suspect the latter as there are considerable differences in size and sculpture between the two. Amongst the Australian tetramoriines with 11-segmented antennae this species is the least sculptured and has a very conspicuously impressed metanotal groove. These two features combined with the characteristic head-shape noted above should easily differentiate this species from all others in Australia.

Tetramorium confusum sp. n.

(Fig. 63)

HOLOTYPE WORKER. TL 3.4, HL 0.76, HW 0.72, CI 95, SL 0.58, SI 81, PW 0.56, AL 0.92.

Mandibles longitudinally striate; anterior margin of clypeus without a median notch or impression. Frontal carinae extending back almost to the occipital corners and forming the upper margins of the shallow and narrow scrobes. Eyes of moderate size, maximum diameter *c.* 0.20. Median clypeal carina strongly developed, reaching to the anterior margin. With alitrunk in profile the metanotal groove feebly impressed, in dorsal view the track of the fused promesonotal suture faintly visible as a feebly impressed, arched line. Propodeal spines short and acute, metapleural lobes elongate, narrowly triangular and acute. Petiole in profile as in Fig. 63; in dorsal view distinctly broader than long, roughly broadly transversely rectangular but somewhat broader behind than in front. Postpetiole subglobular in dorsal view. Dorsum of head with fine, spaced, irregular longitudinal rugulae, the spaces between which are shining and with a sparse superficial reticulation or vestigial puncturation. Cross-meshes between the rugulae virtually absent. Dorsal alitrunk similarly sculptured but with sharp cross-meshes on the anterior pronotum. Dorsal surfaces of petiole and postpetiole smooth and shining but the former with very faint traces of sculpture at the extreme lateral edges. Gaster unsculptured. Fine erect or suberect hairs present on all dorsal surfaces of head and body but such hairs absent from the appendages where the hairs tend to be short and appressed. Colour dark brown, the appendages somewhat lighter.

PARATYPE WORKERS. TL 3.1–3.5, HL 0.72–0.78, HW 0.66–0.72, CI 89–95, SL 0.54–0.58, SI 78–85, PW 0.52–0.56, AL 0.86–0.94 (10 measured).

Holotype worker, AUSTRALIA: New South Wales, Thegib, nr Bowral, 750 m, 19.xii.1962 (*E. S. Ross & D. Q. Cavagnaro*) (CAS, San Francisco).

Paratypes. 20 workers with same data as holotype (CAS, San Francisco; BMNH; MCZ, Cambridge).

Apart from the type-series, good samples have also been examined from Wentworth Falls and Bulli Pass in New South Wales, and from Kuranda in Queensland. Six specimens from each of these series were measured, including the largest and smallest, and the range was found to be: HL 0.72-0.80, HW 0.66-0.74, CI 90-95, SL 0.52-0.62, SI 80-84, PW 0.52-0.56, AL 0.84-0.96. All fit the above description but the Bulli Pass and Kuranda series have a number of workers in which the gaster is yellow-brown and distinctly lighter than the colour of the head and alitrunk, and in all series the track of the promesonotal suture is by no means as distinctive as in the type-series. A number of workers from several series have more numerous cross-meshes in the dorsal alitrunk sculpture than is seen in the types.

Amongst the known Australian species with 11-merous antennae *confusum* and *capitale* are the only two in which the petiole in dorsal view is distinctly transverse. In *capitale*, however, the petiole and postpetiole are densely punctate with a few longitudinal rugulae and the spaces between rugae on the alitrunk are densely punctate.

MATERIAL EXAMINED. AUSTRALIA: New South Wales, Wentworth Falls (*W. M. Wheeler*); N.S.W., Heathcote (*W. M. Wheeler*); N.S.W., Bulli Pass (*W. M. Wheeler*); N.S.W., Sutherland (*W. M. Wheeler*); N.S.W., Gib Mts (*M. I. Nikitin*); N.S.W., Jenolan Caves (*J. O. Wilson*); N.S.W., Katoomba (*W. M. Wheeler*); N.S.W., Royal National Park (*E. S. Ross & D. Q. Cavagnaro*); Queensland, Kuranda (*W. L. Brown*).

Tetramorium splendidior (Viehmeyer) comb. et stat. n.

Xiphomyrmex striolatus subsp. *splendidior* Viehmeyer, 1925 : 29. Holotype worker, AUSTRALIA: New South Wales, Liverpool (MNHU, Berlin) [examined].

WORKER. TL 3.6, HL 0.82, HW 0.74, CI 90, SL 0.60, SI 81, PW 0.60, AL 1.02.

Mandibles finely striate; anterior clypeal margin more or less straight, without a median notch or incision. Median clypeal carina strong, elevated, flanked by a pair of lateral carinae. Frontal carinae extended back as a narrow raised flange to the level of the posterior margins of the eyes, behind this level much weaker, confused with and no more strongly developed than the rugulae in the area. Scrobes weakly developed, consisting of a shallow, narrow groove below the frontal carinae which does not fully accommodate the scape. Eyes moderate, maximum diameter *c.* 0.20. Pronotal corners angulate in dorsal view, metanotal groove feeble, scarcely impressed. Propodeal spines stout and acute; metapleural lobes long and acute. Node of petiole in dorsal view as long as or very slightly longer than broad, narrower in front than behind. Postpetiole subglobular, broader than long. Dorsum of head with a number of spaced rugulae, the gaps between which have faint superficial puncturation. Rugular cross-meshes uncommon on the dorsum, more numerous and distinct in the occipital region and on the sides of the head behind the eyes. Dorsal alitrunk strongly and sharply rugose, the individual rugae raised and acute, predominantly longitudinal on the mesonotum but with strong reticulation on the anterior pronotum. Pedicel segments reticulate-rugose on the sides, the rugae fading out on the postpetiole dorsum so that the disc is predominantly shining with only one or two faint rugulae around its perimeter. Spaces between rugae on alitrunk and pedicel smooth and shining or at most with faint, almost effaced punctulation; gaster smooth, unsculptured. Long, fine hairs present on all dorsal surfaces, the longest on the alitrunk equal to or slightly longer than the maximum diameter of the eye. Colour bright orange-red, the gaster and appendages lighter, yellowish brown.

This species is apparently still known only from the holotype.

Tetramorium strictum sp. n.

(Fig. 64)

HOLOTYPE WORKER. TL 3.1, HL 0.78, HW 0.72, CI 92, SL 0.60, SI 83, PW 0.54, AL 0.92.

Mandibles finely longitudinally striate; anterior clypeal margin without a median notch, the strongly developed median carina reaching to the margin. Eyes of moderate size, maximum diameter *c.* 0.16, slightly in front of the midlength of the sides of the head. Frontal carinae extending back almost to the occipital corners, forming the dorsal margin of the weak and shallow scrobes which are about as long as the scape but not deep enough to accommodate it. Metanotal groove broadly but shallowly impressed in profile. Propodeal spines long and strong, the metapleural lobes elongate and narrowly triangular. Petiole in profile with the dorsum rounding into the posterior face, the latter convex and prominent

(Fig. 64). In dorsal view the petiole node longer than broad, only slightly broader behind than in front and narrower apically than at the base so that the dorsum is narrower than the body of the node. Sides of petiole in dorsal view slightly concave (sometimes feebly so) so that the dorsum has a pinched-in or constricted appearance at about its midlength. Dorsum of head with a few widely spaced longitudinal rugulae which anastomose posteriorly, the spaces between them shining and smooth or at most with a very faint trace of sculpture. Dorsal alitrunk with a loose, wide-meshed rugoreticulum, the spaces between which are smooth or have very faint traces of sculpture. Petiole and postpetiole unsculptured dorsally but the former with vestiges of striae on the sides. Gaster unsculptured. All surfaces of head and body with numerous erect hairs. Colour shining mid-brown, the gaster and appendages lighter than the head and alitrunk.

PARATYPE WORKERS. As holotype, with range TL 3.0–3.2, HL 0.76–0.80, HW 0.70–0.74, CI 92–94, SL 0.58–0.62, SI 80–84, PW 0.52–0.56, AL 0.88–0.94 (8 measured). The ocular diameter shows a range of 0.16–0.18 and in some specimens the dorsal constriction of the petiole is more conspicuous than in the holotype.

Holotype worker, AUSTRALIA: Queensland, Mt Alexander, NW. Daintree, 20–23.xii.1957, rain forest (*P. F. Darlington*) (MCZ, Cambridge).

Paratypes. 8 workers with same data as holotype (MCZ, Cambridge; BMNH).

Apart from the type-series, specimens from four other series have been examined. Some of these show variation from the types in colour and density of rugulose or rugoreticular sculpture, and in a few the sides of the petiole are more strongly sculptured. Specimens from Rocky River, Cape York, are uniform dark brown and have a sharper and less spaced-out rugoreticulum on the alitrunk. The size range in these specimens is HL 0.72–0.82, HW 0.68–0.76, CI 90–95, SL 0.52–0.62, SI 78–83, PW 0.50–0.60, AL 0.86–1.00, with the range of ocular diameter 0.14–0.18 (10 measured).

All specimens examined have been from rain forest and those from Kuranda bear the information 'rotten log, rain forest'.

MATERIAL EXAMINED. AUSTRALIA: Queensland, Cape York, Rocky River (*Darlington*); Q., Kuranda v. Cairns (*Darlington*); Q., Kirrama Rge v. Cardwell (*Darlington*); Q., Kuranda (*W. L. Brown*).

Tetramorium turneri Forel

(Fig. 65)

Tetramorium (Xiphomyrmex) turneri Forel, 1902c : 447. Syntype workers, female, AUSTRALIA: Queensland, Mackay (*Turner*) (BMNH; MHN, Geneva) [examined].

WORKER. TL 3.2–3.7, HL 0.76–0.86, HW 0.70–0.80, CI 90–95, SL 0.56–0.62, SI 75–82, PW 0.54–0.62, AL 0.90–1.02 (15 measured).

Mandibles striate; anterior clypeal margin without a median notch or impression. Median clypeal carina strong, running to the anterior margin. Frontal carinae extending back almost to the occipital corners but weakening behind the level of the eye and posteriorly not more strongly defined than the rugae occurring in that area. Antennal scrobes shallow and weak, not capable of containing the scape. Eyes situated very slightly in front of midlength of sides of head, of moderate size, maximum diameter c. 0.15–0.20. Metanotal groove feebly developed, usually very faintly impressed in profile but rarely quite distinct. In one series (Ravenshoe) some workers have a small triangular prominence medio-dorsally on the anterior portion of the propodeum but this is absent in other workers of the same series and in other series examined. Propodeal spines stout and acute, metapleural lobes elongate-triangular and acute, narrow. Petiole node in dorsal view usually slightly longer than broad, the node narrow in front and much broader behind, with slightly convex sides (Fig. 65); postpetiole broader than long. Head longitudinally rugulose, the individual components irregular and spaced out, with few or no anastomoses or cross-meshes, the spaces smooth and shining or with a very faint superficial shagreening or vestigial puncturation. Dorsal alitrunk irregularly and shallowly spaced-rugulose with numerous cross-meshes, the spaces even more feebly sculptured than on the head, very shining. Sides of petiole and postpetiole with some rugosity but the dorsal surfaces either completely smooth or at least with a smooth and highly polished median longitudinal strip. Gaster unsculptured. All dorsal surfaces with numerous long, fine, acute hairs, which are also present on the ventral surfaces of the femora. Colour uniform dark brown or with the gaster a lighter yellowish brown; appendages light to pale brown.

T. turneri, the first tetramoriine to be described from Australia, is apparently more closely related to *eleates* of Malaysia and Indonesia than to any other species of the *tortuosum*-group occurring in Australia itself.

MATERIAL EXAMINED. AUSTRALIA: Queensland, Ravenshoe, Atherton Tab. (*Darlington*); Q., W. of Brisbane (*E. S. Ross & D. Q. Cavagnaro*); Q., Mt Jacob, S. of Gladstone (*Darlington*); New South Wales, Coffs Harbour (*W. L. Brown*); Gosford (*W. M. Wheeler*).

The *ornatum*-group

(For discussion see p. 104.)

Tetramorium australe sp. n.

(Fig. 68)

HOLOTYPE WORKER. TL 3·9, HL 0·94, HW 0·90, CI 96, SL 0·76, SI 84, PW 0·64, AL 1·10.

Mandibles striate, anterior clypeal margin convex and entire. Frontal carinae distinct to level of posterior margins of eyes, behind which they are reduced and indistinguishable from the other sculpture. Antennal scrobes very feeble, the area of the scrobe traversed by numerous longitudinal rugae. Eyes situated in front of middle of sides of head, maximum diameter *c.* 0·20. Occipital margin broadly and strongly concave in full-face view, the sides of the head behind the eyes convex. Pronotal corners rounded in dorsal view. Propodeal spines long and narrow in profile, slightly downcurved along their length and over two times longer than the triangular, upcurved metapleural lobes. Peduncle of petiole elongate, feebly downcurved along its length, the node shaped as in Fig. 68. In dorsal view the petiole node longer than broad. Dorsum of head covered with sharp, close-packed, coarse longitudinal rugulae without any cross-meshes, with about 14 longitudinal rugulae between the frontal carinae at the level of the midlength of the eyes. Sides of head between eye and frontal carina similarly sculptured. Dorsal alitrunk very coarsely rugose, the rugae sharp and strongly raised. Sides of pronotum coarsely longitudinally rugose, the same sculpture repeated elsewhere on the lateral alitrunk but less sharply defined. Sides and dorsum of both petiole and postpetiole rugulose, obliquely so on the sides but longitudinally upon the dorsum. Gaster unsculptured. All dorsal surfaces of head and body with numerous fine, erect or suberect hairs of varying length. Antennal scapes and dorsal (outer) surfaces of hind tibiae only with suberect or subdecumbent short hairs. Colour mid-brown, the gaster tending to be darker in shade than the alitrunk.

PARATYPE WORKERS. TL 3·5–4·0, HL 0·86–0·98, HW 0·80–0·92, CI 92–96, SL 0·68–0·78, SI 82–87, PW 0·60–0·66, AL 0·96–1·10 (20 measured). Range of maximum eye diameter 0·16–0·20. Number of longitudinal rugulae between frontal carinae at level of midlength of eye varies from 13 to 15 in paratypes, and some are much darker brown than the holotype.

Holotype worker, AUSTRALIA: Queensland, Cape York, v. Tozer Gap, Jan. 1958, gum forest (*P. F. Darlington*) (MCZ, Cambridge).

Paratypes. AUSTRALIA: 5 workers with same data as holotype; 3 workers with same data as holotype but 'rain forest'; 6 workers, Queensland, Shipton's Flat (S. of Cooktown), June 58, gum forest (*P. F. Darlington*); 6 workers, Queensland, Cape York, Rocky River, early June 58, gum forest (*P. F. Darlington*) (MCZ, Cambridge; BMNH).

This species is closest related to *ornatum*, which also occurs in Cape York. The two species are separated by the characters shown in the key.

Tetramorium deceptum sp. n.

HOLOTYPE WORKER. TL 2·9, HL 0·68, HW 0·64, CI 94, SL 0·48, SI 75, PW 0·48, AL 0·80.

Mandibles striate, anterior clypeal margin entire. Frontal carinae extending back well beyond the level of the eyes but only weakly developed, not stronger than the remaining cephalic sculpture. Antennal scrobes present but only weakly developed. Eyes of moderate size, maximum diameter *c.* 0·14. Occipital margin broadly but shallowly concave in full-face view, the sides of the head behind the eyes feebly convex. Pronotal corners rounded in dorsal view. Dorsal alitrunk evenly but shallowly convex in profile. Propodeal spines short, stout and acute in profile, more or less straight, only fractionally longer than the metapleural lobes; the latter elongate-triangular and upcurved. Petiole in profile with a narrow, weakly downcurved anterior peduncle and a relatively high, blocky node. Dorsal and posterior surfaces of the node meet in a curve which is much less pronounced than the angle separating anterior and dorsal

surfaces; dorsum of node feebly convex in profile. In dorsal view the petiole node is very slightly broader than long, broadest posteriorly. Dorsum of head with numerous longitudinal fine low rugulae, the majority of which are irregular or show some tendency to meander. The spaces between rugulae show a quite conspicuous reticulate-punctate ground sculpture. Dorsal alitrunk sculptured much as head but the rugulae tending to form a weak reticulum on the pronotum and the puncture between them somewhat less conspicuous. Sides of pronotum reticulate-rugulose, the remainder of the sides of the alitrunk with fine longitudinal rugulae and conspicuously reticulate-punctate interspaces. Sides of petiole and postpetiole, and the dorsum of the petiole faintly rugulose with still fainter punctulation, but the postpetiole dorsum tending to be unsculptured at least mediodorsally. Gaster unsculptured. All dorsal surfaces of head and body with numerous fine hairs of varying length but antennal scapes and dorsal (outer) surfaces of hind tibiae only with very short, fine, subdecumbent to decumbent hairs. Colour dark brown, the appendages yellowish brown.

PARATYPE WORKERS. TL 2.8–2.9, HL 0.66–0.68, HW 0.60–0.64, CI 90–94, SL 0.46–0.48, SI 74–80, PW 0.46–0.48, AL 0.78–0.80 (4 measured). Maximum diameter of eye *c.* 0.13–0.14. As holotype but some showing very faint, superficial punctulation mediodorsally on postpetiole.

Holotype worker, AUSTRALIA: Queensland, Shipton's Flat (S. of Cooktown), June 58 (*Darlingtons*) (MCZ, Cambridge).

Paratypes. 4 workers with same data as holotype (MCZ, Cambridge; BMNH).

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