

The palm-feeding planthopper genus *Ommatissus* (Homoptera: Fulgoroidea: Tropiduchidae)

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ABSTRACT. The tribe Trypetimorphini, the genus *Ommatissus*, and its two subgenera and eleven species are redescribed or described as new. Evidence for the monophyly of both the genus and of the tribe to which it belongs is examined; it is concluded that while the genus is monophyletic, the monophyly of the tribe is in doubt. Keys for the separation of the three genera of the tribe and for all of the known species of *Ommatissus* are presented. A new subgenus of *Ommatissus* is described: *O. (Opatissus)*, with the type-species *O. vietnamicus*. Four new species are described: *Ommatissus magribus* from Morocco, *O. kamerunus* from Cameroon, *O. natalensis* from South Africa and *O. vietnamicus* from Vietnam. The 'Dubas bug', *Ommatissus lybicus* Bergevin, formerly regarded as a variety of *O. binotatus* Fieber, is raised to full species status. *Trichoduchus* is synonymized with *Trypetimorpha* resulting in the new combinations *Trypetimorpha biermani* Dammerman, *T. china* Wu and *T. japonicus* Ishihara. *Trichoduchus japonicus* Fennah is synonymized with *Trypetimorpha japonicus* Ishihara.

Introduction

The genus *Ommatissus* is widely distributed in the Palaearctic and Oriental Regions and Africa. Some species are associated with palms, including *O. lybicus* Bergevin, also known as the 'Dubas bug', which is the most important pest of date palm (*Phoenix dactylifera*) in the Middle East. Damage resulting from heavy infestations is due to both adults and nymphs sucking sap from leaflets and fronds and to oviposition scars in the plant tissue. Exudation of honeydew by the insects and of sap from the punctured tissues facilitates infection by bacteria and fungi, and

may lead to weakening and death of the trees. Other *Ommatissus* species associated with palms are *O. binotatus* on the native palm *Chamaerops humilis* L. in the south-west Mediterranean Region (e.g. Bergevin, 1916, 1930), *O. magribus* on *C. humilis* in Morocco and *O. tumidulus* on *Phoenix* palms in Sudan (Linnavouri, 1973). The east Asiatic species *O. lofouensis* Muir reportedly feeds 'on grasses' (Muir, 1913), but we doubt this old record.

The tropiduchid tribe Trypetimorphini, as redefined by Fennah (1982), comprises the genera *Ommatissus*, *Trypetimorpha*, *Trichoduchus* and *Caffrommatissus*. Characters of all *Ommatissus* species and of some species in other genera have been examined here in an attempt to establish the monophyly of the genus and of the tribe.

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Type or topotypic specimens of all previously described species have been examined. Other material has been borrowed from the depositories cited below or collected by the first author. All drawings have been made using a Leitz camera lucida. Genitalia preparations were made by maceration in 10% KOH and were stored in glycerine. All measurements are given in millimetres.

Abbreviations of depositories

BMNH: British Museum (Natural History), London, U.K. BPBM: Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A. EIHU: Entomological Institute Hokkaido University, Sapporo, Japan. LOB: L. O. Brien collection, Tallahassee, Florida, U.S.A. MA: M. Asche collection, Marburg, West Germany. RL, R. Linnavuori collection, Somersoja, Finland.

Tribe Trypetimorphini

Trypetimorphini Melichar 1914: 7.

Type-genus: *Trypetimorpha* Costa.

Relatively small Tropicuchidae with body-length (including tegmina) 2.5–6 mm.

Head. Vertex approximately pentagonal, posterior margin concave or distinctly obtuse-angled excavated, anterior margin convex forming a projected obtuse angle, median carina inconspicuous or absent, 1.3–2.3 times broader at base than long in middle. Frons 1.2–1.75 times as long as broad, with median carina distinctly produced, area from lateral carinae ascending to median carina, distinctly longer in middle than maximum breadth. Post-clypeus broadly rounded, median carina absent or present as an inconspicuous continuation of median frontal carina in upper portion; laterally not separated from the lorae by a suture, not by a sharp carina. Ante-clypeus medially with a short, often pointed cone-shaped protrusion ('knob-like callus' of Fennah, 1967). Rostrum, very short, not exceeding the mesotrochanter, apical segment as broad as long, or even broader than long. Antennae with second joint produced antero-distally. Post-tibia laterally with 2 spines, abnormally with 3 (often on one leg only), distally with 5–8 or 11 spines. Hind basitarsus distally 5–8 spines.

Tegmina. Hyaline, semihyaline or (in the brachypterous form of some taxa) coriaceous, veins at least in brachypterous form strongly ridged, *Sc+R*, *M* and *Cu* forked only distad of middle if at all, transverse veins either forming an oblique line between *R-M* and *M-Cu* and *Cu*-branch (*Cu 1b*) and apex of clavus, or numerous between *Sc+R-C* and between *Cu 1b* and distal margin.

Male genitalia. Parameres bilaterally symmetrical, up to 2.7 times as long as broad in side view, dorsolaterally armed with a hook-shaped process, membranously fused at base. Anal tube with ventral side distally projected, often into a membranous lobe.

Female genitalia. Ditrinsic, copulatory aperture and passage separate from distal egg-channel, opening externally on intersegmental membrane between seventh sternite and derivatives of sternite 8 and communicating internally with duct of bursa copulatrix. First valvulae (gonapophyses 8 of Müller, 1942) with at least 4 teeth on dorsal margin, ventral margin with mostly 15–25 or more teeth composed of up to 5 separate short rows at least 5–10 teeth, often irregularly placed in a row, in most of the taxa laterally at base additional teeth, often in an oblique row. Second valvulae (median gonapophyses 9) distally triangularly narrowed, ending in 3 pointed short tips, reduced to approximately less than half the length of first valvulae. Third valvulae (lateral gonapophyses 9 [or gonoplac]) as in other Tropicuchidae with dorsal margin broadly fused with tergite 9, distally without any teeth. Valvifer 8 usually with a distinct blackish spot on dorsocaudal edge.

Remarks. The diagnosis above is modified from that of Fennah (1982). Melichar (1914) subdivided the Tropicuchidae (established by Stål (1866) as a subfamily of the Fuigoridae) into several tribes, a classification which, with a few modifications, was adopted by Muir (1923, 1930) as well as by Metcalf (1938, 1954). Fennah (1982) replaced this classification with an entirely modified and enlarged tribal system gained by considering several different characters, e.g. those of the male and female genitalia. Fennah placed *Ommatissus*, *Trypetimorpha*, *Trichoduchus* and *Caffrommatissus* in the redefined Trypetimorphini. The attempts that have been undertaken so far to subdivide the Tropicuchidae may be considered purely phenetic rather than phylogenetic. They are primarily

based on diagnostic characters without any discussion of homology and evolutionary trends. Neither the family as a whole, nor any of the tribes or genera, has been convincingly proved to be monophyletic by means of even a single good synapomorphic character. We tentatively assume monophyly at least for some of the groups as well as for the family. A cladistic analysis is needed, but is beyond the scope of this paper. Many of the characters listed above probably represent only symplesiomorphies at the evolutionary level concerned. For instance, the ditrysic configuration of the female genitalia is also present in other Tropicuchidae, as, for example, in the genus *Vanua* Kirkaldy in the tribe Tropicuchini. Similarly, dentate first valvulae are widespread within Tropicuchidae and certainly not constitutive of the Trypetimorphini *sensu* Fennah. The non-dentate condition of the third valvulae does not prove the monophyly of the tribe Trypetimorphini since it is also found in Catulliini. For the moment, only the knob-like callus of the anteclypeus (although almost obsolete in some species), the similarly shaped protrusion of the second antennal segment and the mediolongitudinally projected frons might be considered as possibly synapomorphic. The venation of the tegmina and wings shows considerable reductive trends due to widespread brachyptery. Although any reduction of veins can be considered as an apomorphy it could easily be convergent in the species included here.

The male genitalia of *Ommatissus* and *Trypetimorpha* resemble each other superficially, but in fact differ considerably in the construction of the aedeagus complex. In *Ommatissus* the basal portion of the simple tube-like sperm-conducting part (the penis *sensu* Muir (1923) probably corresponding to the strongly chitinized 'central part' in Delphacidae and Cixiidae (Asche, 1985)), is embraced by the chitinized derivative of the diaphragm (periandrium *sensu* Muir, the theca *sensu* Asche). This diaphragm is connected with the ventral base of the anal tube. It may be in the form of a simple ring or hood- or boat-shaped finger-like or largely elongated flag-like processes. This type of aedeagus structure may also be found in a similar or slightly modified manner in other Tropicuchidae such as some *Tambinia* species (tribe Tambinini). This structure could be either symplesiomorphic for

Ommatissus or convergent evolution has to be assumed. However, we believe that *Ommatissus* does not represent a very primitive evolutionary level within the Tropicuchidae. A more plesiomorphic situation can be conceived in *Trypetimorpha* and also for the monotypic South African genus *Caffrommatissus*. In both these genera the periandrium of the aedeagus entirely encloses the sperm-conducting central part. In *Trypetimorpha* part at least is still strongly chitinized, a configuration that in general may correspond to the condition found in Cixiidae and Delphacidae. In *Trypetimorpha* species one or two slender, caudally directed spinous processes arise from the base of the periandrium.

In *Caffrommatissus* no such processes are present. This genus resembles *Ommatissus* in its body-shape and coloration, and in having blackish patches on the head and sides of the pronotum, but differs in having the central part of aedeagus periandrium armed with spinous rods (see Fennah, 1967). This construction occurs also in *Neommatissus* Muir (tribe Neommatissini). The configuration of the aedeagus in *Trypetimorpha* and *Caffrommatissus* can be considered as the more primitive compared with that in *Ommatissus*. We cannot yet assume a closer relationship between the three genera. Since their aedeagus structures appear to be at different evolutionary levels, the monophyly of the tribe is somewhat doubtful although the characters stated above may have diagnostic value. In spite of Fennah's recent (1982) tribal classification the statement of Muir (1923) 'it is necessary to do considerably more work in this family before we can follow the connection of the groups of genera' remains valid today.

Key to genera of Trypetimorphini

- 1 Post-tibia with two spines laterally (aberrantly 3 spines usually on one side only) and 5-8 spines distally, hind basitarsus with 5-8 spines distally. 2
- Post-tibia with one spine laterally and 11 spines distally, hind-basitarsus bearing 8 spines distally
Caffrommatissus
(1 species: South Africa)
- 2 Clavus well developed, apex reaching approximately to middle of tegmen or distad of middle (both in brachypterous and macropterous specimens) *Ommatissus*
(11 species: Palearctic, Oriental Region, Africa)
- Clavus very short, apex distinctly proximad of middle of tegmen, in brachypterous forms about a quar-

ter, in macropterous forms about a third the tegmen length. *Trypetimorpha*
(9 species: Palaearctic Region, Africa, Oriental Region, Australia)

Genus *Trypetimorpha* A. Costa

Trypetimorpha A. Costa, 1862: 60. Type species: *T. fenestrata* A. Costa by original designation.

Trichoduchus Bierman, 1910: 28. Type species: *T. biermani* Dammerman by original designation. **syn.n.**

The separation of *Trypetimorpha* and *Trichoduchus* was based only on the presence or absence of hairs on the body and tegmina, a character that we consider to be of specific value only. The taxa resemble each other in every other character examined including genitalia. The following species are transferred from *Trichoduchus*:

Trypetimorpha biermani (Dammerman, in Bierman 1910) **comb.n.**

Trypetimorpha china (Wu, 1935) (new name for *Trichoduchus biermani* Muir, 1913) **comb.n.**

Trypetimorpha japonica Ishihara, 1954 = *Trichoduchus japonicus* Fennah, 1955 **syn.n.** and secondary homonym.

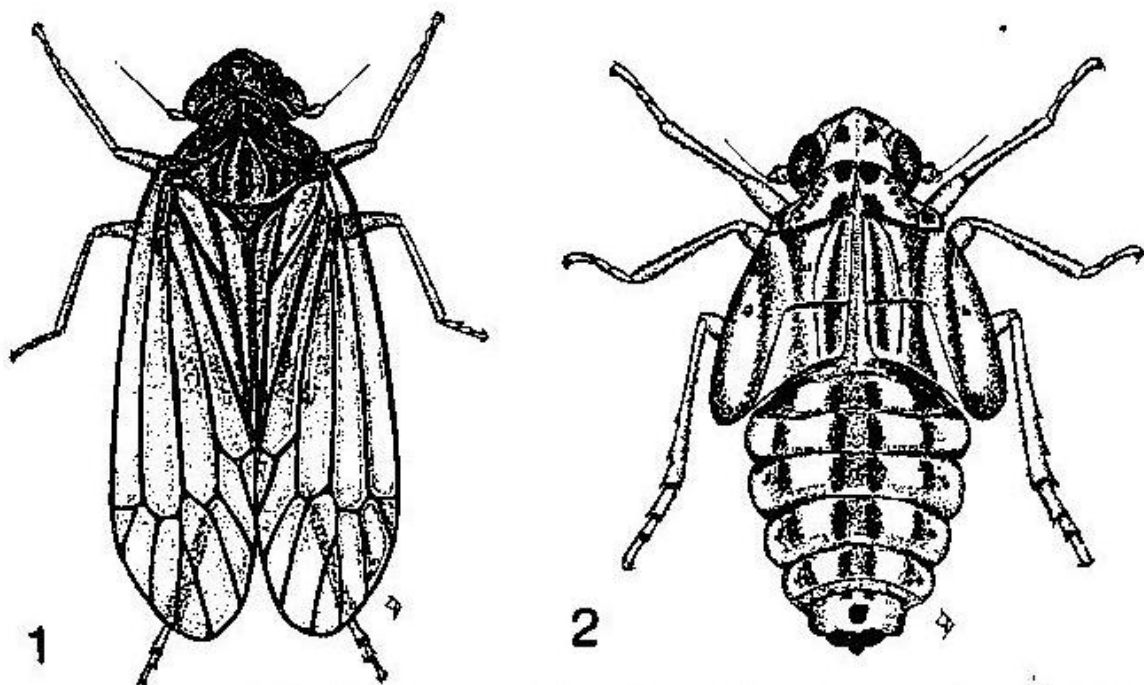
Genus *Ommatissus* Fieber

Ommatissus Fieber, 1872: 3 (nomen nudum).

Ommatissus Fieber, 1875: 353. Type-species: *Ommatissus binotatus* Fieber, 1876 by monotypy.

Pregenital characters

Small, rather slender Tropicuchidae, body-length 3–6 mm. Coloration ranging from pale stramineous to dark brownish with at least one distinct blackish spot present on each side of the pronotum, most species with additional dark marks on frons and partly on lorae. Vertex without dark patches (see Fig. 1). Vertex pentagonal, broader than medially long (1.25–2.2:1), anteriorly obtuse-angled or convex, posteriorly slightly concave, marginal carinae ridged, median longitudinal carina inconspicuous or missing. Frons longer in middle than maximum breadth (1.25–1.71:1), each lateral half flat or shallowly concave, lateral carinae sharp-edged, slightly converging towards the post-clypeal suture, median carina distinctly produced. Post-clypeus short, triangular, broadly rounded, stramineous except in a few species in which it is darkened, frontal median carina either not continuing onto postclypeus or if only on its upper portion, then obliterate. Anteclypeus without carinae, medially with callus, usually pointed.



FIGS 1–2. *Ommatissus lybicus* Bergevin; 1, whole insect; 2, nymph (wax plume from abdominal glands not shown).

Rostrum with terminal segment as long as broad. Compound eyes almost hemispherical, lateral ocelli present, sometimes weakly developed. Antennae with second joint about 3.0–3.5 times as long as the short ring-like first, second segment distally slightly expanded, anterior margin with knob-like protrusion. Pronotum dorsally tricarinate, posterior margin obtuse-angled excavated, dorsal disc about as broad as vertex at base, lateral carinae of disc sinuately converging cephalad, median carina reaching the hind margin, carinae of disc distinctly ridged, surface between them shallowly concave with a small circular depression medially on each side of the central-ridge, laterocaudal portion of pronotum cephalad of tegulae with a longitudinal carina on each side. Mesonotum as in most other Tropicuchidae, tricarinate with a distinct transverse suture separating the dorsal angle, median carina strongly developed reaching caudad till transverse suture, lateral carinae anteriorly converging forming a dorsal disc; pronotum and mesonotum together medially about 4.5–5 times as long as median length of vertex.

Hindlegs. Post-tibia with two distinct lateral spines arising in the distal third (aberrantly with 3 spines, distally 5–8 spines forming either a concave row, or grouped (2–3+5)); basitarsus distally with 5–8 spines in a slightly concave row; second tarsal segment pad-like, hairy with papillated surface, 1 spine on each side as in all other Tropicuchidae. Second and third tarsal segments together as long as first segment.

Tegmina slender and rather narrow, broadest distad of claval apex hyaline to translucent, in one species powdered with whitish wax; brachypterous form: 2.2–3.3 times longer than maximum breadth, macropterous forms 2.6–3.4 times as long as maximum breadth. Tegmina longer than body except in some females of brachypterous forms in which they reach only to middle of anal tube. Claval apex at middle or slightly distad of mid-point of tegmen, forming an acute angle with the inner margin; veins distinct without obvious bristles or hairs, main stems of veins straight, branched (if at all) rather distad, towards apex; cross veins only in the distad portion between *Sc+R* (or branch of it) obliquely laterocaudad to *C*, and medially to *M* (or branch), between *M* (or branch) and *Cu Ia*, between *Cu Ib* and apex of clavus; *Cu* and *M* form a short common stem at base arising from

the inner distal edge of the basal cell; in brachypterous forms crossveins are less developed or evanescent. Wings mostly hyaline, *Cu* distally forked, other veins simple, only two crossveins present, between *M* and *Sc+R* shortly distad of coupling apparatus, and between *M* and *Cu Ia* (see Figs 25–30).

Male genitalia. Genital segment simple ring-shaped, ventrally distinctly longer than dorsally, dorsal margin deeply excavated to accommodate anal tube. Anal tube short, ventral margin distinctly projected caudad, ending in a more or less membranous lobe, anal style rather short. Genital parameres in side view varying in length from almost as long as broad to 2.3 times as long as broad (some variation within populations has been found), distally either rounded or pointed, a strong hook-like process arising from laterodorsal margin, the acute tip bent laterad or lateroventrad; at about the same level a shorter, medially directed tooth-like process arises from the inner dorsal margin. Penis either long, slender tubular, with phallosome apical or slightly subapical and ventrally exposed or branched shortly distad of base into a short distal tube with apical phallosome and a long ventral process; perianthium surrounding penis only at base, distally detached from sperm-conducting part, dorsally connected with ventrobasal margin of anal-tube, ring-, boat- or hood-shaped, without or with up to 3 spine-, finger- or elongated flag-like caudally directed processes; base of aedeagus continuing into a large membranous 'chamber' which is flanked by well-developed 'wings' (apodemes) (terminology adopted from Muir, 1926); connective (basal plate bridge *sensu* Muir) rather long, medially slightly longer or, in some species, considerably bent cephalad.

Female genitalia (Figs 31–33). Ovipositor incomplete and modified from orthopteroid type. First valvulae (G VIII) saw-like, dorsal margin with 8–32 teeth arranged in 5 short rows. Ventral margin with 5–15 teeth, laterally at base with an oblique row of up to 15 teeth. Second valvulae (=Gm IX) strongly reduced and widest at base, where they are fused together triangularly converging caudad, each terminally split into three short tips, mediocephalad with a slender process of different length. Third valvulae (G1 IX) devoid of teeth. Caudal margin of seventh sternite medially straight or slightly projected caudad. Orifice for the reception of

the penis centrally in the intersegmental fold caudad of seventh sternite, often prominent and more strongly chitinized than surrounding membrane.

Remarks. Although most of the characters listed in the generic description seem to be only of diagnostic rather than phylogenetic value we have selected the following characters that may indicate the monophyly of the species included in *Ommatissus*: presence of large, dark patches either on frons or on lateral portions of pronotum, or on both; periandrium detached from the sperm-conducting central part and surrounding the penis only at its base; venation of tegmina and wings, especially the position of cross veins.

Check list of species of *Ommatissus* with distributions and host plants

Ommatissus (Ommatissus)

alpinus Linnavuori 1973; Sudan; host plant unknown.

bimaculatus Muir 1931; northern India and Pakistan; host plant unknown.

binotatus Fieber 1876; Spain, Italy; *Chamaerops humilis*.

chinsanensis Muir 1913; China, Hong Kong; host plant unknown.

kamerunus sp.n.; Cameroon; host plant unknown.

loufouensis Muir 1913; southern China, Japan, Korea; host plant unknown but recorded 'on grasses'.

lybicus Bergevin 1930; Middle East; date palm *Phoenix dactylifera*.

magribus sp.n.; Morocco; *Chamaerops humilis*.

natalensis sp.n.; South Africa; host plant unknown.

tumidulus Linnavuori 1973; Sudan; *Phoenix* sp.

Ommatissus (Opatissus)

vietnamicus sp.n.; Vietnam; host plant unknown.

Key to species of *Ommatissus*

Differences in the species are based mainly on the extent and position of the dark markings on the face, lorae and genae, and on characters of the male genitalia.

- 1 Frons without dark spots (Figs 7, 23)..... 2
- Frons with distinct dark patches (e.g. Figs 3, 5). 3

- 2 Lorae and genae with a circular black spot (Figs 7, 8); tegmina usually powdered with whitish wax; periandrium with 2 long, caudad directed processes which exceed length of penis (Fig. 35) *bimaculatus*

- Lorae and genae without dark spots or dark coloration (Figs 23, 24); tegmina hyaline without obvious wax; periandrium without any processes, ring-like; penis branched shortly distad of its base into a short dorsal sperm-conducting tube and a long, slightly dorsal curved ventral process (Fig. 52) *(Opatissus) vietnamicus*

- 3 Frons with 2 pairs of dark markings (Fig. 17), one pair next to vertex, the other next to post-clypeal suture, the latter markings medially touching each other or almost fused (Fig. 17); periandrium with 2 unequal caudad directed processes, a long one right, a short one left of the penis (Fig. 50) *natalensis*

- Frons with only 1 pair of dark markings next to the vertex..... 4

- 4 Processes of periandrium very long, reaching to tip of penis forming an inverse S (Figs 41, 43, 44) *loufouensis*

- Processes of periandrium different..... 5

- 5 Periandrium with 3 caudad or ventrocaudad directed processes..... 6

- Periandrium with fewer than 3 caudad directed processes..... 7

- 6 Lorae light brown in colour (Figs 15, 16); penis without sub-apical tooth or spine (Fig. 45) *lybicus*

- Lorae dark brown (Figs 9, 10); penis with distinct sub-apical ventral tooth (Fig. 39)..... *chinsanensis*

- 7 Post-clypeus dark brown, darker than frons, pale only vertically on mid-line (Figs 3, 13)..... 8

- Post-clypeus light brown not distinctly darker than frons..... 9

- 8 Dark species, patches on frons circular, mesonotum laterally dark brown, dark stripe between lateral and median carina of dorsal disc (Fig. 3); penis not distinctly longer than anal tube, parameres apically rounded (Fig. 34)..... *alpinus*

- Coloration stramineous, spots on frons almost quadrangular, (Fig. 13); penis conspicuously longer than anal-tube (Fig. 42), parameres distally pointed..... *kamerunus*

- 9 Penis straight, short, not exceeding anal-tube; periandrium ventrally projected into an acute tip (Fig. 51)..... *tumidulus*

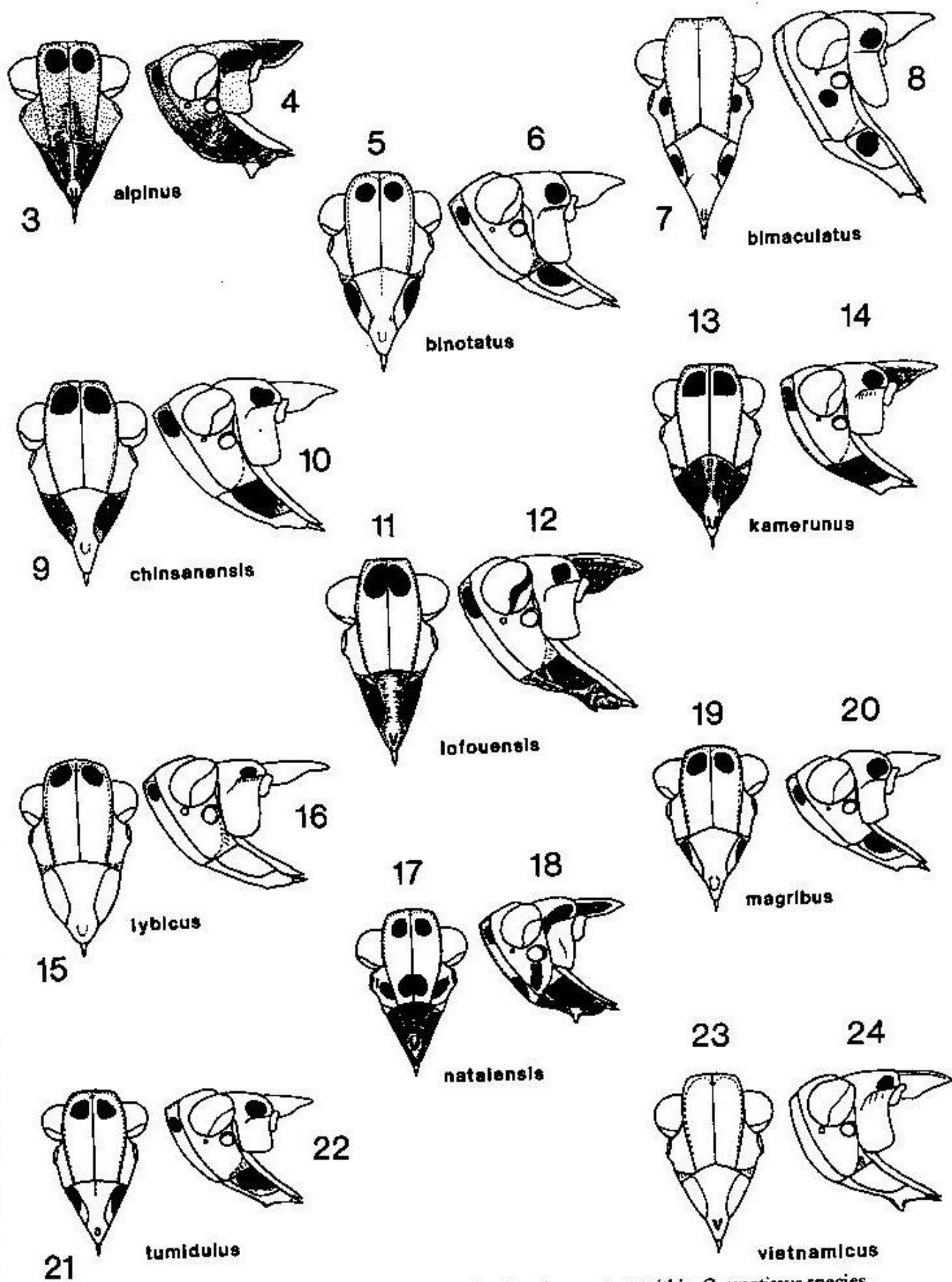
- Penis longer than anal tube, curved (Figs 36, 47) 10

- 10 Penis about 1.3 times longer than anal tube, slightly curved dorsad (Fig. 36)..... *binotatus*

- Penis about 4 times longer than anal tube, strongly curved dorsad (Fig. 47)..... *magribus*

Subgenus *Ommatissus (Ommatissus)*

Black spots present on the head, usually on frons, genae and lorae.



FIGS 3-24. Distribution of dark spots on head and pronotum within *Ommatissus* species.

Ommatissus alpinus Linnavuori

(Figs 3, 4, 34)

Ommatissus alpinus Linnavuori, 1973: 119

Darkest of all *Ommatissus* species; head and pronotum dirty yellowish-brown, mesonotum, abdominal sternites and tergites, and legs brown to blackish brown, tegmina and wings translucent sordid yellow, veins brown; carinae of mesonotum and tip of scutellum pale yellow; two black circular patches on upper frons. Postclypeus and lorae dark brown, anteclypeus with a cream-white median pointed callus; dark spots on sides of pronotum as in *O. binotatus*; in ♀ valvifer 8 entirely blackish brown, no separate dark spot visible in laterodorsal angle. Proportions. Vertex with ratio of basal width to median length 1.75–2: 1. Frons with lateral margins distinctly converging to postclypeal suture, with ratio of median length to width at level of eyes 1.7:1.0. Hind leg spines as in *O. tumidulus*.

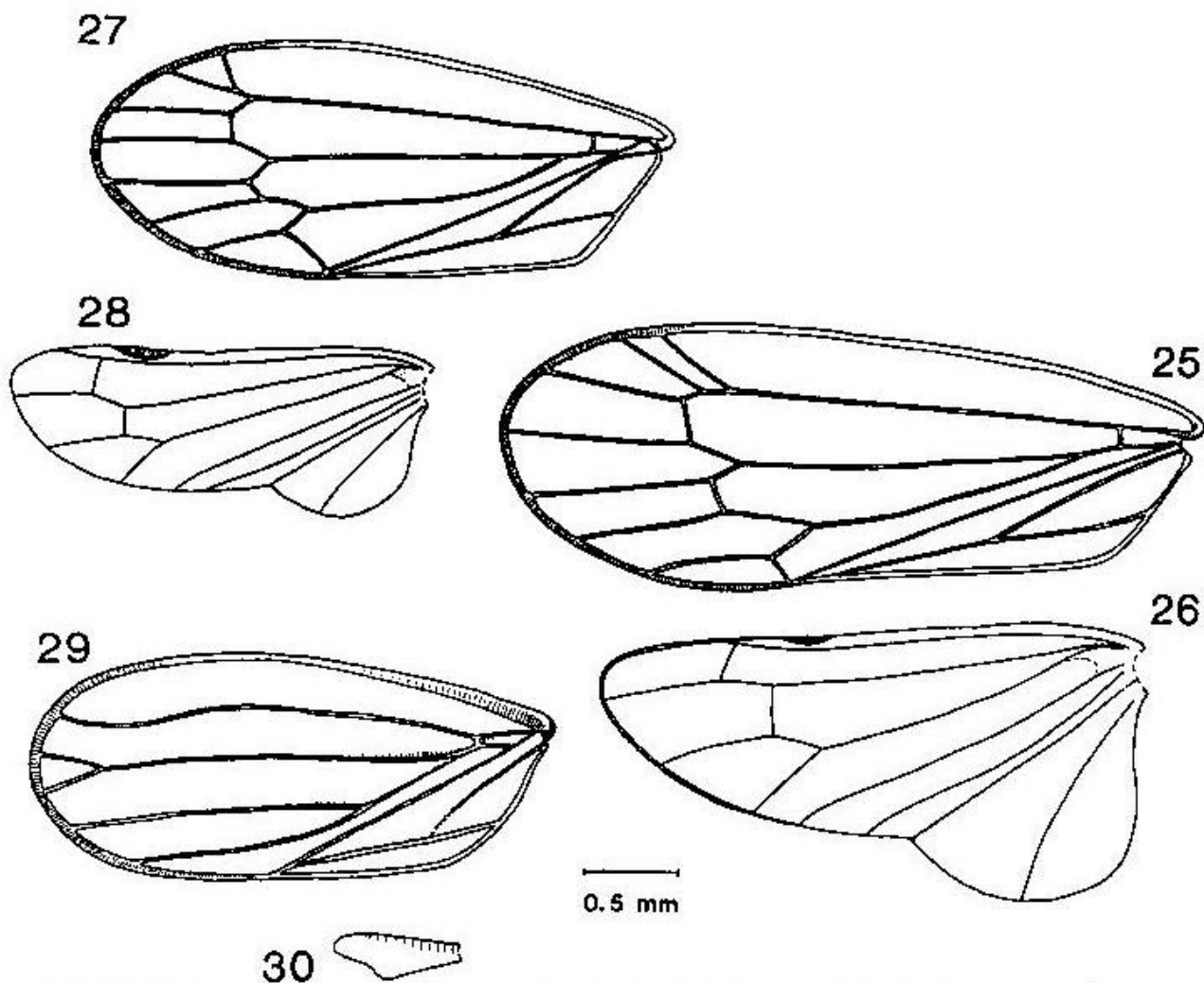
♂ *genitalia* (Fig. 34). Anal segment, parameres and aedeagus shown in lateral view (Fig. 34). Parameres in lateral view about 2 times as long as broad; tubular penis slightly curved dorsad, phallosoma subapical ventrally exposed, periandrium ventrodistally expanded with irregular truncated caudal margin; connective rather long, medially bent cephalad.

♀ *genitalia*. First valvula with dorsal margin with 27–30 teeth (composed of 5 rows), ventral margin with 10–12 irregular teeth, laterally at base with two converging oblique rows with 9–11 teeth in all forming a caudad pointing triangle; second valvula with mediocephalad directed process distinctly shorter than the caudal part.

Measurements. Total body length: macropterous, ♂ 4.1 mm, ♀ 4.5–4.6 mm.

Host plant. Unknown.

Material examined. Paratypes, 2♂ 2♀, SUDAN: Equatoria, Imatong Mountains, near Gilo, alpine zone, 18–24. iii.1963 (Linnavuori) (RL).



FIGS 25–30. *Ommatissus* spp. Tegmina and wings; 25–28, *O. loufouensis* Muir; 25–26, macropterous form; 27–28, brachypterous form; 29–30, *O. bimaculatus* Muir, brachypterous form, male.

Distribution Sudan (Equatoria Province).

Remarks. *O. alpinus* belongs to a group of species in which the male genitalia exhibit a distinctly cephalad curved connective and a long penis with a syringe-like tip. This species-group contains the two new species *O. magribus* and *O. kamerunus* and possibly *O. natalensis*.

***Ommatissus bimaculatus* Muir**
(Figs 7, 8, 35)

Ommatissus bimaculatus Muir, 1931: 310.

Considerably lighter in colour and with a broader body than the other species; pale yellow to stramineous, frons without dark patches; upper portion of lorae with a circular blackish spot; genae anterior of antennal base with a circular or almost quadrangular blackish marking; lateral patches on pronotum rather expanded, circular; in ♀ abdominal tergites yellow with brown longitudinal stripes laterally and medially, abdominal sternites laterally darker light yellow at middle, dorsocaudal edge of valvifer 8 distinctly more darkly marked; in ♂ abdominal tergites and sternites dark brown with indistinct yellow-brown patches; ♂ genitalia yellow except for dirty brown parameres; ♀ with tip of third valvula darkened; tegmina translucent, but usually powdered with whitish wax, veins dark brown or almost black, wings hyaline, veins stramineous.

Proportions. Vertex with ratio of basal width to median length 1.8–1.95:1. Frons with ratio of median length to width at level of eyes 1.6:1, median carina of frons continuing to upper portion of postclypeus; anteclypeus with a distinct knob-like callus.

Hind leg spines as in *O. loufouensis*; in brachypterous form fork of *Cu* distinctly basad of apex of clavus, crossveins indistinct, hindwings almost flap-like and reduced (Figs 29, 30).

♂ *genitalia* (Fig. 35). Anal segment, aedeagus and parameres shown in lateral view (Fig. 35). Parameres in lateral view relatively broad (1.3:1). Penis flanked by a pair of broad, laterally flattened periandrium processes which exceed the tip of penis by about a third of their length. Connective straight.

♀ *genitalia.* First valvula with dorsal margin 22–25 teeth (in 5 rows), ventral margin with 11–15 irregularly placed teeth, oblique row at base with 10–15 teeth. Second valvula with

mediocephalad directed process as long as caudal part.

Measurements. Total body length: brachypterous, ♂/♀ 3.8–4.3 mm.

Host plant. Unknown.

Material examined. Holotype, ♀, India: northern India, Moradabad (BMNH). PAKISTAN: 4♂ 4♀, Punjab, Murree Hills, 13 km W. Sunnybank, 30.viii. 1985 (C. W. & L. B. O'Brien) (BMNH, MA).

Distribution. Northern India and Pakistan.

Remarks. *O. bimaculatus* is easily recognizable by its unique arrangement of black spots on the head (on genae and lorae but not on frons). At present *O. bimaculatus* appears to be isolated within the genus, as does *O. loufouensis*, since similarities with other species in certain structures of the ♂ and ♀ genitalia are either symplesiomorphic or more likely convergently evolved (for instance the elongate processes of the periandrium).

***Ommatissus binotatus* Fieber**
(Figs 5, 6, 36–38)

Ommatissus binotatus Fieber, 1872: 3 (nomen nudum).

Ommatissus binotatus Puton, 1875: 112 (nomen nudum).

Ommatissus binotatus Fieber, 1876: 174.

Coloration of head, thorax and legs pale yellow to stramineous, abdominal sternites and tergites brown, genital segment and anal tube of ♂ yellowish brown, genital styles dark brown, ovipositor of ♀ brown; tegmina translucent, stramineous, veins yellowish to pale brown, wings hyaline, with veins brownish; Head with two separated circular black spots on upper frons (Fig. 5) a dark circular spot on each side of pronotum (Fig. 6), lorae with a diffusely margined brown patch; in ♀ in addition to the black spot on the dorsocaudal edge of valvifer 8 a dark brown marking caudolaterally on tergite 7; in ♂ a brown spot medially on abdominal tergite 8.

Proportions. Vertex with ratio of basal width to median length 1.66–1.9:1. Frons with ratio of median length to width at level of eyes 1.3:1.

Spines of hindlegs: post-tibia laterally 2, distally 7 (2+3+2), basitarsus distally 7–8.

♂ *genitalia* (Figs 36–38). Anal segment, aedeagus and parameres in lateral view as shown in Figs 36–38. Apicodorsal margin of

aedeagus projected into a short point. Tip of the ventral bow of perianthium acutely projected. Some intraspecific variation has been found in the tip of the penis and in the shape of the ventral part of the perianthium.

♀ genitalia. Mediocaudal margin of sternite 7 straight or only slightly projected caudad; from the callus-like projected centre of the membranous intersegmental fold caudad of sternite 7 leads a well-developed, distally stronger chitinized irregularly curved tube internally to the ductus bursae; first valvulae as generic description, 15–17 teeth (in 5 rows) on dorsal, 5–7 teeth on ventral margin, oblique row at base with 5–7 teeth, 1 tooth laterally before caudal tip; basal part of the membranous inner branch of the first valvula acutely projected cephalad; second valvula mediocephalad projected process 1.2 times length of the triangular caudal part.

Measurements. Total body length (incl. tegmina): brachypterous, ♂ 3.1–3.7 mm, ♀ 3.6–4.7 mm; macropterous, ♂ 3.9–4.1, ♀ 4.8 mm.

Host plant. All specimens examined were collected from the palm *Chamaerops humilis*.

Material examined. SPAIN: 1 ♂, nr Valencia, Coll de Rates, 500 m, 4. vi. 1979 (*Asche & Hoch*) (MA); 12 ♂ 5 ♀, Prov. Cadiz, Espera, 11. viii. 1976 (*Asche*) (MA); ITALY: 5 ♂ 2 ♀, Sicily, supra Trapani, Monte Erice, 27. viii. 1979, (*Asche & Hoch*) (MA). ALGERIA: 1 ♂ labelled, 'Algerie, collection de Bergevin' (BMNH).

The holotype (supposedly in the Naturhistorisches Museum, Vienna) has not been re-examined since specimens from southern Spain which are undoubtedly this species were available.

Distribution. Iberian Peninsula (southern Spain and Portugal) and from southern Italy (Sicily). We have seen only one specimen from Algeria (but without full data) and cannot confirm the old record of Chicote (1880). All other records concern other *Ommatissus* species (see below), e.g. from Morocco (*Bergevin*, 1916, *Lepesme*, 1947), from Greece (listed in *Nast*, 1972) but based on a misrepresented record from 'Sarepta' by Chicote (1882) which is actually in southern Russia), from Russia (*Oshanin*, 1908, probably only citing the Chicote record, and 1912), from Manchuria and India (*Kato*, 1933) and from Korea (*Kwon & Lee*, 1979). The species also does not occur in Iraq as

recorded by *Linnavuori* (1973) who presumably intended the record to refer to *O. lybicus*.

Remarks. Externally the species is similar to *O. magribus* but the spots on frons are rounder in *O. binotatus*. The male genitalia are distinctive with the penis only slightly longer than the anal tube in *O. binotatus* while in *O. magribus* it is about 4 times longer than anal tube and strongly curved (Fig. 47).

Ommatissus chinsanensis Muir

(Figs 9, 10, 31, 32, 39, 40)

Ommatissus chinsanensis Muir, 1913: 267

In most characters this species is very similar to *O. lybicus*, but it is distinctly darker in coloration, stramineous to brownish; ♀ a little lighter than ♂, two large dark spots on upper frons, patches considerably more expanded than in *O. lybicus* covering about the upper quarter of frons (Fig. 9); lorae dark brown, lateral markings on pronotum circularly, black abdominal sternites and tergites in both sexes dark brown, in ♀ a distinct black spot on the caudodorsal edge of valvifer 8, while tergite 7 only caudally with a darker margin; genitalia yellowish brown, only the genital styles of ♂ blackish brown; tegmina and wings translucent, veins yellow in ♀ and sordid yellow in ♂.

Proportions of vertex and frons as in *O. lybicus*. Median knob-like callus of anteclypeus weakly developed.

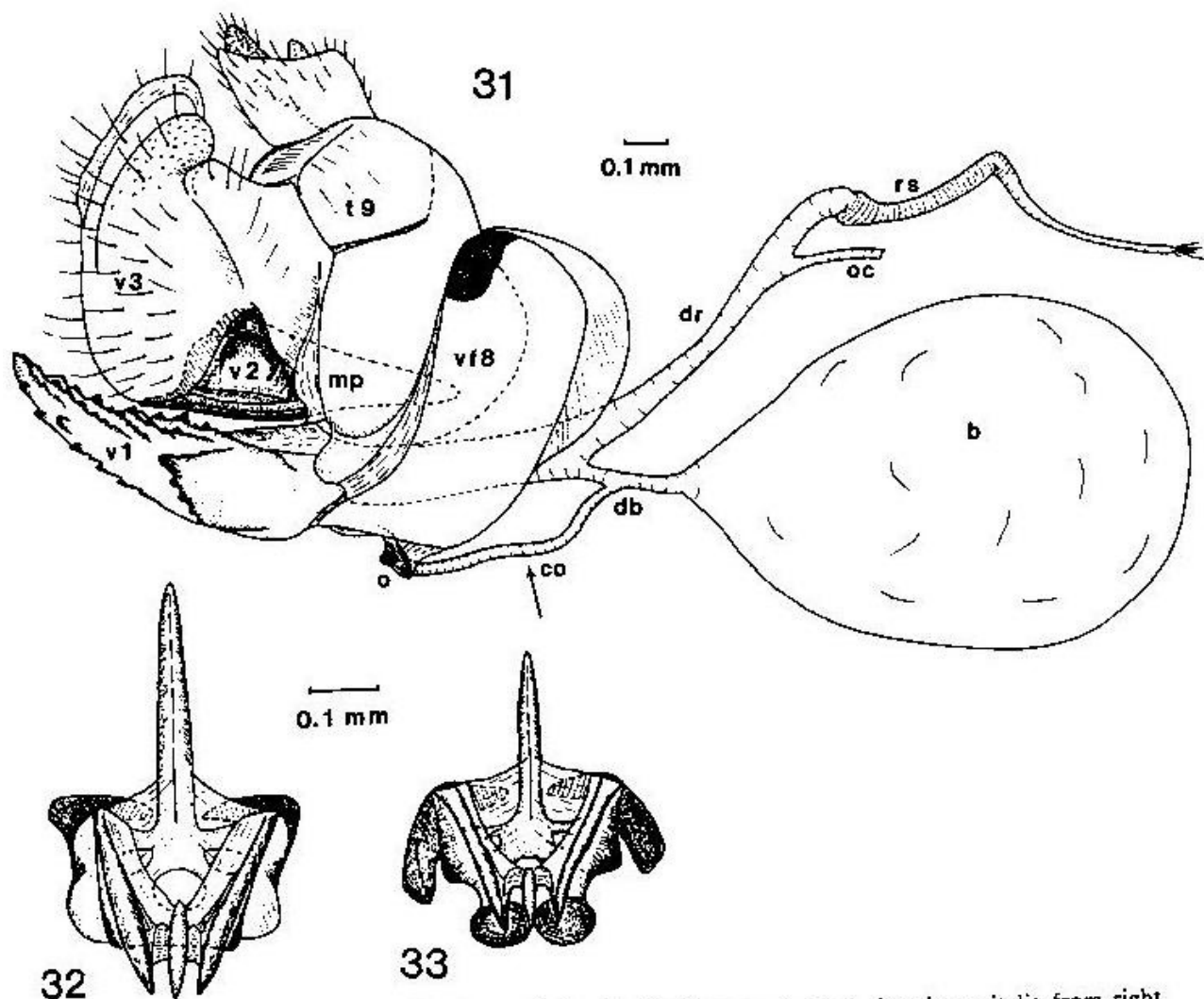
♂ genitalia (Figs 39, 40). Anal segment, parameres and aedeagus shown in lateral view (Figs 39, 40). Aedeagus subapically on the ventral side with a distinct short spine; perianthium similar to that found in *O. lybicus* but unpaired ventral process considerably longer and bent caudad from its base, lateral paired processes distally pointed.

♀ genitalia (Figs 31, 32). First valvifer with dorsal margin with about 32 teeth (5 rows), ventral margin with about 8 teeth, at base two oblique rows distally triangularly converging bearing 6 teeth; second valvula with median cephalad directed process about 1.37 times longer than the caudal part.

Measurements. Total body length: macropterous; ♂ 4.3–4.4 mm, ♀ 4.5 mm.

Host plant. Unknown.

Material examined. Holotype, ♂, CHINA:



FIGS 31-33. *Ommatissus* spp., female genitalia; 31, *O. chinsanensis* Muir, female genitalia from right lateral view; co: copulation-tube (arrow); v1: first valvula; v2: second valvula; v3: third valvula; mp: mediocephalic process of second valvula; t9: ninth tergite; vf 8: valvifer 8; o: orifice for injecting the penis, entirely separated from the opening for oviposition; b: bursa copulatrix; rs: receptaculum seminis; db: ductus bursae; dr: ductus receptaculi; oc: oviductus communis; 32, *O. chinsanensis*, valvula, dorsal view; 33; *O. (Opatissus) vietnamicus* sp.n., valvula dorsal view.

Macao (Muir) (BPBM, No. 5416) Allotype ♀ (Macao, China, 26.viii.06) (BPBM, No. 5416A). HONGKONG: 2 ♂, N. T. Taipokau, Kowloon, malaise trap, 5.vi.1965 (L. K. & H. W. Ming); forestry station, light trap, 15-17.vii.1964 (L. K. & H. W. Ming) (BPBM).

Distribution. Southern China (Macao), Hong Kong.

Remarks. *O. chinsanensis* is very closely related to *O. lybicus*, possibly replacing it geographically in the Far East. It differs from *O. lybicus* by the possession of the distinct sub-apical ventral tooth of the penis. An association with a species of palm might be expected.

***Ommatissus kamerunus* sp.n.**
(Figs 13, 14, 42)

Adult resembles *O. binotatus* in coloration but black patches on frons (Fig. 13) are more expanded, covering about a quarter of the frons, with a straight transverse margin to the postclypeus; lorae and postclypeus blackish brown except for a yellow median longitudinal stripe; anteclypeus stramineous, knob-like callus weakly developed; lateral spots of pronotum circular, black; sides of mesonotum dark brown disc stramineous with longitudinal brown stripes between the carinae, legs stramineous,

undersides of middle and hind-femora diffusely dirty brown.

Proportions. Vertex with ratio of basal width to median length 2–2.2:1, anteriorly only slightly convex. Frons with ratio of median length to width at level of eyes 1.5–1.6:1.

Hind leg spines, as in *O. binotatus* some individual slight variation.

♂ *genitalia* (Fig. 42). Anal segment, parameres and aedeagus shown in lateral view in Fig. 42. In general configuration similar to that in *O. magribus*. Aedeagus-complex with tubular penis very long and slender, distally projected into a long, flexible flagellum-like tip. Connective very long and distinctly curved cephalad, in repose the base of penis and connective stored in a compressed membranous bag which reaches cephalad to the fifth abdominal segment (similar to that found in some Delphacidae, e.g. *Kelisia guttula* (Germar)).

♀ *genitalia*. First valvulae dorsal margin with 15–25 teeth (compounded from 5 irregular rows); ventral margin with 8–10 teeth, laterally at base oblique row with 6–7 teeth, second valvula with mediocephalic process shorter than caudal part, membranous.

Measurements. Total body length: brachypterous, ♀ 3.6–3.7 mm; macropterous, ♂ 3.7–4.1 mm.

Host plant. Unknown.

Type material. Holotype, ♂, CAMEROON: 30 km N. Banyo, 22.i.1981 (*Nentwig*) (BMNH).

Paratypes: 4♂ 2♀, same data as holotype (BMNH, BPBM, MA).

Distribution. Cameroon.

Remarks. With the elongation of the penis and the cephalad shifting of its base into the abdomen *O. kamerunus* forms the end of a morphological series starting with *O. alpinus* and *O. magribus*. This trend could indicate closer relationships of these species. The trend of elongating the sperm-conducting part of the aedeagus-complex primarily probably had its origin in taxa that were organized as in *O. tumidulus* or *O. binotatus*. It should be mentioned that the length of the penis seems to find a counterpart in the length of the injection-tube in the ♀ *genitalia*. *O. natalensis* shows certain similarities with the taxa mentioned above but

differs in patterns of dark spots and the periandrium.

Ommatissus lofouensis Muir

(Figs 11, 12, 41, 43–44)

Ommatissus lofouensis Muir, 1913: 267

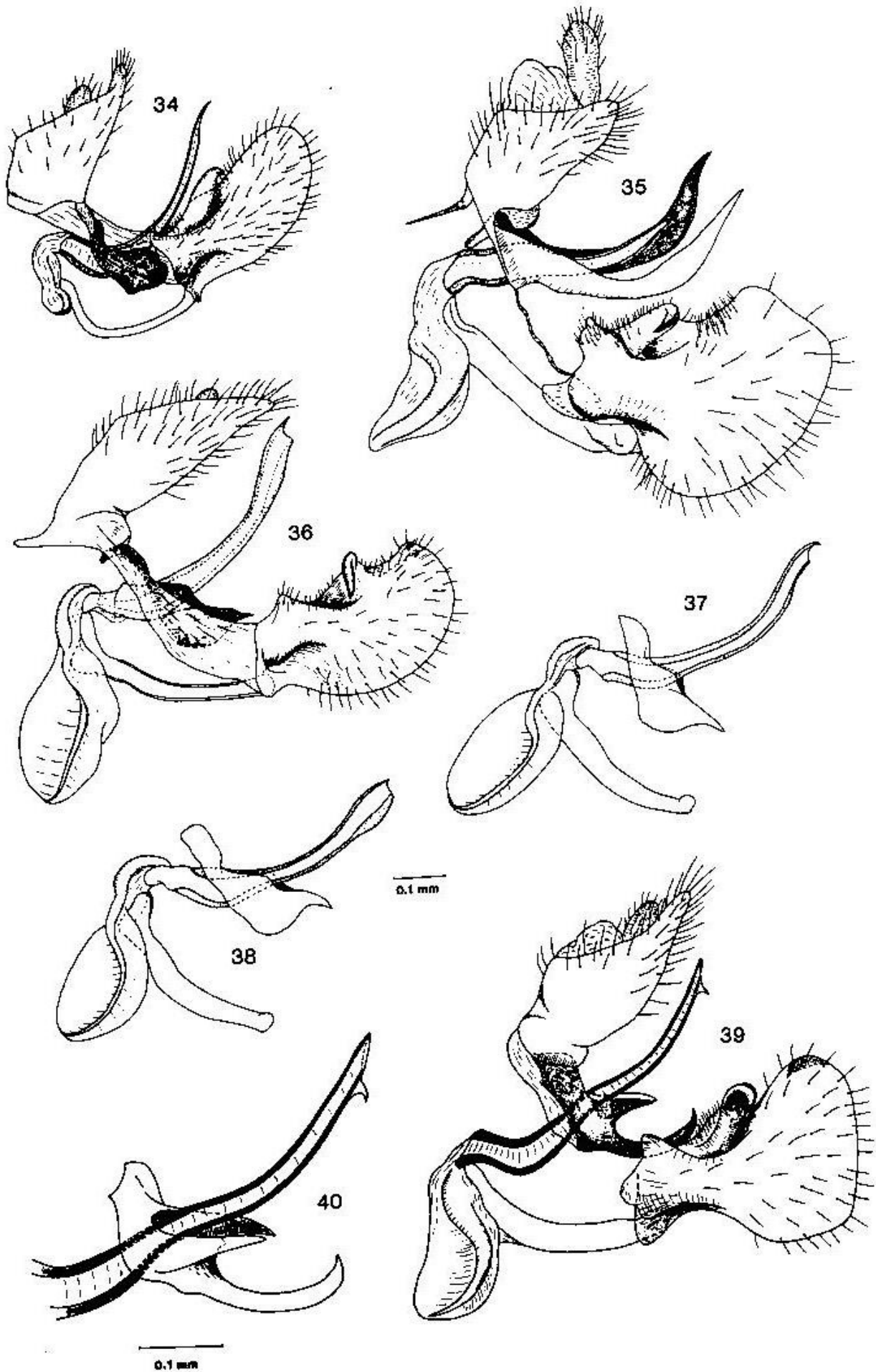
In coloration, this species resembles *O. chinsanensis* although it is slightly darker; yellow earth or brownish, disc and lateral parts of mesonotum brown, abdominal tergites and sternites dark brown with yellow caudal margin, dark spots on frons vertically ellipsoid in shape (Fig. 11), lorae brown, postclypeus indistinctly brown, only in middle line slightly yellowish; lateral spots on pronotum circular, dark brown; eyes with brown longitudinal stripe (Fig. 12); in ♀ laterodorsal parts of eighth valvifer black, caudal margin of seventh tergite with a darker fringe; *genitalia* in both ♂ and ♀ yellowish brown, in ♂ genital styles dark brown.

Proportions. Vertex with ratio of basal width to median length 1.68–1.73:1. Frons slender, lateral carinae from eye level basad to postclypeal suture almost straight, ratio of median length to width at level of eyes 1.55:1, post-clypeus rounded, median carina of frons continuing in upper part of postclypeus, then vanishing, median knob-like callus pointed, distinctly pronounced.

Hind leg spines. Post-tibia with 2 lateral spines, distally 7, basitarsus with 8 distal spines.

♂ *genitalia* (Figs 41, 43, 44). Anal segment, aedeagus and parameres shown in lateral view (Figs 41, 43, 44). Parameres distinctly longer than broad. This feature appears highly variable (from 1.6–2.25:1) even in the same population. Distally parameres rounded or pointed. Aedeagus complex with long S-shaped processes from periandrium, apically lanceolate (Figs 41, 43, 44). The shape of these lanceolate processes varies considerably, even within the same population.

♀ *genitalia*. First valvulae; dorsal margin with about 20 teeth in 5 compound rows, ventral margin with 8–9 teeth, laterally at base about 7 teeth in an oblique row; second valvula similar to that of *O. binotatus*: mediocephaled projected



process about 1.3 times as long as caudal triangular part.

Measurements. Total body length: brachypterous, ♂ 3.9–4.2 mm, ♀ 4.4–4.2 mm; macroppterous, ♂ 4.5–5.1 mm, ♀ 4.9–5.1 mm.

Host plant. Unknown, but Muir (1913) states that the species was collected 'on grasses'.

Material examined. Holotype. ♂, CHINA: Lo fou Shan, 3500 ft, *F. M[uir]*, 1906 (BPBM, No. 5417). Allotype ♀ same date as holotype pinned by minute pin on the same piece of cork (BPBM, No. 5417A), paratypes 9♂, 5♀ same data as holotype (BPBM); 1♂, Heilongjiang, ix.1980 (*Hammond*) (BMNH). Many other specimens from various localities (BPBM). JAPAN: 1♂, 1♀, Chiba-ken, Abiko, vii.1926 (*Matsumura*); 1♂, 2♀, 10.viii.1903, Gifu (data in Japanese) (*Matsumura*); 1♂, 2♀, 10.viii.1903, Gifu (data in Japanese) (*Matsumura*) (EIHU). Korea: 2♂, 2♀, Daegu City, 6.ix.1981 (*Kwon*) (BMNH).

Distribution. Far East: southern China, Japan and Korea. The published records of *O. binotatus* for Japan (*Matsumura*, 1931; *Watanabe*, 1937) from Manchuria (*Kato*, 1933) and from Korea (*Kwon & Lee*, 1979) are more likely to concern *O. lofouensis*.

Remarks. The ♂ aedeagus complex of *O. lofouensis* is the most distinctive of all the *Ommatissus* species, with the long apically lanceolate processes of the periandrium. The species appears to be isolated within the genus, but it shares all of the characters of generic importance with the type-species *O. binotatus*.

Ommatissus lybicus Bergevin stat.n.

The Dubas bug

(Figs 1, 2, 15, 16, 45, 46)

Ommatissus binotatus var. *lybicus* Bergevin, 1930: 20.

Commonly known as the 'Dubas bug' and one of the most serious date palm pests in the Middle East.

Lighter in coloration than *O. binotatus*, pale yellowish or yellow earth (yellowish green (in life?) according to *Hussain*, 1963); tegmina and

wings at least translucent or hyaline, veins stramineous, two blackish patches in upper frons, not circular as in *O. binotatus* but almost quadrilateral, almost touching the lateral carinae; lateral dark spot on pronotum circular, considerably smaller than in *O. binotatus*; lorae in both sexes yellowish or stramineous without dark marking; in ♀ laterally on tergite 7 and on the caudodorsal edge of valvifer 8 a distinctly blackish marking; genitalia pale yellow, ♂ genital styles brown.

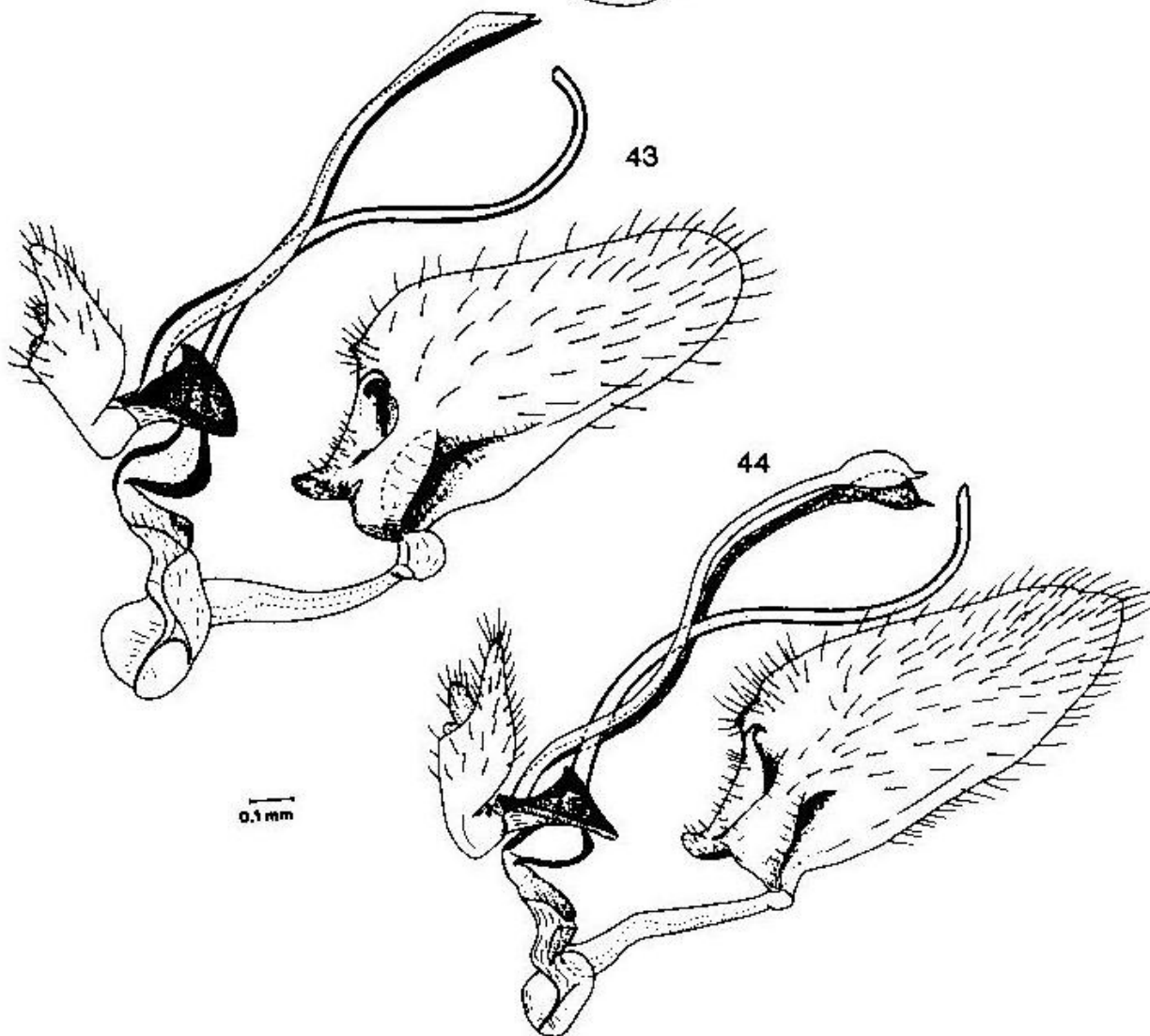
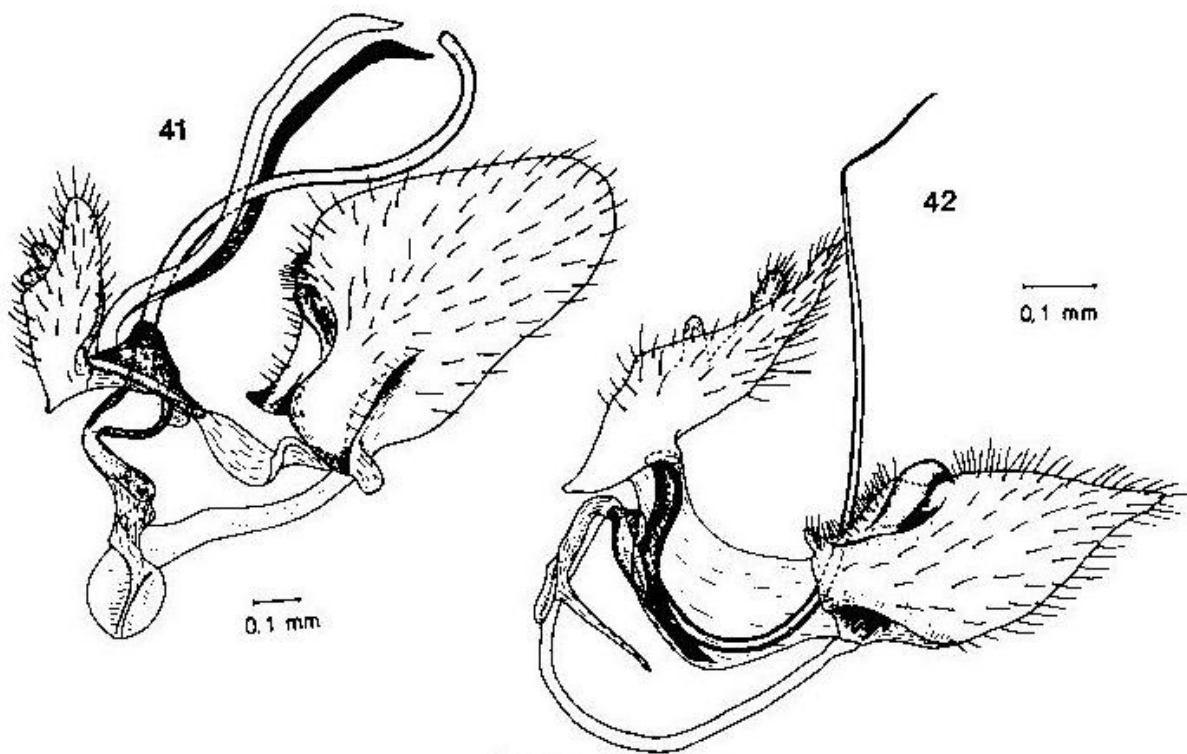
Proportions. Vertex slightly longer than in *O. binotatus*, with ratio of basal width to median length 1.38–1.6:1. Frons with ratio of median length to width at level of eyes about 1.4:1.

Postclypeus broadly rounded; median knob-like callus of anteclypeus weakly developed, in some specimens almost absent.

Hind leg spines; post-tibia usually with 2 (sometimes 3) lateral spines; distally 5–7 in concave row, basitarsus distally with 5–7 spines. Other external characters as in generic description.

♂ **genitalia** (Figs 45–46). Anal segment, parameres and aedeagus shown in lateral view (Figs 45, 46). Penis long, slender, slightly arched dorsad, distally narrowing to a truncated apical phallosoma, periandrium with paired finger-like processes laterad of the base of penis slightly directed ventrad, one unpaired process originating on the ventral side, first directed ventrad, then abruptly hook-like recurrent caudad. Some intraspecific variation was found in the degree of bending of the penis and in the shape of the 3 processes of the periandrium (Figs 45, 46).

♀ **genitalia.** A small swelling in the centre of the membrane intersegmental fold caudad of seventh sternite with a semi-circular, movable chitinized plate-like structure cephalad of this swelling. Beneath this structure a small orifice leading into a separated, entirely membrane tube connected with the ductus bursae; first valvulae as in *O. binotatus* dorsal margin combined with 5 dentated rows (15–20 teeth); ventral margin with an irregular row of 8–10 teeth; oblique row at base with about 5 teeth; second valvula with mediocephalad directed process about 1.5 times longer than the caudal triangular part.



Measurements. Total body-length (incl. tegmina): brachypterous, ♂ 3.0–3.5 mm, ♀, 3.7–4.3 mm; macropterous, ♂ 3.4–4.0 mm, ♀ 4.5–6.0 mm.

Host plant. Appears confined to the date palm *Phoenix dactylifera*.

Material examined. ♂ and ♀ have been examined from IRAN (Bandar Abbas), IRAQ (Basrah), ISRAEL (Ketura), OMAN (Rostaq), SAUDI ARABIA (Al Hair) (all BMNH). Type material from the Siwa Oasis area of Egypt (supposed to be in the Museum National d'Histoire Naturelle, Paris) was not examined as so many specimens from the Middle East were already available.

Distribution. Widespread in the Middle East. This species is found in Egypt (Bergevin, 1930; Alfieri, 1934) and Iraq (Hussain, 1963; Ramchandra Rao, 1922; Dowson, 1936; Linnavuori, 1973). These three latter authors reported the species as *O. binotatus*. It has been recently recorded in Qatar (Al-Azawi, 1986). El Hadari (1982) reported *O. binotatus lybicus* from Sudan but this record might concern either of the *Ommatissus* species described by Linnavuori (1973) of which *O. tumidulus* was collected on *Phoenix* sp. Klein & Venezian (1985) have recently reported *O. lybicus* from Israel.

As the species is associated with the occurrence of date palm a wider range of distribution in northern Africa, the Near and Middle East might be expected. The record of *O. lybicus* from Turkey (Dowson, 1936, as *O. binotatus*) has not been confirmed, neither have the old records of *O. binotatus* from southern Russia (Oshanin, 1908, 1912).

Remarks. *O. lybicus* resembles *O. chinsanensis* but the penis lacks the sub-apical process present in *O. chinanensis* (see also remarks for that species).

Biology. Described by various authors (Alfieri, 1934, Hussain, 1963; Klein & Venezian, 1985). Eggs are laid in the upper or lower surface of the midrib of leaf pinnae, as well as in the fruit stalk. Hussain (1963) also found them in the upper and lower leaf surfaces. Nymphs feed at the midrib, leaf surface, fruit stalk and from the fruit. Severe infestation causes considerable debilitation. Two generations occur (Alfieri, 1933, reported only one in Egypt) with the second generation laying eggs that overwinter and hatch in the following spring.

Ommatissus magribus sp.n.

(Figs 19, 20, 47–49)

Ommatissus binotatus; Bergevin, 1916: 315 nec Fieber, 1876.

Ommatissus binotatus; Chicote 1880: 4 nec Fieber, 1876.

Coloration resembles *O. binotatus* Fieber, but is a little darker and with the dark patches on frons and lateral parts of pronotum more intense.

Proportions. Vertex with ratio of basal width to median length 1.7–1.85:1. Frons relatively broad with ratio of median length to width at level of eyes 1.25–1.3:1. Middle carina of frons indistinctly continuing on upper half of postclypeus; postclypeus and frons almost linear in side view; anteclypeus rounded, median knob-like callus very weak or missing.

Hind leg spines; as in *O. binotatus* and slightly variable.

♂ **genitalia** (Figs 47–49). Anal segment, parameres and aedeagus as shown in Figs 47–49. Parameres in lateral view 1.8 times as long as broad, tubular penis rather long, periandrium dorsally with strongly chitinized Y-shaped arms connected with the lateroventral base of the anal tube, arms ventrally fused, ventral process forming a bow; connective elongate, semicircularly bent cephalad. In repose the base of the penis and connective are retracted inside of a membranous bag into the abdomen reaching cephalad to the seventh segment. Some variation has been found in the direction of the sharply-pointed tip of the penis and in the shape of the ventral process of the periandrium.

♀ **genitalia.** Caudal margin of seventh sternite slightly concave; first valvulae with dorsal margin with 15–17 teeth (composed from 5 irregular rows); ventral margin with 5–6 teeth; laterally at base with oblique row with 5–7 teeth, at tip a single tooth; second valvula; mediocephalic process about 1.7 times longer than the caudal part.

Measurements. Total body length: brachypterous, ♂ 3.2–3.6 mm, ♀ 3.7–4.5 mm; macropterous, ♂ 3.7–3.9, ♀ 4.7 mm

Host plant. *Chamaerops humilis* L.

Type material. Holotype, ♂, MOROCCO: NW, c. 10 km SE Tetuan, nr Beni-kariche, on *Chamaerops humilis*, 14.viii.1976 (Asche) (BMNH).

Paratypes, MOROCCO: 19♂, 17♀ same date as holotype (BMNH, BPBM, MA); 2♂

1♀, between Rifs-Mts. and Moyen Atlas, S. supra Taza, 20.viii.1976 (Asche) (MA); 1♀, S. Jbel Tazzaka, 1380 m, 22.viii.1976 (Asche) (MA); 1♂, Moyen Atlas, nr Azrou, Ouamana, 28.viii.1976 (Asche) (MA); 5♂ 4♀, Tanger (no date) (Matsumura) (EIHU).

Distribution. Northwest Africa; Morocco possibly more widely distributed at least in northern Africa in association with *Chamaerops humilis*. Records for *O. binotatus* from Morocco (Bergevin, 1916; Lepesme, 1947) certainly concern this species.

Remarks. *O. magribus* replaces *O. binotatus* entirely in northwest Africa. In spite of external similarities to *O. binotatus* it is more closely related to the Sudanese *O. alpinus* and to *O. kamerunus* by means of the elongate penis and strongly cephalad curved connective. It differs from both species by the proportion of the penis and by the configuration of the periandrium. It also differs from *O. alpinus* by its considerably lighter coloration and from *O. kamerunus* by its distally rounded (not pointed) styles.

***Ommatissus natalensis* sp.n.**
(Figs 17, 18, 50)

Differs from all other *Ommatissus* in the extent of the dark markings of the frons (Figs 17, 18): two circular spots in the upper part, two large spots adjacent to the postclypeal suture medially partly fused; lorae diffusely dark brownish; postclypeus brown with a lighter longitudinal stripe in middle; anteclypeus stramineus with a pale yellow median callus; genae in the angle between postclypeus and anterior margin of antenna base diffusely brown; lateral portion of pronotum with a blackish longitudinal patch which laterally continues on the mesonotum as a longitudinal stripe; disc of mesonotum earth yellow with a brown longitudinal stripe on each side of median carina; abdomen dark brown; tegmina and wings translucent, pale stramineous, veins brown.

Proportions. Vertex with ratio of basal width to median length 1.86:1. Frons with ratio of median length to width at level of eyes 1.7:1.

♂ **genitalia** (Fig. 50). Anal segment, parameres and aedeagus shown in lateral view (Fig. 50). Aedeagus-complex, penis tubular slightly curved dorsad, distally produced into a

long sharpened tip, orifice sub-apical ventral, periandrium broadly fused with the ventral base of the anal segment, with caudal margin asymmetrically produced into a short process on the left and a longer, spine-like process on the right side. Connective curved as in *O. alpinus*.

Measurements. Total body length: macrop-terous ♂ 3.9 mm.

Host plant. Unknown.

Type material. Holotype, ♂, SOUTH AFRICA: Natal, Royal Natal National Park, 11.xi.1970 (J. J. H. & M. Sedlacek) (BPBM).

Distribution. South Africa: Natal.

Remarks. In the shape of the ♂ genitalia *O. natalensis* is similar to *O. alpinus*, but differs considerably by the two asymmetrical processes flanking the base of the penis. *O. natalensis* belongs in the group distributed only in Africa and Southwest Europe comprising *O. binotatus*, *O. tumidulus*, *O. alpinus*, *O. magribus* and *O. kamerunus*.

***Ommatissus tumidulus* Linnavuori**
(Figs 21, 22, 51)

Ommatissus tumidulus Linnavuori, 1973: 118

Coloration similar to *O. binotatus*, only the blackish marks on the frons are not circular but form a quarter circle.

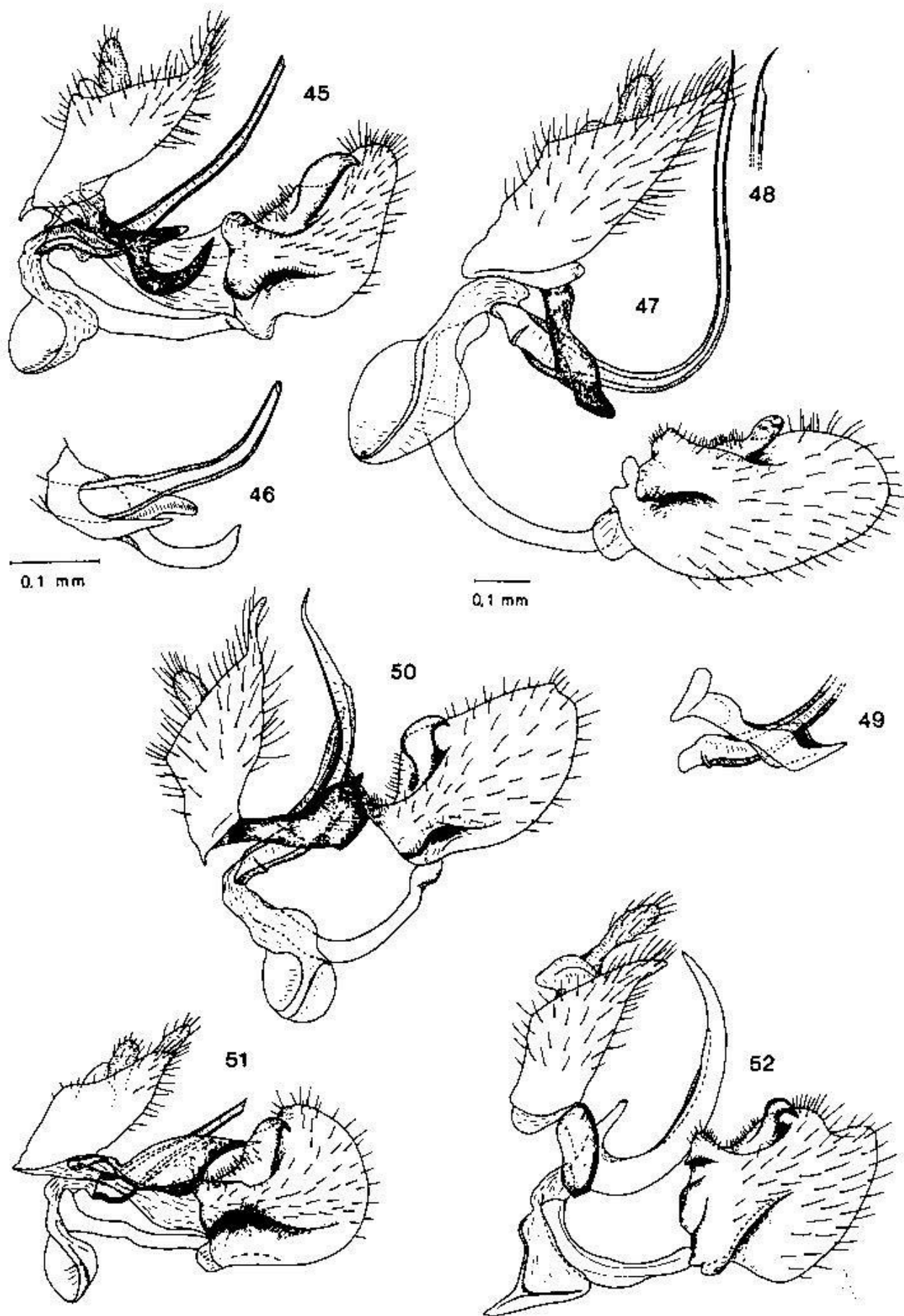
Proportions. Vertex with ratio of basal width to median length 1.65–1.85:1. Frons with ratio of median length to width at level of eyes 1.3:1.

Hind leg spines. Laterally 2, distally 7 or 8, basitarsus distally with 6–8 spines.

♂ **genitalia** (Fig. 51). Anal segment, parameres and aedeagus shown in lateral view (Fig. 51). Parameres as long as broad in lateral view. Tubular penis short, about same total length as styles, periandrium forming a large ventrolaterally pointed process that encloses more than the basal half of the penis. Connective nearly straight with small 'kink' in middle.

♀ **genitalia.** First valvula with dorsal margin composed of 17 teeth in 5 compounded rows, ventral margin with 6–7 teeth, oblique row laterally at base 4–5 teeth; second valvula shaped as in *O. binotatus*, mediocephalad directed process 1.4 times longer than the caudal part.

Measurements. Total body length: brachy-terous, ♂ 3.3 mm, ♀ 3.7–3.8 mm; macrop-terous, ♂/♀ 3.5–4.5 mm.



Host plant. *Phoenix* sp. Linnavuori (1973).

Material examined. SUDAN: 2♂ 2♀ (paratypes), Kassala, Prov. Erkovit, 4-5.vii.1962 (Linnavuori) (RL).

Distribution. Sudan.

Remarks. The simple tubular penis and the shape of the periandrium resemble those of *O. binotatus* as well as those of *O. magribus*. These species seem to be closer related to each other than to *O. lybicus* and *chinsanensis* or to *O. loufouensis*.

Ommatissus (Opatissus) new subgenus

Type-species *Ommatissus (Opatissus) vietnamicus* sp.n.

The new species from Vietnam described below undoubtedly belongs in *Ommatissus* as it shares the constitutive characters of the genus. On the other hand the detailed morphological organization of the ♂ and ♀ genitalia is different from all other *Ommatissus* species and a new subgenus is established for it.

Description. In body shape, size, proportions, carination of head, pro- and mesonotum, venation of wings and tegmina, hind leg spines as in *Ommatissus* s.str. Differs in absence of dark patches on the head in both sexes as well as in configuration of ♂ and ♀ genitalia.

♂ *genitalia.* Penis branches close to base into a dorsally exposed sperm-leading tube with apical orifice and a long ventral process; periandrium forming a simple ring surrounding the penis basad of the branch.

♀ *genitalia.* Ditrysic as *Ommatissus* s.str., middle of the intersegmental with fold caudad of seventh sternite distinctly cone-like projected ventrocaudad, bearing the orifice for receiving the penis during copulation. Second valvula at dorsocaudal margin dorsad of the triangularly narrowed tip with caudally exposed semi circular, ear-like lobes (Fig. 33).

Ommatissus (Opatissus) vietnamicus sp.n. (Figs 23, 24, 33, 52)

External features as described in genus and subgenus. Coloration stramineous, lateral spots on pronotum circular blackish (Fig. 24).

Proportions. Vertex with ratio of basal width to median length 1.6-1.7. Frons with ratio of median length to width at level of eyes 1.4:1. Postclypeus with a rounded median carina, knob-like callus of anteclypeus distinct.

♂ *genitalia* (Fig. 52). Anal segment, parameres and aedeagus shown in lateral view (Fig. 52). Ventral part of aedeagus curved dorsad, distally pointed, more than 3 times as long as dorsal part, ventral side rounded, strongly chitinized, dorsal side excavated, membranous; base of aedeagus continuing into a large membranous chamber which is ventrally broadly fused with a slightly cephalad-curved connective.

♀ *genitalia* (Fig. 33). As described above for subgenus. First valvulae dorsal margin with 8-12 teeth in a single irregular row, ventral margin with 7-9 teeth which differ in size and shape, laterally at base a set of 6-7 teeth forming a caudad pointed angle; second valvulae with mediocephalad directed process about twice as long as the terminal portion, from base to caudal end narrows triangularly and as in other *Ommatissus* ending in three short pointed tips, dorsodistally of these tips are two well-chitinized caudally exposed lobes, medially fused and concave and shell-like (Fig. 33).

Measurements. Total body length: brachypterous, ♂ 3.7-4.0 mm, ♀ 4.1-4.3 mm, macropterous, ♂ 4.3-4.4 mm, ♀ 4.3-4.9 mm.

Host plant. Unknown, but according to a label attached to a specimen, 'on grass near bamboo'. If so, the species could be similar in its food plant preferences to *O. loufouensis* as Muir (1913) indicated that this species also were collected 'on grasses'.

Type material. Holotype, ♂ (macropterous), VIETNAM: Mt Lang Bian, 1500-2000 m, 19.v-8.vi.1961 (Spencer) (BPBM).

Paratypes. 24♂ 18♀, same locality and date as holotype; 5♂ 5♀, 15 km NW of Dalat, 1850 m, 5.v.1960 (Quate); 1♀, 18 km NW of Dalat, 1300 m, 4-5.v.1960 (Quate); 2♂ 2♀, 5 km from Dalat, 1500 m, 29.iv-5.v.1960 (Quate); 1♂ 6♀, Dalat, 1500 m, 29.iv-4.v.1960 (Quate); 1♀, 6 km S. of Dalat, 1400-1500 m, 9.vi-7.viii.1961 (Spencer); 1♀, 9 km S of Dilinh (Djiring), 24.iv.1960 (Leech); 1♀, 31 km S of Dilinh (Djir-

FIGS 45-52. *Ommatissus* spp. male genitalia, anal tube, aedeagus and parameres from left lateral view; 45-46, *O. lybicus* Bergevin; 46, left dorsal view; 47-49, *O. magribus* sp.n.; 47, Morocco, Tangier; 48-49, Morocco, nr Beni-kariche, paratype; 48, tip of penis, 49, periandrium of the same specimen; 50, *O. natalensis* sp.n. holotype; 51, *O. tumidulus* Linnavuori, paratype; 52, *O. (Opatissus) vietnamicus* sp.n. paratype.

ing), 1050 m on grass near bamboo, 29.iv.1960 (Leech); 1♀, 39 km S of Djiring, 810 m, 29.iv.1960 (Quate) (BPBM, BMNH).

Distribution. Vietnam.

Remarks. No close relationships can be demonstrated at present between *O. (Opatissus) vietnamicus* and any of the other species-groups within *Ommatissus*.

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