

**RELATIONSHIPS OF THE GENERA OF CHINAMYERSIINAE,
WITH DESCRIPTION OF A RELICT SPECIES FROM
MOUNTAINS OF NORTH QUEENSLAND
(HEMIPTERA: HETEROPTERA: ARADIDAE)**

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Abstract. A geographically isolated species of the flightless genus *Kumaressa* is described from the summit of Mt Bellenden-Ker in North Queensland; its biogeographic implications are discussed and a key to species of the genus is presented. Additional taxonomic information is given on the New Caledonian genus *Gnostocoris* and a synoptic key to world genera is given.

When Usinger & Matsuda published their classic volume "The Classification of the Aradidae" in 1959, they erected a new subfamily, the Chinamyersiinae, to include 2 curious primitive genera from New Zealand. These 2 genera are markedly dissimilar in general appearance: *Tretocoris* Usinger & Matsuda is a monotypic genus based on a large, apterous, bizarre species with prominent lateral lobes on the thoracic segments, while *Chinamyersia* Usinger comprises 2 small, winged species with some dorsal abdominal spiracles. They are so dissimilar, in fact, that Usinger & Matsuda expressed some misgivings about their decision to lump them in one subfamily.

Since then, 2 additional genera from outside New Zealand have been described and attributed to the Chinamyersiinae as follows. *Kumaressa* was described from mountains of southeastern Australia by Monteith (1966) and was placed very close to *Tretocoris*; a more detailed review of its affinities with *Tretocoris* was given when a 2nd species of *Kumaressa* was described from the same region by Monteith (1969). Kormilev (1967a) described the 2nd new chinamyersiine genus, *Gnostocoris*, based on a single macropterous female from the northern New Hebrides; although no statement was made about the relationships of *Gnostocoris*, it was separated next to *Chinamyersia* in a key to genera given in the same paper. Additional material of the same species of *Gnostocoris* was reported from New Caledonia in passing by Kormilev (1970), but although males were included the vital information on male characteristics of the genus were not recorded. Lee & Pendergrast (1976) made an innovative, comparative study of the method of coiling of stylets in the Aradidae and related the different patterns they found to the subfamily classification of the family. They noted very different arrangements of stylets in *Tretocoris* and *Chinamyersia* and queried their inclusion together in one subfamily. However, they unfortunately overlooked the description of *Gnostocoris* and *Kumaressa* since publication of "Classification of the Aradidae" and, hence, information on the stylets of these 2 critical genera is lacking.

The recent discovery of a significant new species of *Kumaressa* on a mountain top

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in North Queensland, together with the collection of additional material of both sexes of *Gnostocoris* from New Caledonia, affords an opportunity to clarify some of these problems in the Chinamyersiinae.

All measurements are given in millimetres.

Subfamily CHINAMYERSIINAE Usinger & Matsuda, 1959

Genus **Kumaressa** Monteith, 1966

The 2 known species of *Kumaressa*, viz. *scutellata* Monteith, 1966 and *carraiensis* Monteith, 1969, are known from wet mountain rain forests of, respectively, the Lamington Plateau on the border between New South Wales and Queensland, and the Carrai Plateau behind Kempsey in northern New South Wales. This sort of distribution pattern in the temperate rain forests of the southern half of Australia is rather familiar for insects in Australia with New Zealand affinities. But the recognition below of an additional species from the Bellenden-Ker Range in North Queensland, 1500 km further north, adds a new dimension to our conception of the relictual nature and antiquity of *Kumaressa*. The differences between the 3 species now known are summarized in the following key.

KEY TO SPECIES OF *Kumaressa*

1. Lateral margins of scutellum continuous anteriorly on mesonotal disc; head with small postocular tubercles; parameres of ♂ with a subapical, backwardly directed hook **scutellata**
- Lateral margins of scutellum obsolete on mesonotal disc; head without postocular tubercles; parameres of ♂ without backwardly directed hook 2
2. Lateral lobes of pronotum broad and symmetrically rounded; anterior pronotal margin without an angulate lobe on each side of collar; apex of scutellum blunt, subtruncate; 1st antennal segment not thicker than clypeal width **storeyi, n. sp.**
- Lateral lobes of pronotum narrowed and slightly curved posteriorly; anterior pronotal margin with an angulate lobe on each side of collar; apex of scutellum pointed; 1st antennal segment thicker than clypeal width **carraiensis**

Kumaressa storeyi Monteith, new species

FIG. 1, 2, 3, 4

Holotype ♂. Length 8.50; maximum width 4.25 across segment IV of abdomen.

Body and antennae reddish brown; legs bicolored, fore and mid legs dark with pale basal and subapical rings on femora and pale subbasal and subapical rings on tibiae; hind legs pale with subbasal dark rings on femora and with basal and medial dark rings on tibiae.

Head a little longer than wide, length 1.52, width 1.44; clypeus short, bulbously inflated dorsally, reaching basal ⅓ of 1st antennal segment. Eyes small, exserted, subpedunculate; preocular and postocular tubercles absent. Posterior ½ of head with a narrow, longitudinal band of crowded granules; postocular head margin without posteriorly converging ridges. First antennal segment stout, slightly curved, 2nd and 3rd segments narrower, cylindrical, with petiolate bases, 4th segment fusiform; lengths of antennal segments (I–IV), 0.80, 0.72, 1.14, 0.60. Rostrum reaching to posterior ½ of metasternum; lengths of rostral segments (I–IV), 0.22, 1.06, 0.92, 0.74. *Thorax*. Pronotum about 3½× as wide as long (3.42, 1.00), its lateral lobes entire, broad, symmetrically rounded; pronotal disc with a double, median, longitudinal ridge which divides posteriorly into 2 weak ridges running laterad parallel to posterior pronotal border; hind margin of pronotum slightly curved, with a prominent median notch flanked by 2 blunt teeth. Pronotal collar rather indistinct; laterad of collar on each side pronotal margin forms a rounded lobe. Mesonotum as wide as pronotum with lateral lobes large, entire, slightly reflexed. Scutellum triangular with apex bluntly truncate, reaching hind border of 1st abdominal tergum, its margins thickened surrounding depressed

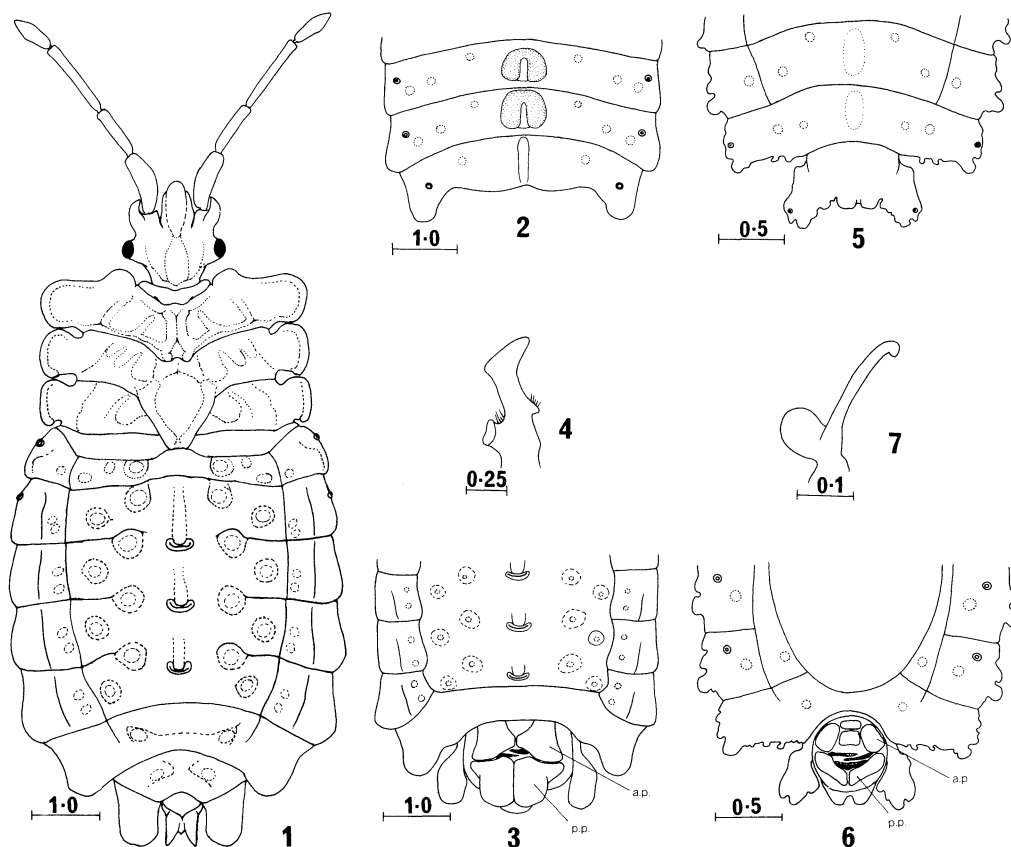


FIG. 1-7. 1-4. *Kumaressa storeyi*: 1, ♀, dorsal view; 2, ♂ holotype, ventral view of abdominal apex with seg. VIII removed; 3, dorsal view of abdomen; 4, paramere. 5-7. *Gnostocoris gressitti*: 5, ♂, ventral view of abdominal apex; 6, dorsal view of abdominal apex; 7, paramere. Scales in mm; a.p., anterior parandria; p.p., posterior parandria.

central area; lateral margins of scutellum obsolete on mesonotum. Metanotum with lateral lobes entire, smaller than those of pro- and mesonotum. All thoracic sterna sulcate longitudinally beneath rostrum. *Abdomen* (FIG. 2 & 3) quadrate, sides straight; tergum I narrow, its posterior border emarginate at middle. Connexival sutures virtually straight; connexiva III-VI with weak submarginal ridges; connexiva VII with prominent, posterior, rounded lobes. Scent gland scars marked by longitudinal ridges. Tergum VII broadly elevated above pygophore. Median lengths of sterna II-VII, respectively, 0.40, 0.64, 0.64, 0.72, 0.76, 0.76; sterna V and VI each with a median, smooth, bilobed callosity. Pygophore and parandria typical of the genus *Kumaressa*. Parameres as in FIG. 4.

Paratype ♀ (FIG. 1). As for ♂ except: ventral callosities on sterna V and VI absent; abdomen broader, margins of all connexiva convex; tergum VII elevated along midline only; paratergites of VIII slightly longer than wide; paratergites of IX long, apically acute. Measurements: total length, 10.00; maximum width, 5.08; head length, 1.64; head width, 1.60; pronotal length, 0.88; pronotal width, 4.17; antennal segments (I-IV), 0.88, 0.80, 1.20, 0.66; rostral segments (I-IV), 0.24, 1.10, 1.10, 0.76.

Holotype ♂, AUSTRALIA: North Queensland, Mt Bellenden-Ker, Centre Peak, 1561 m, R.I. Storey, taken in a formalin-filled pitfall trap exposed continuously be-

tween XI.1977 and I.1978 (in Queensland Museum, Brisbane, Reg. No. T.7791). Paratype, 1 ♀, same data as holotype (in Queensland Museum, Reg. No. T.7792).

It is a pleasure to dedicate the species to Mr Ross Storey, whose enterprise and enthusiasm brought it forth from its mountain fastness.

The single pair of specimens was taken in a semipermanent pitfall trap installed on the mountain. *Kumaressa* species are normally rather sedentary on very decayed wood on the ground; the presence of 2 specimens in a pitfall trap is surprising. *Kumaressa storeyi* is the smallest known species in the genus. The more reduced scutellum, the absence of both postocular and preocular tubercles, the less distinct pronotal collar, and the reduction of the anterior pronotal spines to blunt sinuations are all derived from the more generalized condition of these features as seen in the type-species, *K. scutellata*, and can be taken as indications of long isolation.

The biogeographic significance of Kumaressa on North Queensland mountains

The highest mountains in northern Australia lie near the coast in the wet tropical portion of Queensland north and south of Cairns. The mountain complex of which they form part consists of an extensive system of ranges and plateaus in the altitude range of 500–1000 m, of which the well-known Atherton Tableland is typical. Within this complex the elevational maxima are found in the Bellenden-Ker Range which forms a short, discontinuous rim on the eastern seaboard of the Atherton Tableland. This range is divided into 2 sections: the southerly, twin-peaked Mt Bartle-Frere, with summits at 1530 m (North) and 1622 m (South), and a northern ridge called Mt Bellenden-Ker with 3 summits (North Peak, 1451 m; Centre Peak, 1561 m; South Peak, 1221 m). Since the discovery there of Australia's only endemic *Rhododendron* species during the first ascents of the mountain in the 1880's, these high summits have been known to have a number of relict plant species unknown from the surrounding lower mountains (von Mueller 1887, Meston 1889, Brass 1953); some examples with the location of their nearest relatives are shown in FIG. 15. Tracey & Webb (1975), in mapping the vegetation of the Queensland wet tropics, have ascribed the upper portions of the Bellenden-Ker Range to the category of Simple Microphyll Vine-Fern Forest grading into thicket at the absolute summit. This wet, mossy forest environmentally resembles the wet temperate forests of Tasmania and New Zealand, and the high, montane forests of New Guinea. Although these mountain tops are extremely restricted in area today, Webb & Tracey (in press) list them as one of the major refugia of wet-adapted rain-forest plants during the past, climatically-induced regressions of rain forest in North Queensland postulated by Kershaw (1975) on the evidence of lacustrine pollen strata from the Atherton Tableland.

Although the insect fauna of the surrounding plateaus is fairly well known, there has been little collecting on the high summits because of difficulty of access and inhospitable weather. The first serious collecting was by the indomitable P. J. Darlington, who collected his carabid beetles intensively on both Bartle-Frere and Bellenden-Ker in the summer of 1957–58 (Darlington 1960) and subsequently described

a remarkable fauna of flightless species completely restricted to altitudes above 1000 m (Darlington 1961a, b, c). Installation of a television transmitter serviced by a cable car on the summit of Bellenden-Ker has now made this mountain more accessible; one of the first discoveries was of a new species of Peloridiidae (Hemiptera) (Evans 1972), the classic example of a cool temperate, "antarctic" relict, insect group, which was previously known only as far north as the Lamington Plateau. This 1500 km gap between the Lamington Plateau and Bellenden-Ker is the same gap we now know to be bridged by the genus *Kumaressa*, and an identical situation is seen in the flightless, stag-beetle genus *Lissapterus* of which an undescribed species was taken in the same pitfall traps which captured *Kumaressa storeyi* (R. I. Storey and A. & M. Walford Huggins, pers. commun.). Other outstanding examples of relict insects have also recently been described from above the 1000 m mark on Mt Lewis, part of another high mountain system 100 km north of Bellenden-Ker, e.g., the South American stag-beetle genus *Sphaenognathus* (Moore 1978) and the primitive leafhopper tribe, Myerslopiini, otherwise unknown from Australia (Evans 1977).

Although these various mountains are not high by world standards, these discoveries show that their restricted summit areas nevertheless house insect faunas of extreme biogeographic importance. The significance of the presence of *Kumaressa storeyi* there to the distribution of the subfamily Chinamyersiinae is considerable. Previously, the close relationship of *Kumaressa* and the New Zealand *Tretocoris* could be seen as a link of the New Zealand-SE Australia type not uncommon among temperate biota. Now, with the discovery of *Kumaressa* in North Queensland and *Gnostocoris* in New Caledonia and New Hebrides, the distribution of the subfamily becomes a wider problem within the framework of the Melanesian Arc-eastern Australia complex, as recently reviewed by Smithers & Thornton (1974). There are examples of close links in flightless insects between New Caledonia and North Queensland mountains, e.g., the scarab genus *Ignambia* (Matthews 1974) and the delphacid genus *Nothuchus* (J. F. Donaldson, in prep.), the latter significantly also occurring on Lord Howe I. Complete complementarity between the chinamyersiine faunas of Australia, New Zealand and New Caledonia could be demonstrated by the discovery of a winged relative of *Chinamyersia-Gnostocoris* in Australia, and the discovery of a wingless *Tretocoris-Kumaressa* form in New Caledonia; while the former is probably now unlikely, the latter is still conceivable due to paucity of systematic aradid collecting on this enigmatic island.

Genus *Gnostocoris* Kormilev, 1967a

Gnostocoris gressitti Kormilev, 1967a

FIG. 5, 6, 7, 11, 13, 14

The series studied here was collected in a small aggregation on the undersurface of a dead log in an advanced kauri pine (*Agathis*) plantation with much secondary undergrowth. As is to be expected with its tubercular body surface and cryptic color pattern, *Gnostocoris* lives on the outside of the bark, not subcortically as is the case with most conventional winged Aradidae.

This monotypic genus and its type-species were described from a single female glued to a card, so that ventral characters were not available. Below I give characters of importance additional to the original description, as well as the first description of the male.

Metathoracic scent gland opening large, widely-open, deep, with a carina emerging from the depths of the pit; situated anterolateral to hind coxa (FIG. 14). Pretarsus with a pair of median parempodial bristles; pulvilli large, flattened, lobelike. Abdomen with pattern of glabrous areas as follows: dorsal pattern 1:1:1 in nymphs, 1:1:0 in adults; ventral pattern 1:2:1 in adults and nymphs. Nymphal scent gland openings equidistantly spaced, with large, paired openings separated by a raised carina; gland openings displaced posteriorly so that posterior sutures of segments IV, V and VI are bent backwards in middle (FIG. 11).

♀. Spermatheca bulblike but without apparent pump flanges, its duct short, thick, about as long as bulb (FIG. 13).

♂. Smaller than ♀, length 5.75, width 2.5; abdomen widest across segment III with sides straight, narrowing slightly posteriorly to the angulate margins of tergum VII; segment VIII broadly exposed ventrally, forming a cuplike receptacle for the pygophore and bearing a pair of large, lateral lobes; spiracles of VIII borne on lateral margins of lobes; pygophore exposed dorsally, with relict terga of IX and X visible; laterad of latter are a pair of subtriangular, mobile "anterior parandria" (terminology of Monteith 1966); posterior ½ of pygophore with a pair of immobile, subrectangular "posterior parandria" meeting in midline. Parameres slender, styloid, with hooked apex and large basal flange (FIG. 7).

Material examined. 2♂, 4♀, 1N, NEW CALEDONIA: Col d'Amieu, 549–610 m, 12–13.XII.1973, G.B. & S.R. Monteith (Queensland Museum, Brisbane).

DISCUSSION

Now that both sexes of all species in the 4 genera attributed to the Chinamyersiinae are described, I take this opportunity to discuss some characters, to present some further information, and to provide a comprehensive generic key.

Characters

Stylet coiling. Lee & Pendergrast (1976) carried out a comparative study of the configuration of the coiled stylets in the aradid subfamilies. They recognized 3 basic patterns: "clockwise" in the Calisiinae, Aradinae and *Tretocoris*; "anticlockwise" in the Aneurinae, Prosymptestinae, Isoderminae, Carventinae and Mezirinae; "figure-of-eight" in *Chinamyersia*. The unusual pattern in *Chinamyersia* made it unique in the family and quite different from *Tretocoris*, and the authors cited this as evidence of tenuous relationship between these 2 chinamyersiine genera. In the present study, the stylet configurations of the other 2 genera were checked in the adult of *Gnostocoris gressitti* (FIG. 12) and in an advanced nymph of *Kumaressa carraiensis* (FIG. 9). That of *Gnostocoris* is identical to *Chinamyersia* in having 2 superimposed figures-of-eight within an elongate, double-humped clypeus; that of *Kumaressa* agrees with *Tretocoris* in having a "clockwise" pattern with about 4 or 5 turns in each direction.

Spermatheca. The only information on the spermatheca in the Chinamyersiinae is from Kumar (1967) who describes, without illustrating, the spermatheca of *Chinamyersia cinerea* as being conventional with apical bulb, distal and proximal pump flanges and short duct. The spermathecae of *Gnostocoris gressitti* (FIG. 13) and *Ku-*

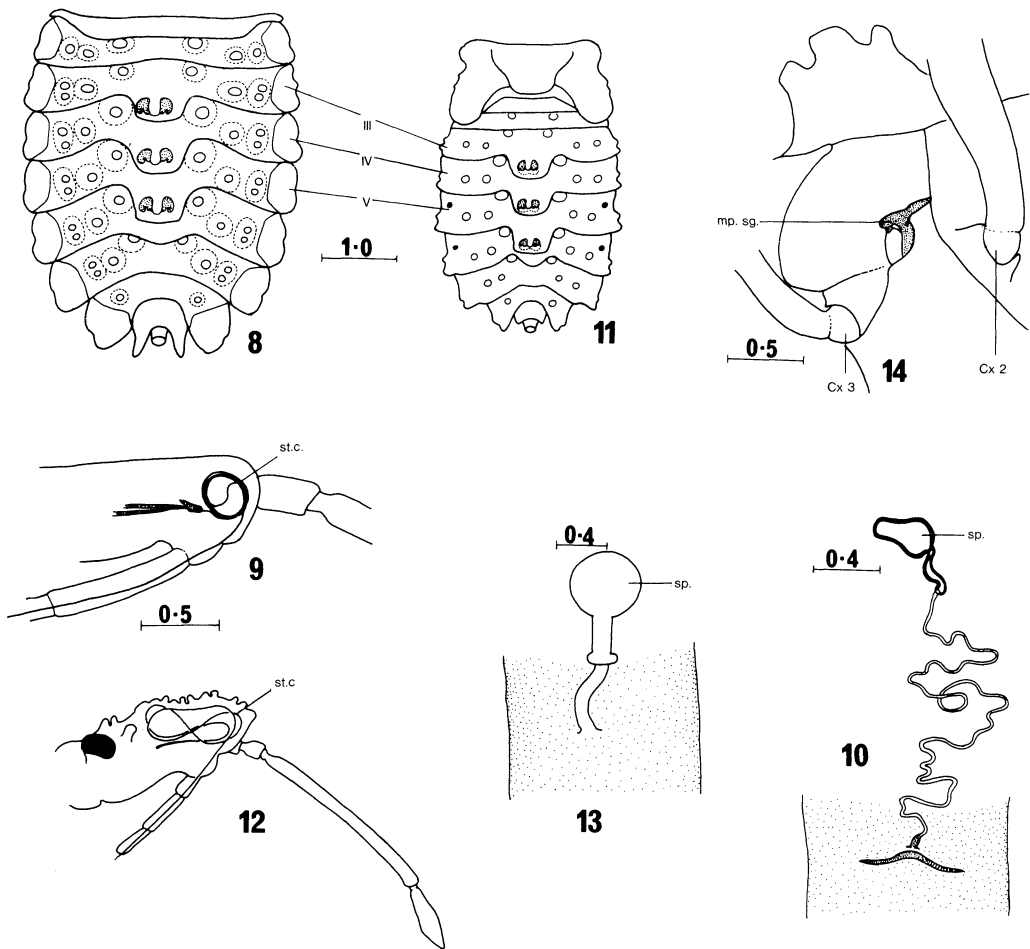


FIG. 8-14. 8-10. *Kumaressa carraiensis*: 8, nymph, dorsal view of abdomen; 9, lateral view of dissected head showing stylets; 10, ♀, spermatheca. 11-14. *Gnostocoris gressitti*: 11, nymph, dorsal view of thorax and abdomen; 12, ♀, lateral view of dissected head showing stylets; 13, spermatheca; 14, metathoracic scent-gland opening. Scales in mm; st.c., stylet coil; sp., spermathecal bulb; Cx.2, mid coxa; Cx.3, hind coxa; mp. sg., metapleural scent gland; III, IV, V, 3rd, 4th and 5th abdominal segments.

maressa carraiensis (FIG. 10) were examined. That of *Gnostocoris* is of the conventional type, but with proximal pump flanges apparently absent. That of *Kumaressa* is unlike any other aradid described and has an apical, thick-walled, pyriform chamber which leads to a thick-walled, contorted neck-piece without pump flanges. The duct is extremely long, thin, coiled and enters the vaginal wall immediately anterior to a bow-shaped sclerotization.

Abdominal glabrous areas. The pattern of glabrous areas on the abdominal terga and sterna was used by Usinger & Matsuda (1959) as a basic criterion in their subfam-

ily definitions. They record the dorsal pattern of *Tretocoris* as 2:1:1 and that of *Chinamyersia* as 1:1:1, though admitting uncertainty in their interpretation of the latter. The adult formula for *Gnostocoris* appears to be 1:1:0, but examination of the nymph (FIG. 11) shows that the actual formula is 1:1:1, with the inner glabrous area being obliterated in the adult. *Kumaressa* is identical to *Tretocoris*; a nymph of *K. carraiensis* is shown in FIG. 8. It is notable that the paired outer glabrous areas of *Kumaressa* lie on a single disc and, thus, the *Gnostocoris*-*Chinamyersia* condition could be derived from the *Kumaressa*-*Tretocoris* condition by simple fusion of the outer pair. The ventral pattern appears to be 1:2:1 in all 4 genera.

Nymphal scent glands. *Kumaressa* (FIG. 8), *Tretocoris* and *Gnostocoris* (FIG. 11) all agree in having 3 equidistant gland openings, each with a pair of prominent circular openings separated by a raised ridge; the nymph of *Chinamyersia* is unknown to me. Usinger & Matsuda (1959: 20) note that in nymphal *Tretocoris* the posterior sutures of segments III, IV and V are deflected backwards in the region of the gland openings. This is here seen to be the case in both *Kumaressa* and *Gnostocoris*. In these features, the Chinamyersiinae differ from the Aradinae and agree with the Prosymptestinae.

Adult scent gland. The metathoracic scent gland aperture in *Gnostocoris* (FIG. 14) is identical to that characteristic feature of *Chinamyersia*. Thus all 4 genera share enlarged apertures as seen elsewhere in the family only in the Prosymptestinae. The internal evaporative areas of the 2 winged genera do not have the vermiculate pattern of ridges seen in *Tretocoris* and *Kumaressa*.

Pretarsal appendages. Myers & China (1928) note that *Chinamyersia* was the only aradid with leaflike pulvilli, but as stated by Usinger & Matsuda (1959) the Calisiinae are similar. Pulvilli of *Gnostocoris* are identical to those of *Chinamyersia*, but *Tretocoris* and *Kumaressa* both differ in having curved, bristlelike or spatulate pulvilli, as is usual in the family.

♂ terminalia. *Gnostocoris* agrees with the described condition in the other 3 genera in having segment VIII of the abdomen broadly exposed ventrally to form a receptacle for the pygophore and bearing prominent flattened, spiracle-bearing, lateral lobes. The structures of the dorsal wall of the pygophore are fundamentally homologous in all 4 genera, but *Gnostocoris*-*Chinamyersia* differ from *Tretocoris*-*Kumaressa* in having the anterior parandria smaller and the posterior parandria fused and immobile (terminology of Monteith 1966).

Relationships

It is clear that of the 4 genera attributed to the Chinamyersiinae, 2 very distinct lines are represented: a macropterous line (*Gnostocoris*-*Chinamyersia*) and an apterous line (*Tretocoris*-*Kumaressa*). The differences between the genera within each line are relatively slight and in accord with their long period of disjunct distribution since separation of the land masses they currently inhabit. On the other hand, the differences between the 2 lines are quite fundamental in features such as stylet coiling,

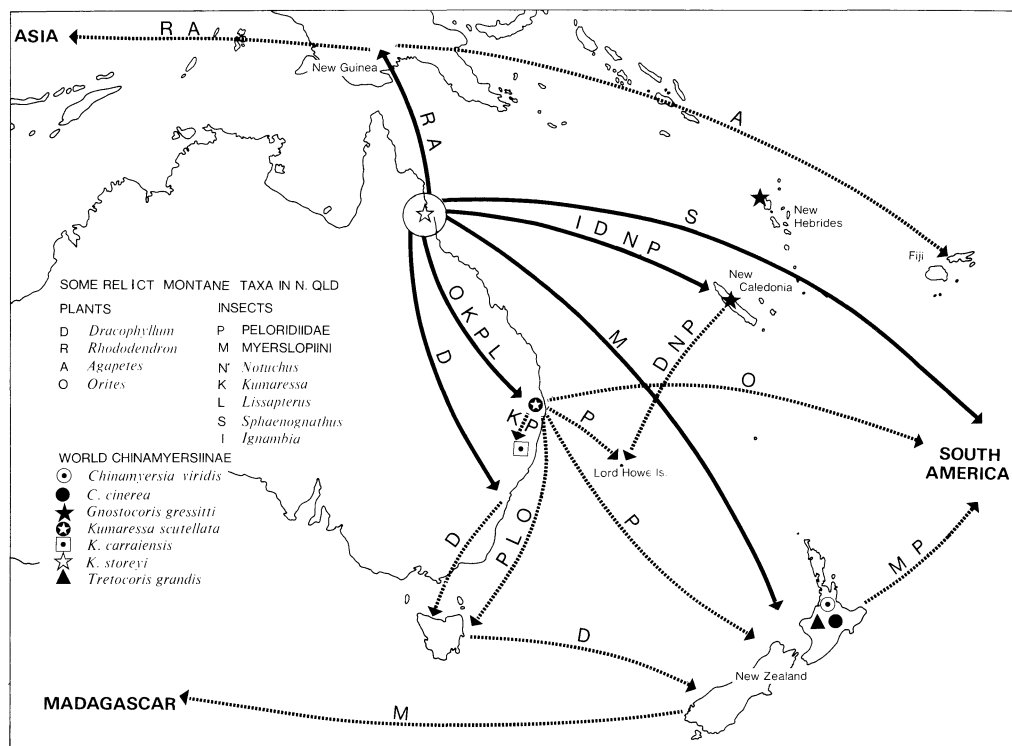


FIG. 15. Map showing world distribution of the subfamily Chinamyersiinae and the geographic relationships of some relict montane taxa of plants and insects on mountains of North Queensland. Solid arrows show distance to nearest member of same taxon; dotted arrows show distances to other members of the same taxon. See text for further details.

pretarsal pulvilli, rostral length, and spiracle position. The question of the advisability of lumping the 2 lines in 1 subfamily arises, and, in this respect, the equally fundamental similarities between the 2 lines need to be taken into account (adult and nymphal scent glands; form of dorsal abdominal sutures; male terminalia; geographic proximity). The differences between the 2 lines are subjectively accentuated by the gross differences in body form associated with winged and wingless habits. Here it is instructive to note the remarkably *Tretocoris*-like, apterous genus *Aradiolus* which has developed in Mexico from the *Chinamyersia*-like, macropterous genus *Aradus* in the subfamily Aradinae (Kormilev 1967b).

Obviously the "chinamyersiine" genera as we see them today are ancient, primitive relicts in which it is to be expected that a rather mosaic pattern of characters should have been preserved. My inclination is to retain them as a single subfamily at least until a full "Hennigian" phylogenetic analysis can be undertaken on all the primitive gondwanic taxa in the Aradidae, including also the Isoderminae, the Prosympiestinae and the as yet unplaced Chilean genus *Llaimacoris* Kormilev (Pendergrast 1969). The

genera of the Chinamyersiinae, as I accept them, are separated and summarized in the following key.

KEY TO GENERA OF CHINAMYERSIINAE

1. Macropterous; rostrum short, reaching prosternum at most; head with shallow rostral groove; 1st antennal segment short, not reaching clypeal apex; stylets coiled in "figure-of-eight" configuration; pretarsal pulvilli lobelike; metathoracic scent-gland evaporative area not ridged; spiracles of V and VI dorsal; dorsal glabrous areas forming 1:1:1 or 1:1:0 pattern; posterior parandria of ♂ not separate and moveable 2
- Apterous; rostrum long, reaching metasternum; head without rostral groove; 1st antennal segment long, surpassing clypeal apex; stylets coiled in a single clockwise coil; pretarsal pulvilli bristlelike; metathoracic scent-gland evaporative area with a vermiculate pattern of ridges; spiracles of V and VI ventral; dorsal glabrous areas forming 2:1:1 pattern; posterior parandria of ♂ separate and moveable 3
2. Spiracles of II and III ventral, and of IV dorsal; 3rd antennal segment less than 3× length of 4th; legs short, stout; posterior lobe of pronotum with explanate lateral extensions ... New Zealand **Chinamyersia**
- Spiracles of II, III and IV lateral; 3rd antennal segment 3× length of 4th; legs long, slender; posterior lobe of pronotum with lateral, blunt spines ... New Caledonia, New Hebrides **Gnostocoris**
3. Lateral thoracic lobes with entire margins; preocular tubercles inconspicuous or absent; antennae with short setae; scutellum triangular; spiracles of segment VIII ventral; ♂ with polished median callus on sterna V and VI of abdomen ... Australia **Kumaressa**
- Lateral thoracic lobes with scalloped margins; preocular tubercles prominent, as long as eye diameter; antennae with long setae; scutellum semicircular; spiracles of segment VIII sublateral; ♂ with polished median callus on sternum VI only ... New Zealand **Tretocoris**

Acknowledgments. I am grateful to Mr R. Storey, of Mareeba, for sending me the Bellenden-Ker material, to Dr T. E. Woodward, of the Entomology Department, University of Queensland, for comments on the manuscript; to my wife, Sybil, for inking my pencil sketches; and to Dr G. Kuschel of DSIR, New Zealand, for permitting me to add to FIG. 15 his recent unpublished record of Peloridiidae in New Caledonia.

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