The Australasian spider family Periegopidae Simon, 1893 (Araneae: Sicarioidea)

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Abstract – The subfamily Periegopinae (Simon, 1893), based on two species of *Periegops* Simon, is raised to family status. The type species, *Periegops suterii* (Urquhart) from New Zealand, is redescribed and the recently discovered Australian species, *Periegops australia* sp. nov., is established. A possible second species in New Zealand is noted. The phylogeny of the Periegopidae is discussed and the family is grouped with (Sicariidae – Loxoscelidae), Plectreuridae, Scytodidae, Drymusidae, and Diguetidae to form the superfamily Sicarioidea.

INTRODUCTION

The two closely related species which make up the distinctive Australasian monogeneric family Periegopidae probably constitute the rarest and most geographically restricted family taxon known for our present day spiders bearing in mind that, although known from two widely separated countries, the actual area inhabited in each country appears to be extremely limited. The similarity of the two species is remarkable considering the relict nature of the two populations which, for contiguity, must date back to Gondwanaland.

The type species for the genus is the New Zealand *Periegops suterii*, first recorded by Urquhart (1892b) from Banks Peninsula near Christchurch in the South Island of New Zealand. Despite the comprehensive and widespread collecting programmes over most regions of New Zealand in recent decades, the failure to find *Periegops suterii* elsewhere strongly suggests that this species is now restricted to a few hectares of forest on Banks Peninsula near Christchurch and the much smaller Riccarton Bush Reserve in the City of Christchurch. The recent discovery of a single female *Periegops* from the East Cape region of the North Island of New Zealand suggests the presence of a second species which may be similarly restricted.

As far as we know the recently discovered Australian species, described below, is restricted to two populations in southeastern Queensland.

Little is known of the life history of these spiders. Most of the Australian specimens have been collected from pitfall traps while the few New Zealand records have revealed little information other than one note that an adult female spider was found within a thin silken tube under a log. The recent discovery of four *Periegops* together under a log in Riccarton Bush, of which two were

adult males and a third an adult female (the fourth spider, probably another male, escaped examination) suggests a mating scenario in which the males are attracted to the female, perhaps by pheromones. The capture of both male and female specimens in pitfall traps as well as the paucity of silk glands, implies that these spiders do not construct a snare but are active hunters. Only the two front pairs of legs are directed forward hence it is unlikely that the spiders inhabit a permanent tunnel retreat as do the Segestriidae.

The ecological data available for the New Zealand species are extremely limited but suggest that *P. suterii* is restricted to four or five small, isolated patches of forest on Banks Peninsula and a small forest reserve in Christchurch City. This is all that remains of the original extensive forest cover which, little more than one hundred years ago, clothed most of the Peninsula. Fortunately most of these forest remnants are now designated as Reserves but as none are more than a few hectares in area the future for the species is not hopeful. The size and extent of the North Island population of *Periegops* is not yet known but the discovery of only a single specimen despite extensive fieldwork implies that it is rare. The failure to find *Periegops australia* in other than a relatively small area of southeastern Queensland suggests this species is also restricted in distribution and it may well be the sole representative of the family in Australia.

The fact that specimens of *P. suterii* were found on two separate occasions when spider taxonomy in New Zealand was in its infancy and very few endemic species had been collected does suggest that the species was much more abundant in earlier historic times. The geological history of Banks Peninsula indicates a long period of isolation as an offshore island subsequently linked to the mainland by the building up of the Canterbury

Plains. This isolation is further substantiated by the surprising number of invertebrates endemic to the peninsula and so it is not surprising that the species should be restricted in distribution.

Material is lodged in the Canterbury Museum, Otago Museum, and Queensland Museum (QM).

TAXONOMIC HISTORY

Despite its limited distribution and apparent rarity, specimens of *Periegops suterii* were available for description by Urquhart in 1892. His description, under the name *Segestria suterii*, was based on one female and two immature males collected by the conchologist, Henry Suter, from Dyers Pass on the Port Hills near Christchurch. Undoubtedly, Suter would have been looking for land snails on the forest floor when he encountered these spiders. Shortly after Urquhart's paper appeared, Simon (1893), who was unlikely to have seen Urquhart's paper when he prepared his manuscript, recorded the same species under the new generic and specific names *Periegops hirsutus*. Although Simon's generic diagnosis is based on a female (he states 'male not known' in the generic description) the species description, printed as a footnote on the next page, states that the specimen described as a new species was a male. However the descriptive information suggests that the specimen was actually a female and a subsequent search of the Simon collection by Dalmas (1917) revealed only a single female specimen. No locality data other than New Zealand was given for this specimen but it is known that Simon had other material available for study at this time from Banks Peninsula. It can, therefore, be reliably assumed that his specimen came from the same locality as Urquhart's *Segestria suterii*.

Simon, at this time, established the subfamily Periegopinae for his new genus *Periegops* and placed the subfamily in the Sicariidae. He was obviously puzzled about the correct placement of tis spider and commented that *Periegops* was one of the most ambiguous spiders he knew and that, while he was placing it within the Sicariidae, it could well merit a family in its own right. However, some time later Simon (1903) retained subfamily status for *Periegops* and added two genera, *Digueta* and *Pertica*, to the Periegopinae. In his Systema Araneorum, Petrunkevitch (1928) removed these two genera from the Periegopinae and so reinstated the subfamily to its original monogeneric status. Bryant (1935a) examined a female cephalothorax from the Urquhart collection (now housed in the Canterbury Museum), labelled as *Segestria suterii* which is probably the type specimen. She concluded that Simon's *P. hirsutus* was a synonym of *P. suteri* (Urquhart) as had been suggested earlier by Dalmas (1917). Interestingly,

in this paper Bryant also suggested that a new family be established for *Periegops* which, in her view, would also include *Plectreurys* and *Digueta* but she took no direct action. In a second paper, published in the same volume and recording more recently collected material from the Canterbury Museum Collection, Bryant (1935b) described a male of *P. suterii* from Rhodes Bush on the Port Hills. The specimen examined by Bryant (which, until very recently, remained the only male known for the type species) has unfortunately suffered badly from dehydration and mould but an intact palp was found in the vial.

Chamberlain (1948) appears to be the only New Zealand worker to have examined these spiders subsequent to Urquhart's original description. He confirms the synonymy of the species described by Urquhart and Simon after examining a specimen labelled as *Periegops suteri* by Dalmas. It is not clear where this specimen is located as Dalmas (1917), judging from his brief comments, only examined the original female specimen described by Simon and which is now held in the Museum Histoire Naturelle, Paris. It is probable that, by mistake, Chamberlain is referring to the male specimen held in the Canterbury Museum examined by Bryant and labelled *Periegops suteri*. The elevation of the subfamily Periegopinae to family status has been a matter of general agreement by most authors who have encountered the group. However no formal action has been taken to implement these opinions mainly because of the paucity of study material, but also because of the reluctance of authors to establish a family taxon solely on one species. The discovery of a probable second species in New Zealand and a further one in Australia, reinforced by revisions of Simon's other sicariid genera and their elevation to family rank by Gertsch (1958a, 1958b, 1958c, 1967, 1983) has now opened the way for the establishment of the higher taxon.

With the establishment of the seventh family taxon from the original generic assemblage, the revision of Simon's Sicariidae is completed. Until now, *Periegops* has been listed by cataloguers in either the Sicariidae (where Simon placed it) or the Segestriidae (as suggested by Urquhart in his original description of *suterii*). It has also been suggested that *Periegops suterii* may be a synonym of *Segestria saeva* Walckenaer 1837 (Bonnet 1958, Roewer 1942, Dalmas 1917) but this association is very doubtful and certainly not strong enough to be acted upon. The descriptive information associated with *S.saeva* is, in itself, too indefinite to support such an assertion and in view of *suterii's* restricted distribution and rarity, the probability of specimens being collected at this early date by random collecting seems unlikely. More probably, the species described by Walckenaer belongs in one of the other two groups of relatively large six-eyed

haplogyne spiders of the families Segestriidae or Orsolobidae, both of which are strongly represented in New Zealand (Forster and Forster 1973, Forster and Platnick 1985). The basis for this suggested synonymy appears to be founded on the premise that *hirsutus* and *suterii* are separate species and that *suterii* is the synonym of *Segestria saeva*, perhaps because it was originally placed in *Segestria*. There is little doubt, however, that the earlier descriptions do represent a single species. Unless it is possible to re-examine the material described by Walckenaer his species will probably remain a *nomen nudum*.

SYSTEMATICS

Family Periegopidae Simon, new status

Periegopinae Simon, 1893: 266.

Diagnosis

Related to the ecribellate, haplogyne families Plectreuridae, Loxoscelidae, Scytodidae, Drymusidae, Diguetidae and Sicariidae which are grouped together primarily on the basis of the possession of a lamina on the ventral surface of the chelicerae, the relatively slender maxillary lobes directed across the labium and the limited development of the posterior respiratory system associated with the fusion of the apodemes. The chelicerae of all families associated with the periegopids bear a prominent ventral lamina but have lost the teeth and the chelicerae are fused along the inner margin. The Periegopidae, however, retain some of the cheliceral teeth and the chelicerae are not fused (Figs 8–10). Furthermore the internal female genitalia in the Periegopidae is represented by a single, median, crescent-shaped, poreplate discharging directly into the distal portion of the oviduct from numerous minute cups (Figs 22–24), in contrast to the clearly bilateral structures characteristic of all of the other associated families (eg., Diguetidae Fig. 25). The presence of three tarsal claws on a distinct onychium separates the family from the double-clawed Loxoscelidae which also possesses a unique tracheal system. The bipectinate retroclaw of legs I, II, in contrast to the single row of teeth on all other superior claws, is present only in the Periegopidae and the Scytodidae.

Description

Ecribellate, haplogyne spiders. Carapace with median rows of erect serrate setae; fovea lacking. Six eyes in three diads; widely separated; AME lacking (Figs 1, 4). Clypeus vertical, height equal to the width of both PME. Sternum scutate, distinctly longer than wide. Maxillae slender, more than twice as long as wide, directed across the labium but not meeting medially. Labium free, slightly wider than long (Fig,2). Chelicerae without boss; free, i.e. not fused at base. Stridulatory ridges lacking. Lamina present; with three teeth beyond the apex of the lamina and a group of denticles on the inner margin (Figs 8–10). Legs 4:1:2:3, clothed with short serrate erect hairs which are generally arranged in longitudinal rows. The ventral rows of hairs on tibiae and metatarsi of legs I and II generally stouter and male tibiae with a group of strong bristles on the retrolateral surface,.but true spines absent. Three trichobothria on the distal half of the tibiae and one on distal surface of metatarsi. Bothria with a which the onychium and tarsal claws may make contact. Female palp with tarsal claw reduced to short transverse ridge; trichemes long and smooth (Fig. 29). Tarsal organ exposed; sensillae not raised (Fig. 25). Three claws on distinct onychium. Proclaw of legs I and II with double row of teeth (Figs 11, 12); otherwise superior claws with one row (Fig. 13). Inferior claw with a single tooth. There is a distinctive bristle with a wide base on the disto-dorsal slope of each tarsus which appears to be a proprioreceptor on denticle. Male palp small but tibia stout. Bulb simple with a typical coiled spermophor and a short embolus (Figs 3, 5–7). Abdomen densely clothed with short serrate hairs. Internal genitalia of female simple, haplogyne, consisting of a single crescent shaped poreplate with numerous small invaginated cups. Each cup enclosed by a secretory gland which discharges into the cup through a single pore. Respiratory system with well developed anterior booklungs. Posterior system indicated by a transverse groove clearly separated from the spinnerets. Within the groove a pair of small widely separated spiracles lead by short ducts into a common atrium from which a single tracheal tube on each side extends forward to near the level of the epigastric furrow. The median pair of apodemes are however fused and are represented by a short conical lobe (Fig. 14). Six spinnerets, small colulus with 6–7 hairs. Spigots few (at least in juvenile). Single MAP on ALS.

Type genus

Periegops Simon, 1893.

Distribution

A single genus found in New Zealand and Australia.

Genus *Periegops* Simon

Periegops Simon, 1893: 267.

Type species

Periegops hirsutus Simon, 1893 (junior synonym of *Segestria suterii* Urquhart, 1892b), by original designation.

Description

With the characters of the family.

Distribution

Type species restricted to Banks Peninsula and Christchurch in the South Island of New Zealand. A probable second New Zealand species on the East Cape of the North Island. A further species in southeastern Queensland.

Periegops suterii (Urquhart)

Segestria suterii Urquhart, 1892b: 230; Urquhart, 1892a: 221 (catalogue listing).

Periegops hirsutus Simon, 1893: 268; Warburton, 1909: 393; Merian, 1913: 47; Petrunkevitch, 1928: 110; Dalmas, 1917: 338; Roewer, 1942: 331; Bonnet, 1958: 3483; Platnick, 1989: 143; Platnick, 1993: 134.

Periegops suteri (Urquhart): Bryant, 1935a: 54; Bryant, 1935b: 81; Roewer, 1942: 331 (*suterii*); Chamberlain, 1946: 88; Forster, 1967: 72; Forster and Forster, 1973: 151, figs 1–3, 6 14, 23–24, 27, 31.

Material Examined

Holotype

♀, Dyers Pass, Banks Peninsula, New Zealand, coll. H. Suter. The carapace and fragmentary legs of a female specimen in the Canterbury Museum Collection labelled by Urquhart in pencil as "*Segestria suterii* immature male, Vol. XXIV 230" (the volume and page number for the original description in the Transactions of the New Zealand Institute) is, in all probability, Urquhart's type specimen. While the label suggests that the specimen in the vial is one of the two immature males he examined but did not describe in detail at the time he established the species, there is no doubt that the carapace belongs to a mature female. It is clear from the original description that Urquhart had only the single female specimen. There is a specimen labelled `Allotype male': Rhodes Bush, Port Hills, 13 November, 1915, G. Archey, in the Canterbury Museum Collection. This is the secondary `type' established by Bryant in 1935 when she described the male. The specimen is in poor condition (seen).

Other Material

New Zealand: South Island: Banks Peninsula, Canterbury: 2♀, Kaituna Valley, 11 September 1949, R.R. Forster; 1♀, Little River, 10 January 1985, A.C. Harris; 2 immature ♀, Akaroa, under logs, 14 October 1949, R.R. Forster; 1♀, Akaroa, 16 October 1920, G. Archey; 3♂, 1♀, Riccarton Bush,

Christchurch, found together under a log, 9 April 1994, A.D. Blest.

Description

Female

Description based on a specimen from Kaituna Valley, Banks Peninsula.

Total length 7.70. Carapace 3.97 long. 2.31 wide. Abdomen 3.98 long. 2.75 wide. Carapace reddish brown with black lines extending from mid posterior slope to eyes. Chelicerae and sternum reddish brown but legs paler yellowish brown. Abdomen yellowish brown with six narrow black chevrons down dorsal surface (Fig. 1). Carapace smooth with three rows of short, erect serrate hairs along dorsal surface and further similar hairs along lateral margins and eye region. Fovea absent. Eyes minute; in three pairs which from in front appear in a straight line but from above are strongly recurved. Clypeus height equal to combined width of the two PME (which are separated from the lateral pairs of eyes by three times this distance). Chelicerae slightly less than half carapace length. Three teeth on retromargin beyond the lamina and seven or eight small denticles on inner margin of lamina. Fang relatively short (Figs 8–10). Without lateral boss or stridulatory ridges. Maxillae slender, slightly more than three times as long as wide; directed across labium but not meeting distally. Labium as wide at the base as long and not fused to sternum. Sternum longer than wide in ratio of 4:3. Coxae 4 separated by about one half of the width of a coxa (Fig. 2). Legs I and II with dissimilar superior claws. Retroclaw with two rows of teeth, proclaw with single row (Figs 11, 12). Both superior claws of legs III and IV with a single row of teeth (Fig. 13). Inferior claw of all tarsi with a single tooth. Legs 4.1.2.3.

|	I	II	III	IV	Palp
Femur	2.98	2.44	2.25	2.98	1.01
Patella	0.97	0.97	0.97	1.09	0.36
Tibia	2.13	2.01	1.95	2.56	0.61
Metatarsus	4.39	3.96	3.05	4.57	
Tarsus	1.95	1.89	1.46	1.70	2.56
Total	12.42	11.29	9.68	12.90	4.64

Trichobothria 2.1 on proximal surface of tibiae and one subdistal on each metatarsus. Bothrium with single transverse ridge (Fig. 31); tricheme long, smooth. Legs clothed with short serrate hairs, often arranged in longitudinal rows; two rows of hairs on ventral surface of tibiae and metatarsi of legs I, II are relatively strong but could not be classed as spines. Pedipalp without spines. Claw reduced to a short denticle.

Male

The 'allotype' specimen described by Bryant
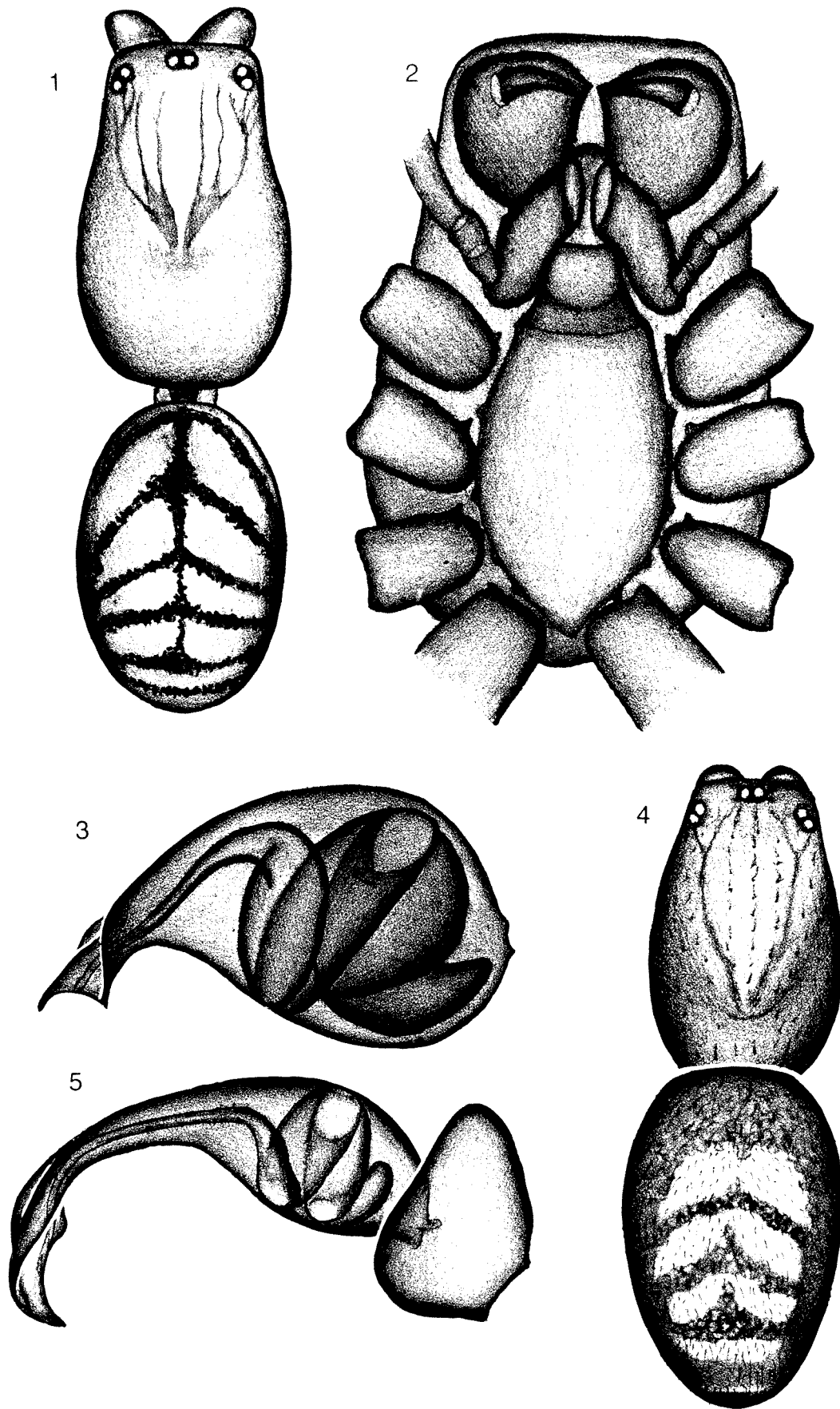
Figures 1–5   1–3, *Periegops suterii* (Urquhart): 1, dorsal surface body of female; 2, ventral surface of cephalothorax of female; 3, bulb of male palp. 4–5, *Periegops australia* sp. nov.: 4, dorsal surface of body of female; 5, bulb of male palp.
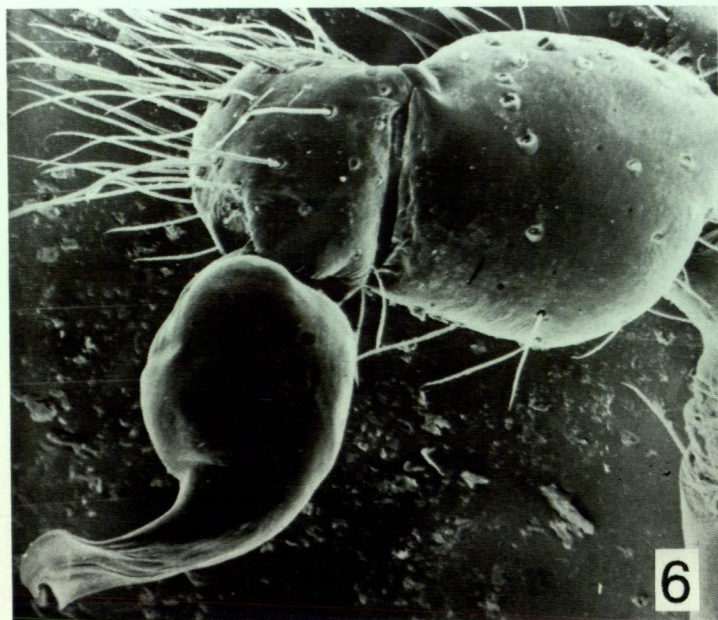
Figures 6–7   *Periegops suterii* (Urquhart): male palp.

(1935), which until recently was the only male known for the species, has dried out and is in a fragmentary state. However from Bryant's original description it was clear that the general characters were similar to those of the female.

The collection of two males from Christchurch after this paper was originally prepared confirms this conclusion.The colouration of both of these males is similar to typical females (the female collected with the males however lacked abdominal patterning).

Total length 7.69. Carapace 3.78 long, 2.34 wide. Abdomen 3.60 long, 2.09 wide.

	I	II	III	IV	Palp
Femur	3.21	2.52	2.28	2.71	0.76
Patella	1.62	1.53	1.41	1.43	0.62
Tibia	2.65	2.40	1.83	2.58	0.63
Metatarsus	2.77	2.46	1.77	2.65	
Tarsus	1.02	0.88	0.63	0.88	0.31
Total	11.27	9.79	7.92	10.25	2.32

The relative length of the legs differs from the female in that leg I is slightly longer than leg IV. Legs clothed with short ciliate hairs as in female but with a prominent row of strongly developed setae along the retrolateral surface of tibia I which are almost bristles. Claws and onychium as in female. Palpal tibia swollen; as wide as long. Bulb extending well beyond; cymbium, spermophor relatively large and weakly coiled (Figs 3, 6–7).

Periegops sp.

Remarks

A single female specimen collected by Grace Hall from an *Aparua* burrow on the Lighthouse Track,

East Cape, North Island of New Zealand, 30 September 1993 could mark the presence of a second species of *Periegops* in New Zealand. A close examination of the specimen, including the genitalia, however, reveals no clear characters by which the species can be satisfactorily defined. At present the separation of species is strongly dependent on the detailed structure of the male palpal bulb. The description of the species, if separate, should await the availability of further material, including a male.

Periegops australia sp. nov.
Figures 4–5, 22, 32–35

Material Examined

Holotype

♀, Kroombit Tops (Beauty Spot 98), S.E. Queensland, Australia, 24°22'S, 151°01'E, 9–19 December 1983, pitfall, rainforest, V.E. Davies and J. Gallon (QM S20422).

Allotype

♂, Mount Goonaneman, via Childers, S.E. Queensland, Australia, 25°26'S, 152°08'E, 670 m, 27 August 1976 – 13 December 1976, pitfall trap, rainforest, G.B. and S.R. Monteith (QM S20418).

Other Material

Australia: S.E. Queensland: 1 immature, Kroombit Tops (Beauty Spot 98), 45 km SSW Calliope, 9–19 December, 1983, rainforest, V.E. Davies and J. Gallon, (QM S20420); 1♂, Mount
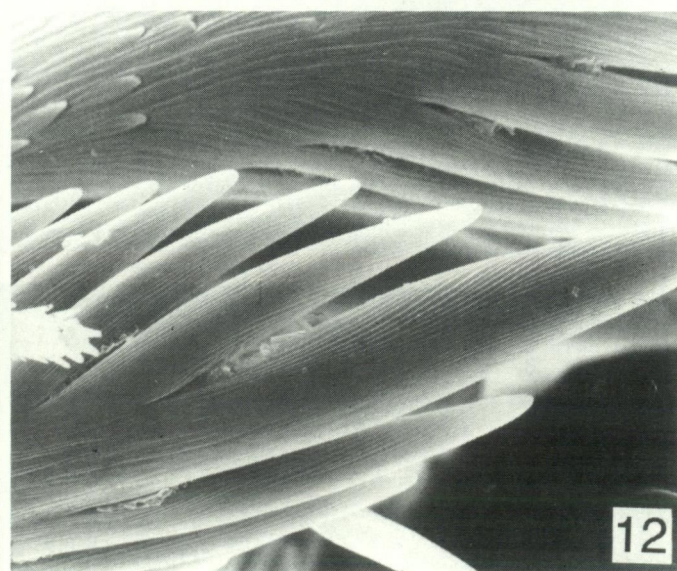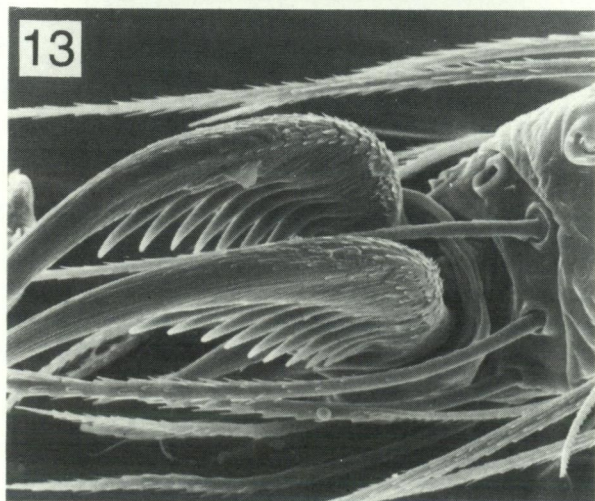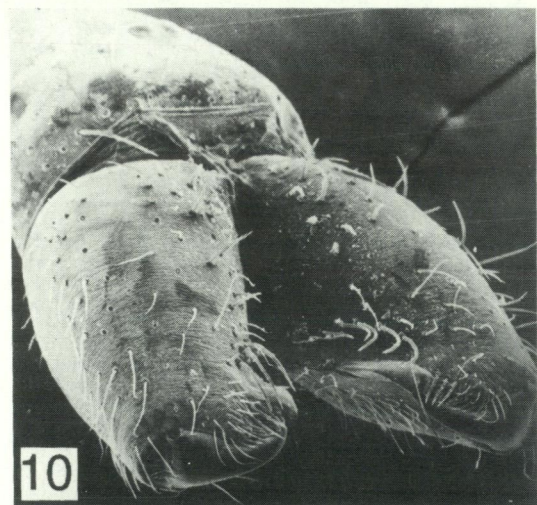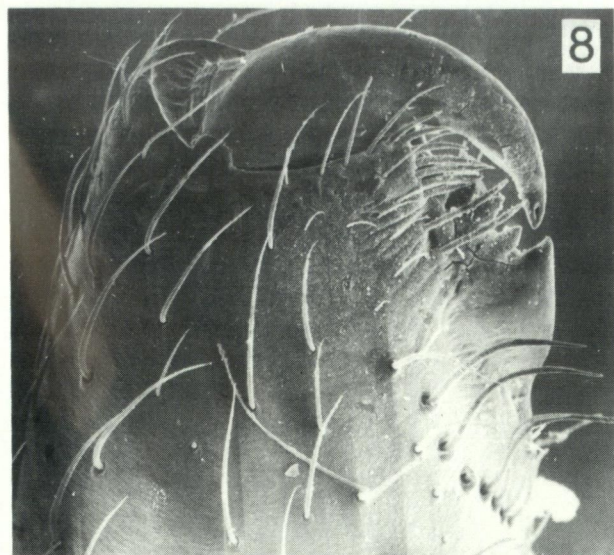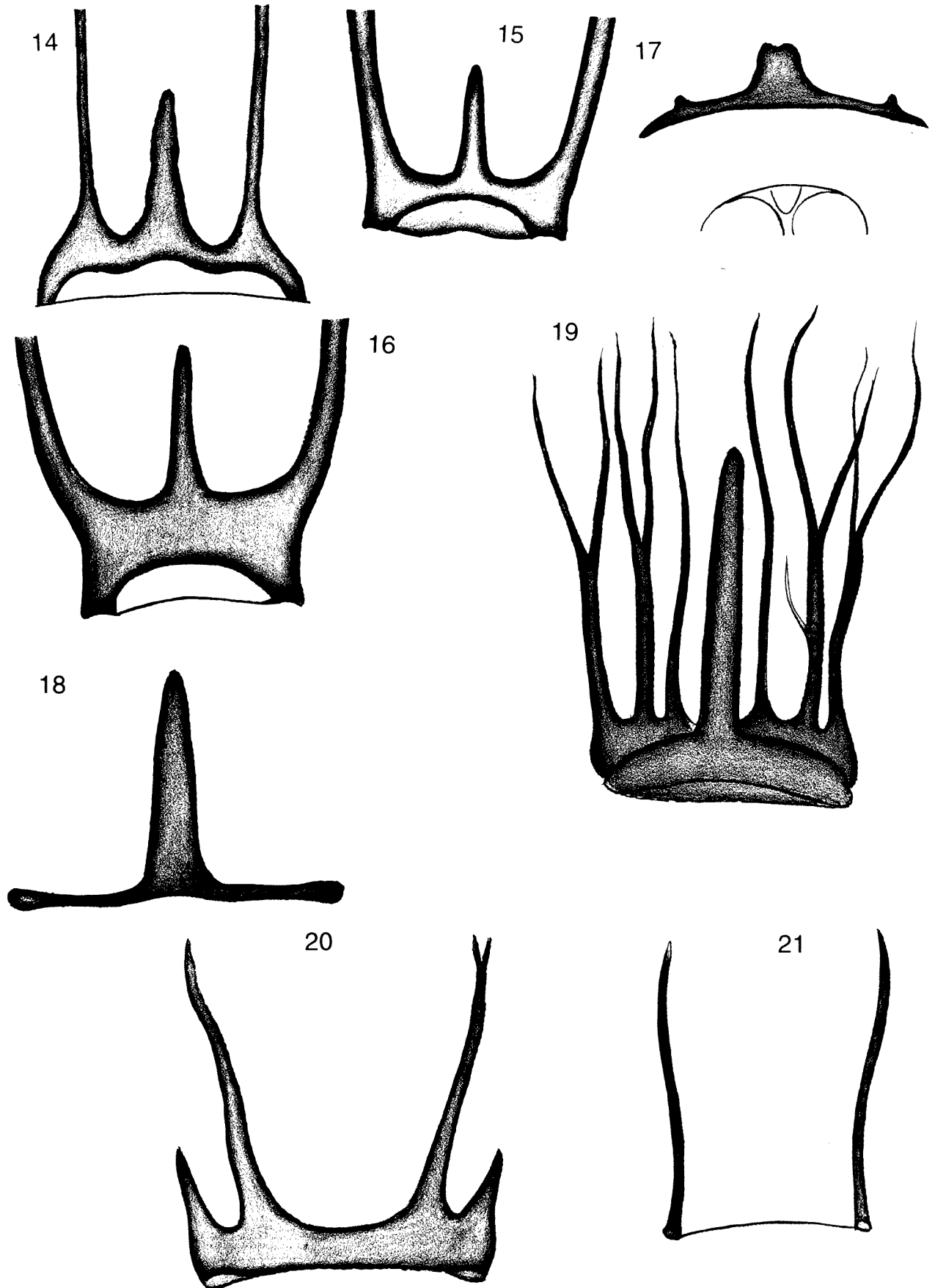
Figures 8–13   *Periegops suterii* (Urquhart): 8–10, chelicerae of female; 11, paired tarsal claws, leg I of female; 12, distal portion of paired claws of leg I; 13, claws of leg IV of female.

Goonaneman (670 m), via Childers, 27 August 1976 – 13 December 1976, pitfall, G.B. and S.R. Monteith (QM S20421); 1♀, Mount Goonaneman (670 m), via Childers, 6 November 1980, found on ground in rotted root cavity while excavating *Australothele*, R. Raven (QM S20419).

Diagnosis

Similar in most characters with *P. suterii* but separated by the different shape of the palpal bulb; heavier pigmentation of the carapace and abdomen, the squat carapace and more slender maxillary lobes.

Figures 14–21   Posterior tracheal systems (semi-diagrammatic): 14, *Periegops suterii* (Urquhart); 15, *Drymusa* sp. (Drymusidae); 16, *Scytodes* sp. (Scytodidae); 17, *Plectreurys tristis* Simon (Plectreuridae); 18, *Sicarius* sp. (Sicariidae); 19, *Loxosceles laeta* (Nicolet) (Loxoscelidae); 20, *Kukulcania hibernalis* (Hentz) (Filistatidae); 21, *Pritha* sp. (Papua New Guinea) (Filistatidae).

Description

Female

Total length 6.55. Carapace 3.76 long, 2.13 wide. Abdomen 3.59 long, 2.44 wide. Similar in most characters to *P. suterii*. General colour pattern similar. Abdomen with similar chevron pattern but more strongly pigmented (Fig. 4). Carapace relatively shorter than *P. suterii*. Lateral eyes separated from PME by three times combined width of PME. Clypeus vertical, almost twice width of both PME.

Maxillae distinctly more slender than *P. suterii*. Almost four times as long as wide.and nearly meeting in front of labium. Labium wider at base than long in ratio of 5:4. Chelicerae two-fifths of length of carapace. Carina and teeth as in *P. suterii*. Sternum longer than wide in ratio of 24:19. Coxae 4 more widely separated than *P. suterii;* separated by a distance equal to coxal width. Legs and claws as in *P. suterii*. 4123. Trichobothria 1.2.1 on proximal surface of tibiae and 1 distal on metatarsi.

	I	II	III	IV	palp
Femur	2.44	2.38	2.25	2.75.	0.73
Patella	0.67	0.61	0.61	0.67	0.24
Tibia	2.38	2.01	1.64	2.44	0.42
Metatarsus	2.32	1.77	1.64	2.25	
Tarsus	1.10	0.91	0.67	0.85	0.67
Total	8.91	7.38	6.61	8.96	2.06

Male

Total length 6.31. Carapace 3.53 long, 2.44 wide. Abdomen 2.98 long, 2.01 wide. The general characters including the colour pattern are as in the female. Maxillary lobes slightly stouter and chelicerae slightly longer. Palp relatively short and stout. Similar to *P. suterii* but bulb more slender and distal structure distinct (Fig. 5).

	I	II	III	IV	palp
Femur	4.27	3.35	2.98	3.66	0.61
Patella	0.73	0.73	0.61	0.73	0.18
Tibia	3.84	2.98	2.37	3.35	0.48
Metatarsus	3.66	3.05	2.44	3.35	
Tarsus	1.09	0.79	0.79	0.97	0.29
Total	12.59	10.90	9.19	12.06	1.51

Discussion

In view of the fact that the specimens came from two clearly separate localities the possible presence of two separate species was considered but could not be supported on the basis of the material available. However the morphology of these spiders is extremely conservative and species differentiation may eventually be based on further detail including ethological data.

Etymology

The specific name is based on the name of the continent used as a noun in apposition.

LIFE HISTORY

Little is known of the life history of either species. Some of the Australian specimens have been collected from pitfall traps while hand collected records of both the New Zealand and Australian species have revealed little direct information other than one note that an adult female of *P. suterii* was found within a thin silken tube under a log. The capture of both male and female specimens in pitfall traps does suggest, as would be anticipated from the paucity of the silk glands, that these spiders do not construct a snare but are active hunters. Because only the two front pairs of legs are directed forward it is not anticipated that the spiders inhabit a permanent retreat as do the Segestriidae. Perhaps the most interesting observation is the recent discovery by Dr A.D.Blest of an aggregation of two, and possibly three, adult males with a single female under a log. In view of the probable low population in the small isolated Riccarton Bush Reserve it is likely that the female possesses some means of attracting males.

MORPHOLOGY

Respiratory Systems

In all seven families which I suggest constitute the superfamily Sicarioidea the anterior pair of booklungs are unmodified and, linked by a transverse duct. The configuration of the posterior respiratory system is however directly influenced by the fusion of the original paired apodemes to form a single median lobe. Fusion of these structures is significant because it precludes the development of the paired median tracheal system which appears to be the primary origin of tracheal development in many families (Forster 1980). The median lobe, which may be relatively large and thin-walled, is more often reduced to a vestigial stump. With the exception of the loxoscelids, only the atria of the original booklungs remain (Figs 14–16).

While the larger thinwalled apodemal lobe may possess some respiratory function this is unlikely to be so where the structure is reduced to a vestige (Figs 18, 19). The simple lateral tracheal tubes which develop from the booklung atria are invariably limited to the abdomen, usually extending no further forward than the level of the epigastric furrow. It seems that in all of the sicarioid families (as I restrict them) the original paired spiracles are retained but are often difficult to see externally as they may open near the inner margins of a transverse groove which, in all of these spiders, is situated clearly in advance of the spinnerets. This groove is characteristically wide in contrast to the narrow slit associated with a single spiracle.

In the Loxoscelidae the respiratory system is unique because some of the booklung lamellae are retained in a modified tracheate form (Fig. 19). These tracheae, which are thin-walled and uneven in width, arise in a row across the transverse connecting duct. Although some of the tracheae are weakly branched they are all limited to the abdomen. In a recent cladistic analysis of the phylogeny of the haplogyne spiders (Platnick *et al.* 1991) it was suggested that the family Loxoscelidae be merged with the Sicariidae. However, the tracheal systems in the two taxa are quite different so that if respiratory systems were included in the matrix the two taxa would probably remain separate. In the Sicariidae the median apodemal lobe is relatively large and may have a limited respiratory function but unlike the loxoscelids the slender transverse duct leading out from each side of the median lobe to the spiracle shows no trace of the original lamellae or even the atrial extension (Fig. 18). The spiracles are situated near the mid-point between the spinnerets and the epigastric furrow. A similar reduction is found in the Plectreuridae but the median lobe is reduced and only minute traces of the pulmonary atria remain. In this family the spiracles are placed further back towards the spinnerets (Fig. 17).

Unlike the respiratory systems of the four families mentioned above, the periegopid tracheal system consists of a short median apodemal lobe and a distinct pair of simple lateral tracheae derived from the booklung atria (Fig. 14). An almost identical configuration is found in both the Scytodidae and Drymusidae (Figs 15, 16). The lateral tracheae in all three of these families extend forward to above the epigastric furrow.

However, the Filistatidae, which I do not include in the Sicarioidea, follow two quite different paths, neither of which involves the fusion of the apodemes. As in the sicarioid families the spiracles are situated well in advance of the spinnerets. In *Kukulkania* the pulmonary lamellae are totally lost leaving a vestigial atrial lobe at each spiracle linked by a strong transverse duct which bears a pair of unmodified apodemes on the median surface (Fig. 20). In *Pritha*, however, the apodemes have been lost, along with the transverse duct and booklung lamellae. All that remains are a pair of widely spaced spiracles, well in advance of the spinnerets, each leading into a short slender tracheal tube probably derived from the atrium of the original booklung (Fig. 21). A development similar to that found in *Pritha* occurs in the archaeids (Forster and Platnick 1984) and the mygalomorph *Micromygale diblemma* (Platnick and Forster 1982).

Female Internal Genitalia

The female internal genitalia of *Periegops* are unique amongst the Sicarioidea in that the distal portion of the oviduct is relatively unmodified and provided with a single, undivided, median poreplate. There are no receptacula but the numerous secretory glands each open separately from a shallow cup (Figs 22, 23). This configuration is presumed to be close to the primitive state for haplogyne genitalia (Forster *et al.* 1987), being intermediate between the basic single perforated plate and the development of multiple receptacula which usually lead to bilateral grouping of the secretory glands and receptacula. The genitalia of
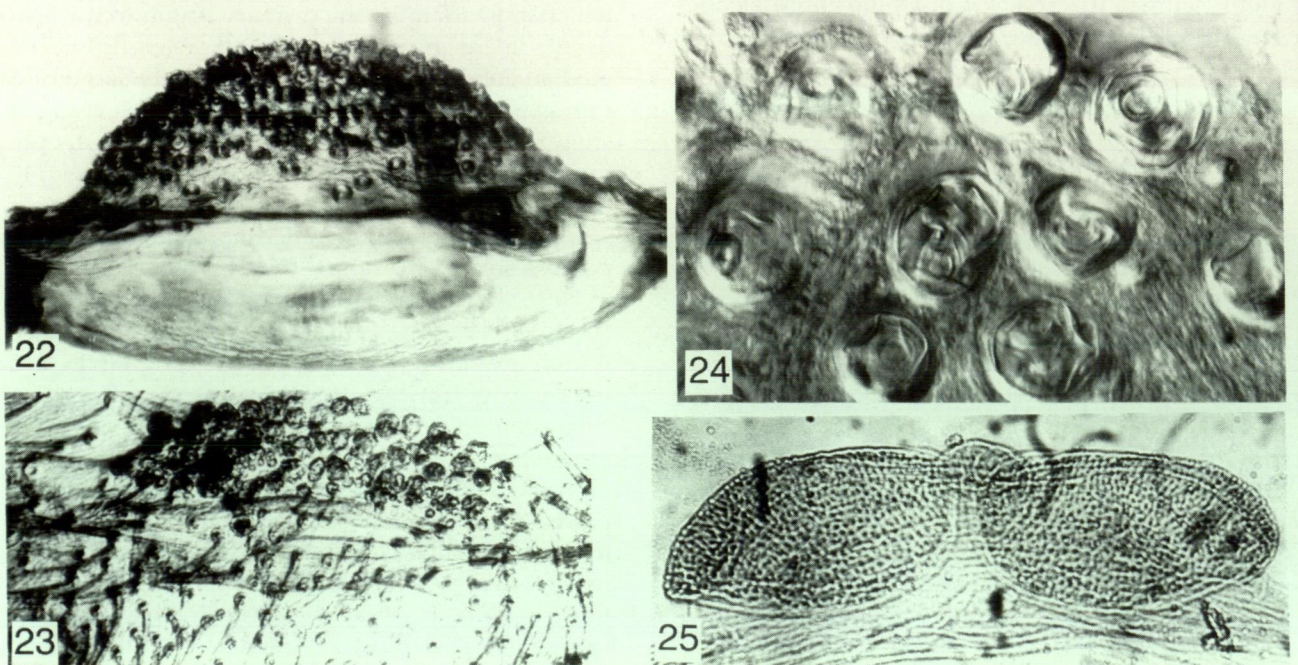
Figures 22–25 Female genitalia: 22, *Periegops australia* sp. nov; 23, *Periegops suterii* (Urquhart); 24, enlargement of secretory cups of *Periegops suterii* (Urquhart); 25, *Digueta canites* (McCook) (Diguetidae).

the other families (including the Filistatidae) which have been considered related to the periegopids, clearly show bilateral development although, interestingly, there is no indication at all in any of these families of the intermediate multiple receptaculate development which might be expected to follow from the periegopid structure. The genitalic configuration morphologically closest to the periegopids in this group of families is found in the diguetids. In these spiders a similar type of poreplate is present but here it is a divided structure separated by a small median receptaculum (Fig. 25). In this family the paired poreplates are pierced by simple perforations in contrast to the cup development found in the periegopids.
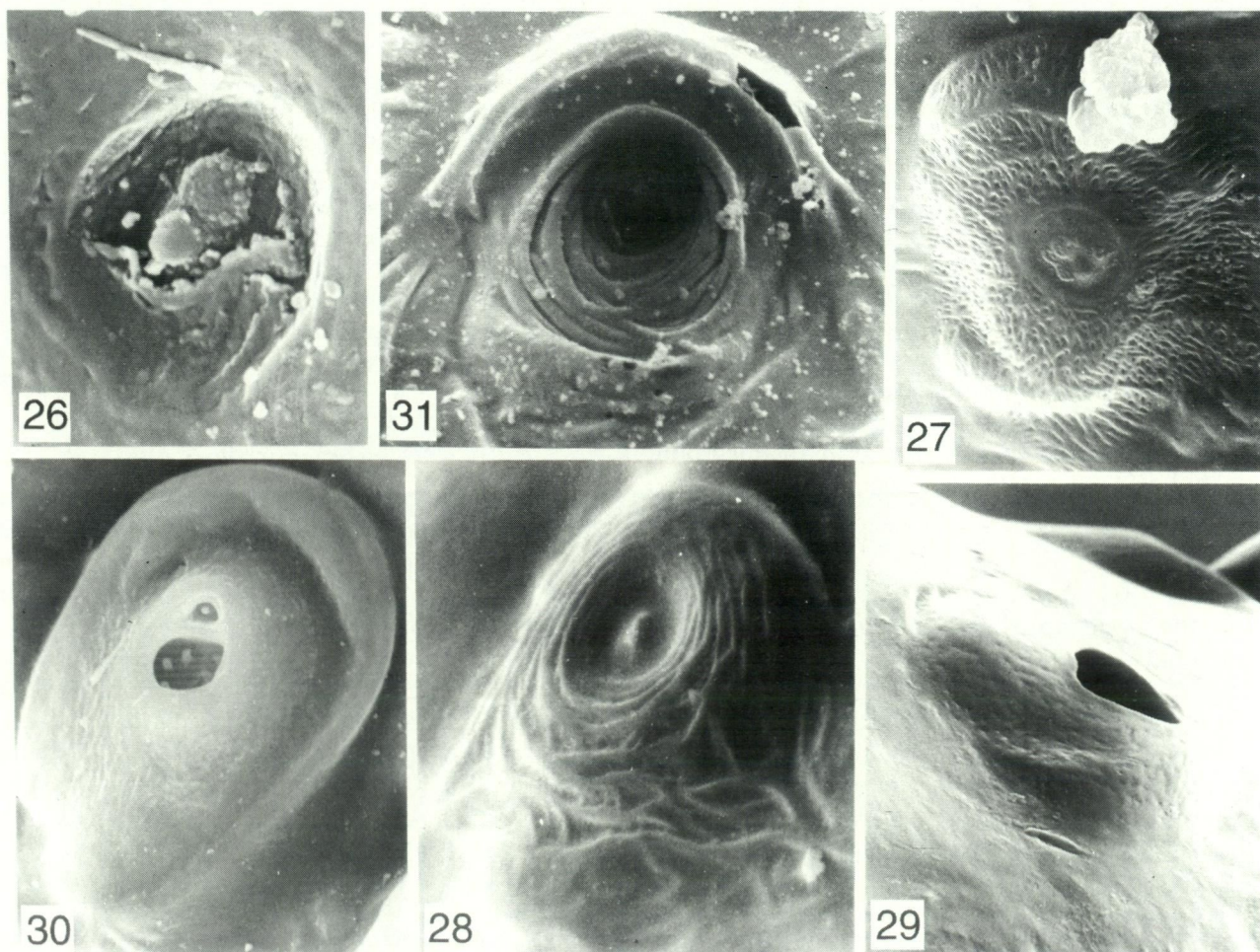
Tarsal Organ

The periegopid tarsal organ is a simple form of exposed organ with inconspicuous receptor lobes (Fig. 27), found in a wide range of haplogyne spiders including a number of mygalomorph families. In the sicarioid group of families it is common to the Sicariidae, Scytodidae,

Drymusidae, Plectreuridae and Loxoscelidae (Figs 26–28). The diguetid tarsal organ (Fig. 29), however, is in strong contrast. This is a domed, capsulate, organ with the receptors concealed within a chamber. While this capsulate form of tarsal organ is found mainly in the entelegyne spiders (none of which have been recorded with an exposed form of tarsal organ), it does occur elsewhere in entirely haplogyne families (e.g. Palpimanidae, Tetragnathidae) and is also found in the haplogyne species in otherwise mainly entelegyne families, e.g., Anapidae (Platnick and Forster 1989), Metidae, Leucagidae and Uloboridae (Forster, pers. obs.).

The filistatid tarsal organ is, however, quite different. The receptor region (which may be divided) is depressed to form a distinct open cup and the receptor lobes are relatively long, arising from the floor of the cup to the level of the opening (Fig. 30).

Chelicerae

The grouping together of taxa primarily based on the presence of a thin lamina on the ventral surface

Figures 26–30   26–30, tarsal organ: 26, *Sicarius* sp. (Sicariidae); 27, *Periegops suterii* (Urquhart) (Periegopidae); 28, *Plectreurys tristis* (Simon) (Plectreuridae); 29, *Digueta canites* (McCook) (Diguetidae); 30, ?*Kukulkania* sp., Panama (Filistatidae); 31, trichobothrium, *Periegops suterii* (Urquhart).

of the chelicerae has a long history in spider systematics and has indeed recently been accepted as a prime character grouping together the classical haplogyne spiders (Platnick et al. 1991). The assumption of synapomorphy for the cheliceral lamina in the chosen cladogram in this paper brings with it diverse non laminate taxa. Doubts still exist as to whether the loss of this lamina could be followed by the full restoration of plesiomorphic structures, in this instance, by the double row of cheliceral teeth. Furthermore the cladogram does not take into consideration the laminate state of the entelegyne family Pararchaeidae. It is mainly for these reasons that, at present, I suggest that the Sicarioidea be restricted to the seven laminate families which originally were contained within the Sicariidae.

The presence of this lamina is usually accompanied by the fusion of the chelicerae along the inner margins. While the functional advantage of this development may be evident in the 'spitting' prey capture of scytodids it is not clear just what function it may have in other families which share this character.

It is of considerable interest to find that the periegopid chelicerae, although possessing typical lamina are not, in fact, fused. Furthermore, they retain some of the original cheliceral teeth as well as a patch of the furrow denticles which are found associated with the cheliceral furrow in diverse families, e.g. Gradungulidae, (Forster et al. 1987), Mysmenidae (Forster 1959), Araneidae (Court and Forster 1988). Their structure provides support for the suggestion that they demonstrate a stage in the development of laminate chelicera from typical dentate chelicerae. The end result would be the typical state where the teeth are completely lost. To reverse the transformation so as to derive some haplogyne families from laminate ancestral forms would involve not only the loss of the lamina but the full reinstatement of the ventral furrow and paired rows of teeth.

Claws

In the periegopids the superior claws of the anterior two pairs of legs have an unusual and striking dentition which consists of a double row of teeth on the ventral surface of the retroclaw and a single row on the proclaw. Interestingly a similar condition is found in the Scytodidae. It is not known whether bipectinate dentition is plesiomorphic for all this group of families but it does seem that both of the superior claws of the anterior legs of the periegopids were originally bipectinate. The single row of teeth on the proclaw is clearly the homologue of the inner row of the retroclaw, suggesting that the outer row has been lost and that originally both claws were

bipectinate. However, the single row of teeth on the superior claws of legs 3,4 are ventral and show no sign of a bipectinate origin. The disparate development of the superior claws of the first two pairs of legs is in itself not unique in that grossly dissimilar superior claws are found in a wide range of families (e.g. Gradungulidae, the tetragnathid Doryonychus, and the araneid Celaenia, Forster and Gray 1979). In all of these cases the modifications are restricted to the two anterior pairs of legs and, although only rarely demonstrated (Gillespie 1991), it is usually assumed that these modifications relate to the capture of prey.

Spinnerets

It was hoped that the spinning glands of the periegopids would provide some clues about the phylogenetic relationships of these spiders. Dr Charles Griswold carried out an SEM examination of an immature female of P. australia (Figs 32–35). There are surprisingly few spigots present but this seems to be characteristic of many of the families associated with Periegopidae. The ALS are provided with a single major ampullate gland spigot but a distinct nubbin representing the second spigot is present. There are eight piriform spigots on the ALS (Fig. 33). Both the posterior lateral and the posterior median spinnerets seem to have only a single spigot which is probably associated with an aciniform gland. On the basis of this state of affairs the periegopids are best associated with the Scytodidae and, by direct comparison, with the Drymusidae. However it should be noted that separation from the remaining sicarioid families is based primarily on losses of spigots and occasional specialisations which do not actually involve the spigots.

DISCUSSION

When Simon (1893), in his Histoire Naturelle des Araignées, grouped eight genera within the earlier Keyserling family, Sicariidae, he recognised the distinctive nature of most of them by establishing a number of separate suprageneric taxa within the family. Because of the paucity of species in some of these taxa and of genera in others there has been a reluctance to elevate the status of the components and so Simon's family grouping remained virtually intact until it was breached by Gertsch (1949). In his popular book, American Spiders, Gertsch suggested that the family, as it stood, was polyphyletic at the family level. He followed up this suggestion with a series of papers (Gertsch 1958a, 1958b, 1958c, 1967, 1983) which firmly established a new family hierarchy for the earlier Sicariidae. Of the six genera which formed the original basis for Simon's Sicariidae, five (Sicarius,
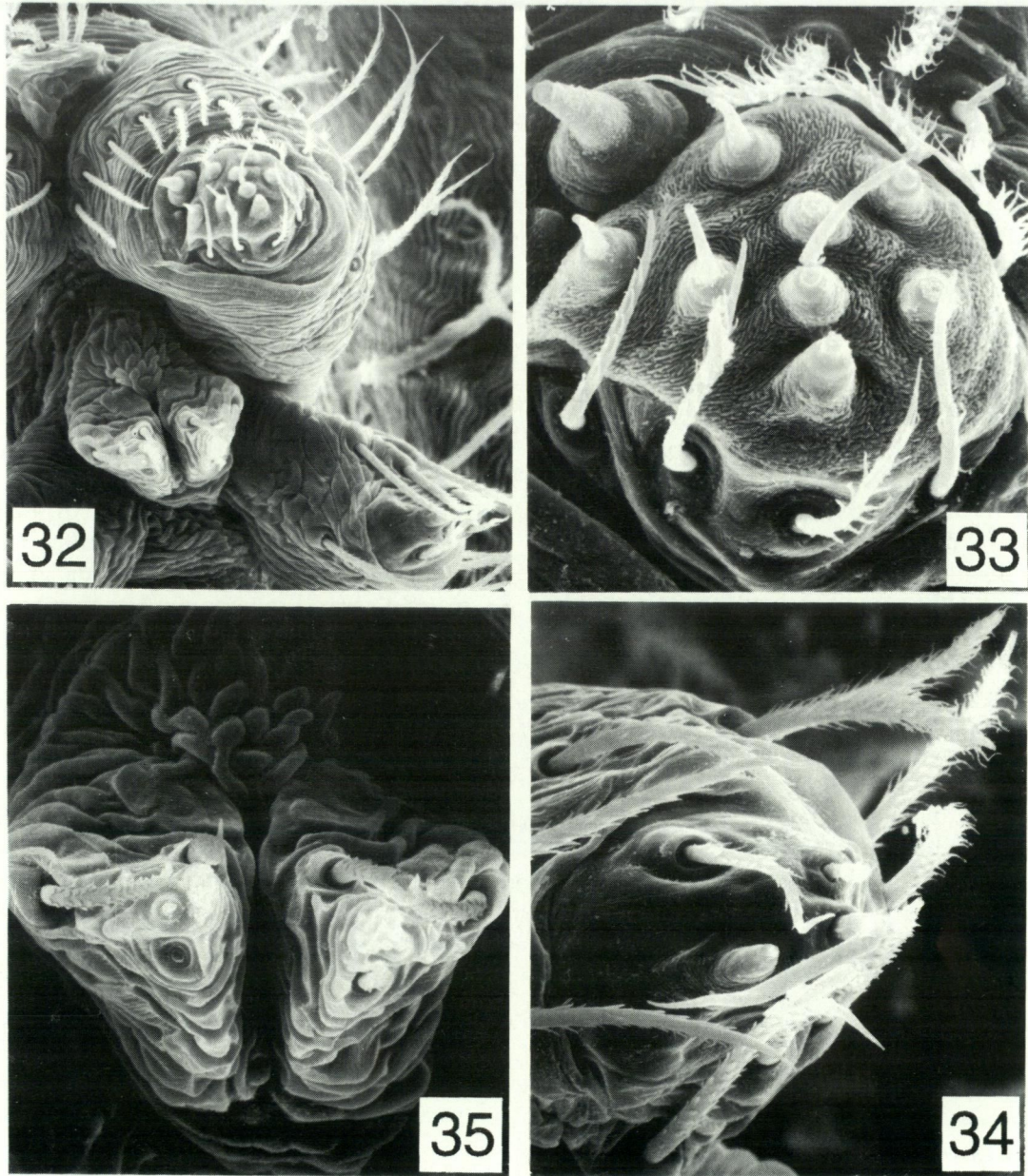
Figures 32–35 Spinnerets of immature *Periegops australia* sp. nov. showing the spigots (photo C. Griswold): 32, right side of spinnerets, anterior lateral spinneret (top), osterior lateral spinneret and posterior median spinneret enlarged in Figures 33–35; 33, anterior lateral spinneret; 34, posterior lateral spinneret; 35, posterior median spinneret.

Plectreurys, Scytodes, Drymusa and *Loxosceles*) have so far formed the basis for separate families. Two further genera, *Digueta* and *Pertica*, which Simon (1903) had originally added to the Periegopinae in the General Supplement to his Histoire Naturelle, formed the basis for the establishment of the family Diguetidae by Gertsch in 1949. Now, with the elevation of Simon's Periegopinae to family rank in the present paper, the fragmentation of Simon's Sicariidae is complete and the genera are now dispersed in seven separate families.

Nevertheless, despite the distribution of the genera over a wide range of family taxa, the monophyly of the original components at a family level, is still generally accepted and the present study, while failing to provide a satisfactory phylogeny for the families involved, provides no evidence which would negate the monophyly of this group of families. Primarily, because of doubts about the role of the laminate chelicerae in grouping the Haplogynae (Platnick *et al.* 1991), I suggest that at present the superfamily Sicarioidea be restricted to those seven ecribellate families derived from Simon's Sicariidae. The earlier use of this name by Berland (1932), incorporating most of the haplogyne families, has no merit. The use of the term, Scytodioidea, by Brignoli (1978) as a taxon to group all of the families with cheliceral

laminae is, I consider, of doubtful validity. The recent cladistic appraisal of the phylogeny of haplogyne spiders (Platnick *et al.* 1991) in emphasising the importance of the lamina in the phylogeny of a wide range of both laminate and non-laminate haplogyne family implies a much wider monophyletic assemblage than I now accept in this paper. The cladogram on which this earlier phylogeny was based hypothesised the subsequent loss of the lamina and restoration of the cheliceral teeth to justify the inclusion of a number of the non-carinate families as well as all of the carinate families. I am, however, restricting the taxon to those carinate families linked by a further strong synapomorphy – the fusion of the apodemes of the posterior respiratory organ in association with the primitive retention of the paired spiracles. Interestingly this proposal coincides with Simon's concept of the limits of his Sicariidae.

There can be little doubt that, as the earlier study (Platnick *et al.* 1991) suggested, the Loxoscelidae can be considered a sister group to the Sicariidae but despite the monogeneric status of these two families I suggest that the difference in the posterior respiratory organ can, in itself, be used to justify separate family recognition and it would seem that on the basis of at least two shared characters (claws, tracheal system) the Periegopidae is most closely related to the Scytodidae.

Simon (1903) compared the genera he placed in the Sicariidae with the Filistatidae (which, in his classification, was placed in the section Cribellatae). While there does not appear to be any other cribellate taxon which might be associated with the Sicarioidea, the relationship with the Filistatidae seems distant.

Not many of the families which I include in the Sicarioidea could be considered "successful" compared with the widespread distribution and/or morphological diversification of some of the other exclusively haplogyne families such as the Oonopidae, Dysderidae, Segestriidae, Orsolobidae or Pholcidae. Those sicarioid families which have achieved or maintained a moderately wide distribution and diversification, seem to be characterised by distinctive specialisations such as the `spitting' behaviour of the Scytodidae. It is tempting to relate the general failure of this group of families to diversify to the lack of development of the posterior respiratory system which in turn is a consequence of the fusion of the median pair of apodemes.

Of all of the family taxa we know from Australasia (possibly embracing all animal groups), the periegopids stand out as those with the most precarious hold on the survival stakes. At least they do have the advantage of obtaining possible protective measures in widely separated areas in two countries but first they need to be recognised and listed along with the worlds most endangered animals.

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