

A prospective study of definite bites by spiders of the family Sparassidae (huntmen spiders) with identification to species level

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Abstract

Spiders of the family Sparassidae occur on most continents in tropical and temperate regions of the world. They are large Araneomorphae (modern spiders) which are often feared. There are few reports of confirmed sparassid bites and some suggest that particular genera (*Neosparassus*) can cause severe effects. This study investigated the circumstances and clinical effects of bites by Australian sparassid spiders with correlation to taxonomic species level. Cases were recruited prospectively from calls to Australian poison information centres and two emergency departments. Patients were included if there was a clear history of bite and the spider was caught, and were followed up over a week. There were 173 patients with spider injuries and 168 with definite bites by sparassid spiders over a 27 month period. Ninety-five percent of bites were by spiders from four genera: *Isopeda* (32%), *Isopedella* (21%), *Neosparassus* (27%) and *Heteropoda* (14%); other genera included *Delena* and *Holconia*. The seasonal and diurnal distribution of bites differed between genera, although the majority occurred in warmer months in daylight hours. Seventy-six percent of bites occurred because the spider was interfered with (picked up, dressing or picked up an object with the spider) consistent with the behaviour of most of the family requiring provocation to bite. Ninety-five percent of bites occurred on limbs, 82% on distal limbs, again consistent with handling the spider. Pain/discomfort occurred in all cases, and was severe in 27%. The median duration of pain was 5 min which was significantly less than other spiders. Puncture marks (40%) or localised initial bleeding (35%) occurred in 54% of bites, and both occurred significantly more often in all sparassid bites compared to all other spider bites ($p < 0.0001$). Swelling occurred in 16%, itchiness in 14% and redness/red mark in 57% of cases, the latter significantly less common than other spiders ($p = 0.0002$). Systemic effects occurred in 4% of bites and were minor (nausea and/or headache). There were no cases of necrotic ulcers or allergic reactions. There were four cases with features consistent with local infection. Bites by sparassid spiders cause minor effects, characterised by immediate and transient pain, associated with bleeding, puncture marks and local redness. The mechanism of effects appeared to be trauma rather than envenoming. There were no major differences between genera, and *Neosparassus* spp. did not cause major effects.

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1. Introduction

Spiders of the family Sparassidae (previously Heteropodidae) occur worldwide in temperate and tropical regions,

and are variously referred to as huntsmen spiders (Australia and United States [US]), banana spiders (New Zealand and the United Kingdom) or giant crab spiders (Southcott, 1976; Sutherland and Tibballs, 2001). The family currently includes 80 genera and 700 species worldwide. In Australia huntsmen spiders are one of the more readily recognised groups of spiders (Southcott, 1976) and 18 genera with 150 species occur across most parts of the continent (Fig. 1).

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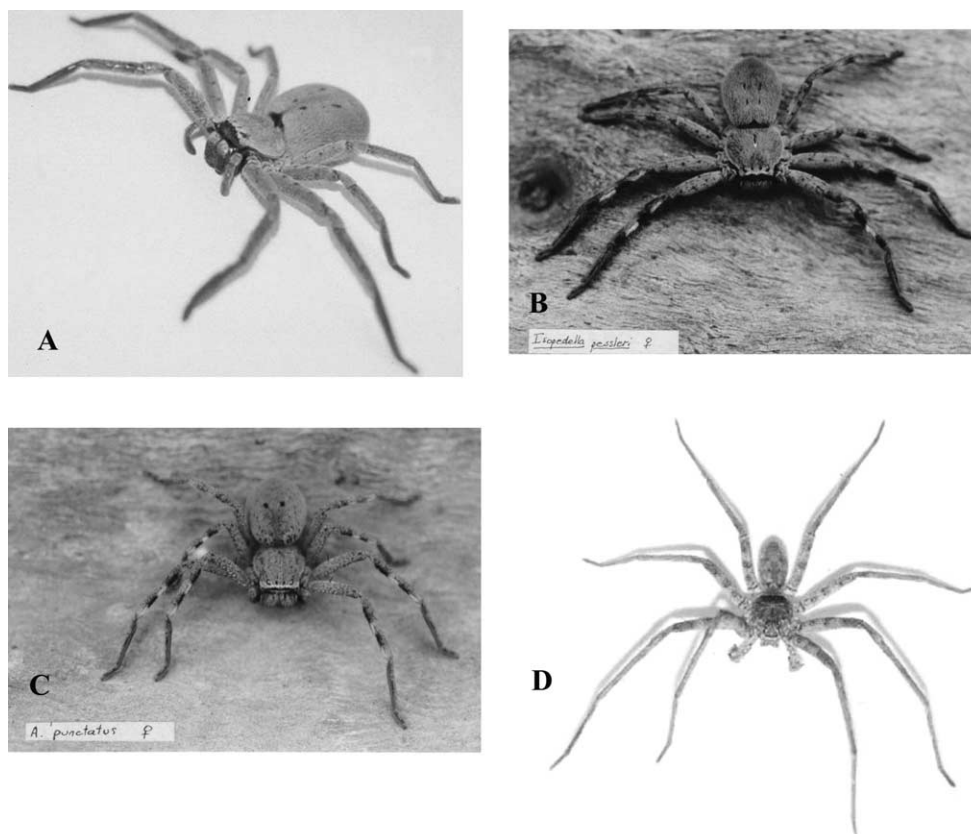


Fig. 1. Spiders of the family Sparassidae or huntsmen spiders. (A) Female *Isopeda villosa*; (B) *Isopedella pessleri*; (C) *Neosparassus*; (D) immature male *Heteropoda*.

They are large spiders and are sometimes mistaken for trapdoor spiders because of this, but belong to the group of modern spiders or Araneomorphae (White et al., 1995).

There are few studies of spider bites where the spiders are collected at the time of the bite and identified definitively to species (White et al., 1989; Isbister et al., 2001; Ribeiro et al., 1990; Lucas et al., 1994). Far more studies have been done where spiders have not been identified by experts or not even collected at the time of the bite. There have been no previous studies of sparassid spider bites and information on this family of spiders comes from case reports (Musgrave, 1949; Raven and Gallon, 1987; Southcott, 1976; Sutherland and Tibballs, 2001), part of larger studies (White et al., 1989; Isbister et al., 2001) or often unpublished reports (Sutherland and Tibballs, 2001). It is thought that huntsmen spiders only cause minor effects, but it is purported that spiders of the genus *Neosparassus* (previously included in *Olios*), badge (or shield) huntsmen, cause more severe effects based on case reports (Southcott, 1976; Musgrave, 1949; Raven and Gallon, 1987; Sutherland and Tibballs, 2001) and should be considered dangerous. In other parts of the world there are a few cases of bites by *Heteropoda* spp. or tropical huntsmen, although this group is reported commonly in parts of the US, including Florida (personal

communication, Vetter 2003). It was reported by Main that the indigenous population of Western Australia feared *Heteropoda* spp. saying that they were known to cause severe effects (Sutherland and Tibballs, 2001). *Olios* spp. are reported in Western states of the US, but there are no confirmed bites (personal communication, Vetter 2003).

Here we present the subgroup analysis of spiders from the family Sparassidae from a larger study of spider bites in Australia (Isbister and Gray, 2002). We hypothesise that badge huntsmen (*Neosparassus* spp.) do not cause more severe effects than other huntsmen spiders, and that all members of the family cause similar minor effects. We also compare the family and individual genera with all other spiders.

2. Methods

The methods have been described in detail elsewhere (Isbister and Gray, 2002; Isbister, 2002). In brief, cases of spider bite were recruited prospectively from February 1999 to April 2001, from either Royal Prince Alfred hospital or Royal Darwin hospital emergency departments or calls to NSW, Queensland or Western Australia poison information

centres. Inclusion criteria were a definite history of spider bite with spider collection at the time of the bite. All patients were seen or contacted within 24 h of the bite, and followed up by telephone for at least 1 week. Only cases of bites by spiders from the family Sparassidae are included here.

The following information was recorded for each spider bite: demographics, circumstances of the bite (location, time, activity at the time, season), bite site, local and systemic effects. A standard spider information sheet was completed at the time of each call [full details available from the authors] (Isbister, 2002).

Spiders were identified by an expert arachnologist (DH). Identification was to species, including gender and maturity. Ethics approval was obtained from all institutions involved. All statistical analysis was done using GraphPad Instat (Version 3.05, 32 bit for Win 95/NT created September, 2000) and 95% confidence intervals (CI) were calculated with StatMate (Version 1.01 July 1, 1996).

3. Results

During the 27 month period, 1474 subjects with spider bites were recruited (Isbister and Gray, 2002). Of these, 168 had a definite bite by a huntsman spider (Sparassidae), two had definite contact reactions to a spider and in three cases it could not be established whether the effects were due to a reaction or bite. The spider was obtained for identification in all 173 cases of spider injury.

In 95% of bites the spider was from one of four genera: *Isopeda* (32%), *Isopedella* (21%), *Neosparassus* (27%) and *Heteropoda* (14%) (Table 1). The remaining spiders belonged to two other recognised genera (*Delena* and *Holconia*), one belonged to an as yet unnamed genus, and two were unable to be identified past family. Species identification was possible in 160 cases, and 30 different species were responsible for injuries in the study. Eight species accounted for 58% of bites, the commonest being *Isopeda villosa* which caused 37 bites (21%) (Fig. 1). The other seven species that caused a significant number of bites were *Isopeda leishmanni* (8%), *Isopedella pessleri* (6%), *Isopedella leai* (5%), *Isopedella flavida* (4%), *H. jugulans* (7%), *N. punctatus* (7%) and *N. calligaster* (5%).

The seasonality of bites by the different genera varied, with only *Isopeda* spp. having a peak in summer months and few bites over winter (Fig. 2). The genera *Neosparassus* and *Heteropoda* caused bites with a more tropical seasonal pattern (dry and wet seasons) (Fig. 2). Bites from huntsman spiders occurred in all parts of Australia, although the genera differed based on their known distributions (Fig. 3). The majority of bites occurred during daylight and the evening, although this was more typical of *Heteropoda* spp. and *Neosparassus* spp.

Of 172 spider injuries where the location and circumstances were known, 95 occurred indoors, 71 outdoors and 6

Table 1

Genus and species level identification of 173 Australian sparassid spiders that caused definite injuries in humans. There was one undescribed species from an unknown genus and four other undescribed species of the genus *Neosparassus*

Taxonomic identification	Number
Genus: <i>Isopeda</i>	56
<i>Isopeda echuca</i>	1
<i>Isopeda leishmanni</i>	13
<i>Isopeda montana</i>	2
<i>Isopeda vasta</i>	1
<i>Isopeda villosa</i>	37
<i>Isopeda</i> sp.	1
Genus: <i>Isopedella</i>	36
<i>Isopedella cerussata</i>	2
<i>Isopedella flavida</i>	7
<i>Isopedella leai</i>	8
<i>Isopedella pessleri</i>	11
<i>Isopedella saunders</i>	1
<i>Isopedella victorialis</i>	5
<i>Isopedella</i> sp.	2
Genus: <i>Heteropoda</i>	25
<i>Heteropoda alta</i>	1
<i>Heteropoda</i> cf. <i>cervina</i>	2
<i>Heteropoda crediton</i>	1
<i>Heteropoda jugulans</i>	12
<i>Heteropoda renibulbus</i>	4
<i>Heteropoda</i> sp.	5
Genus: <i>Neosparassus</i>	46
<i>Neosparassus calligaster</i>	8
<i>Neosparassus diana</i>	3
<i>Neosparassus magareyi</i>	5
<i>Neosparassus patellatus</i>	1
<i>Neosparassus praecinctus</i>	1
<i>Neosparassus punctatus</i>	12
<i>Neosparassus rutilus</i>	2
<i>Neosparassus salacious</i>	3
<i>Neosparassus</i> sp. A6	4
<i>Neosparassus</i> sp. N6	1
<i>Neosparassus</i> sp. N7	2
<i>Neosparassus</i> sp. N9	1
<i>Neosparassus</i> sp.	2
Genus: <i>Delena</i>	3
<i>Delena cancerides</i>	2
<i>Delena</i> sp.	1
Genus: <i>Holconia</i>	4
<i>Holconia immanis</i>	4
Genus: unknown	1
Undescribed species	1
Genus: unable to identify beyond family	2

in a car. This differed between genera, with 63 and 61% of *Isopeda* and *Isopedella* occurring indoors, 52% of *Heteropoda* and 41% of *Neosparassus*. Of *Neosparassus* spiders causing bites indoors, 15 out of 19 (79%) were male spiders,

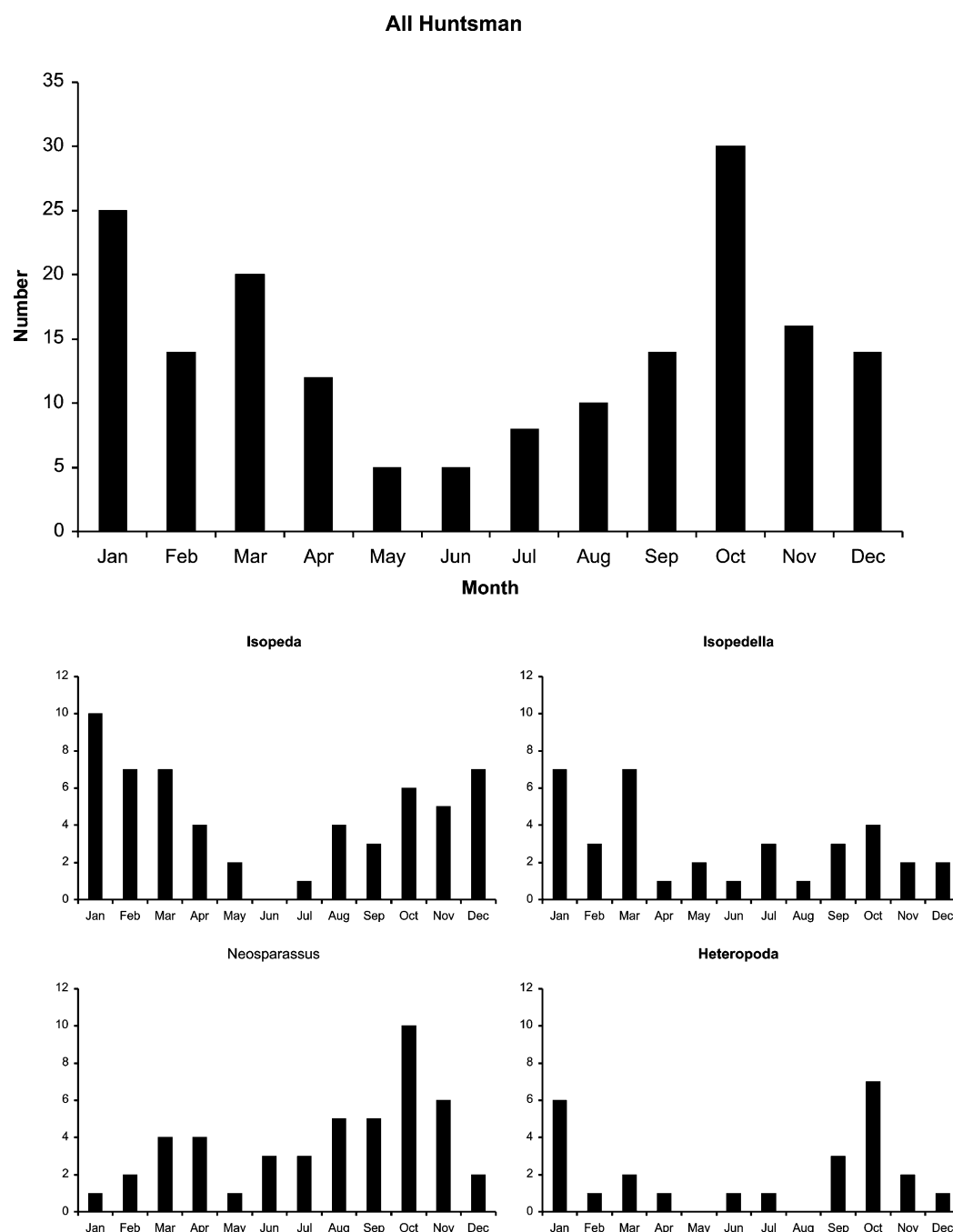


Fig. 2. Seasonal distribution of bites by spiders of the family Sparassidae, including the distribution of the whole family, and of the four genera causing the most bites.

compared to equal numbers of each sex causing outdoor bites. Interfering with the spider, dressing or picking up an object were the major reasons for being bitten by huntsman spiders (Table 2).

Of 173 patients, there were 90 males (52%) and 83 females (48%). Ages ranged from 1 to 86 with a median age

of 37 years (IQR: 23–49 years). There were 31 paediatric cases (ages < 15). Almost all bites (96%) occurred on limbs, with 82% on distal limbs and 13% on proximal limbs, and only 2% occurring each on the trunk and head/neck.

The clinical features of the 168 spider bites are considered in more detail (Table 3). Pain or discomfort

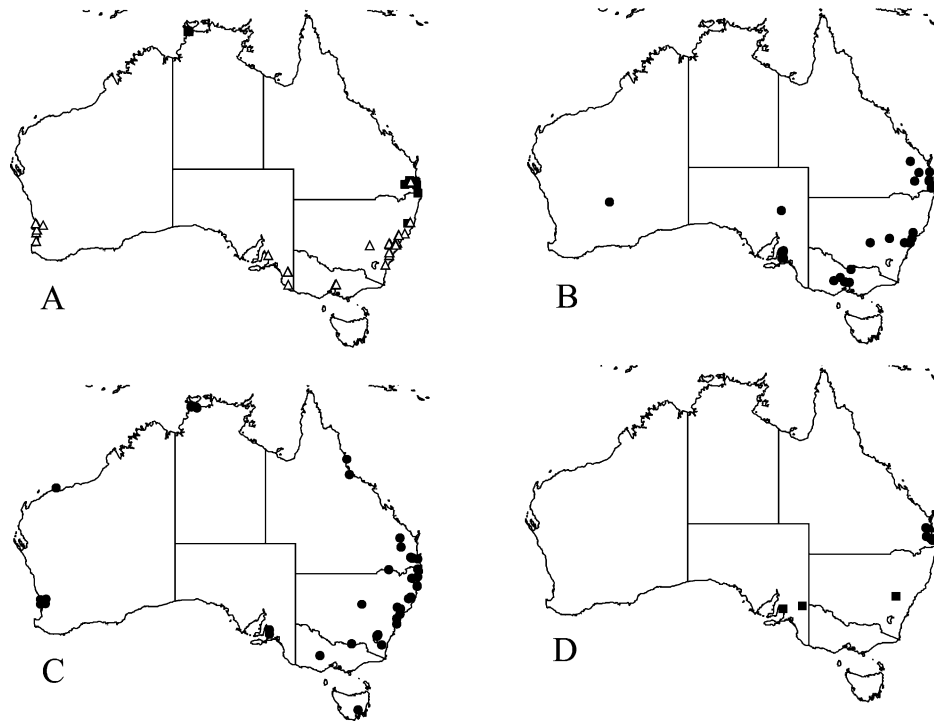


Fig. 3. Geographical distribution of bites by six genera of spiders from the family Sparassidae. (A) *Isopeda* spp. (open triangles); *Heteropoda* spp. (filled squares); (B) *Isopedella* spp.; (C) *Neosparassus* spp.; (D) *Holconia* spp. (filled squares); *Delena* spp. (filled circles).

occurred in all 168 cases, was mild to moderate in 122 cases (73%) and severe in 46 cases (27%). This differed slightly between genera but not significantly (Table 3). The median duration of pain was 5 min (IQR 1–30 min) which was significantly less than all other spiders, but not significantly different within the family. Puncture marks (40%) or localised initial bleeding (35%) occurred in 54% of bites, and both bleeding and puncture marks occurred significantly more often in sparassid bites compared to other spider bites ($p < 0.0001$). Swelling occurred in 16%, itchiness in 14% and redness or a red mark in 57% of cases (Table 3), the latter significantly less common than all spider bites ($p = 0.0002$). Minor local bruising occurred in 5 bites. Systemic effects occurred in 4% of huntsmen spider bites. All systemic effects were minor, mainly nausea and/or headache. Nine percent of patients reported anxiety or related symptoms.

There were 10 cases of contact reactions, including 8 of the 168 where the person suffered a bite and a contact reaction. In the majority of these 10 the effect was due to injury from leg spines. This has been described in detail elsewhere (Isbister and Hirst, 2002). There were no cases of necrotic ulcers or allergic reactions. Although there were no cases of confirmed secondary infection, in four cases there were clinical features consistent with local infection (redness, swelling and pain, often delayed). These occurred in 1 *Isopeda* and 3 *Neosparassus* spider bites.

4. Discussion

This study provides a comprehensive analysis of the effects of bites by spiders of the family Sparassidae, comparing the four major genera that bite group, and the commonest species *I. villosa*. Spiders within the family

Table 2
Activity of the patient at the time of the bite

Description or details of activity	Number	%
Interfering with spider	69	40
Catching spider	28	16
Crawling on self (body)	19	11
Inadvertently touched	14	8
Playing or teasing spider (5 picked up spider; age 1–4)	7	4
Squashed spider	1	1
Dressing	29	17
Putting on shoe	16	9
Dressing in clothes	13	8
Picked up object	32	19
Trod on spider	14	8
Gardening	9	5
Washing (bring in or taking out)	8	5
On towel (drying self)	4	2
Other	7	4

Table 3

Clinical effects of huntsmen (Sparassidae) spider bites and the duration of effects (at least two of these effects); duration as median and interquartile range; percentage and 95% CI for all proportions

Clinical effects	<i>Isopeda</i> (%) ^a	<i>Isopedella</i> (%)	<i>Heteropoda</i> (%)	<i>Neosparassus</i> (%)	All Sparassidae	All other spiders
Local effects						
Pain	100 (93–100)	100 (90–100)	100 (85–100)	100 (92–100)	100 (98–100)	100 (99–100)
Severe pain	34 (22–48)	22 (10–39)	13 (3–34)	35 (21–50)	27 (21–35)	27 (24–31)
Duration of pain	5 min (1–30)	5 min (0.2–19)	5 min (1–10)	5 min (1–20)	5 min (1–30) [†]	5 min (1–88)
Fang marks	43 (30–58)	28 (14–45)	22 (7–44)	37 (23–52)	40 (32–48)*	24 (21–28)
Initial bleeding	40 (26–54)	33 (19–51)	13 (3–34)	54 (39–69)*	35 (27–42)*	7 (5–9)
Initial redness or red mark	51 (37–65)	50 (33–67)	57 (34–77)	65 (50–79)	57 (49–64) [‡]	72 (68–76)
Swelling	21 (11–34)	11 (3–26)	9 (1–28)	20 (9–34)	16 (11–23)	12 (9–15)
Itchiness	13 (5–25)	11 (3–26)	9 (1–28)	17 (8–31)	14 (9–20)**	24 (20–27)
Systemic effects	2 (0–10)	8 (2–23)	0 (0–15)	7 (1–18)	4 (2–8)*	15 (12–18)

Red mark < 24 h or red mark for longer with no other effects. [†]Significantly different to all other spiders: $p < 0.05$; *significantly different to all other spiders: $p < 0.0001$; [‡]significantly different to all other spiders: $p = 0.0002$; **significantly different to all other spiders: $p < 0.01$.

^a No difference for *I. villosa* the largest individual species.

caused similar effects and the previous suggestion that badge huntsmen spiders (*Neosparassus* spp.) cause more severe effects, is not confirmed (Musgrave, 1949; Raven and Gallon, 1987; Southcott, 1976; Sutherland and Tibballs, 2001).

Huntsmen spiders (Sparassidae) are large, common nocturnal hunters distributed throughout Australia (Raven and Gallon, 1987; Musgrave, 1949; Bettini and Brignoli, 1978) and have a characteristic appearance (Fig. 1). During the day they are inactive and shelter beneath loose bark, in crevices or in a temporary retreat in leaf litter. At night, tree or rock dwelling species venture out and often sit motionless waiting for insects to come within reach. Most genera are found on walls of houses, although their normal habitat is trees or shrubs. The erection of dwellings following destruction of their habitat provides these spiders with a suitable alternative (dry vertical surfaces on which to hunt at night and crevices in which to hide during the day). They are also found in cars and are more likely to cause injury from a car accident than from their bites, and only 6 bites occurred in cars in this study.

The genera *Isopeda*, *Isopedella* and to some extent *Heteropoda*, are most often encountered by people (based on museum records), and caused the majority of bites in this study. In bites by spiders of these three genera, over half occurred indoors, reflecting their propensity for housing (Gray, 1977). *Holconia* and *Delena* are uncommon in houses (author observation) and is the likely reason that they caused very few bites in this study. However, *Neosparassus* spp. were the second most common genera to cause bites, and these spiders are rarely seen in buildings as habitat preferences for most species are low shrubs. Where they do occur in residential areas they may be disturbed by gardening activities. Although less bites by this genus occurred indoors, there were still (19 bites) 40% of cases indoors. However, the majority of the bites (78%) from *Neosparassus* spp., that occurred indoors, were due to male spiders, consistent with the behaviour of wandering male

spiders. Seven of the 9 bites occurring while gardening were *Neosparassus* spp.

Huntsmen spiders are not usually aggressive and will only bite if provoked or put in a position where they have no other option (Southcott, 1976). Some *Neosparassus* species (Fig. 1) are very aggressive and when disturbed on the ground may raise the front of the body past a vertical position and, supported by the rear legs and abdomen, spread the front legs and fangs wide ready to attack. Similar threatening displays are sometimes adopted by *Isopedella* and *Isopeda* species but generally these species will move away rather than stand their ground. *Isopeda* will not bite unless provoked, but occasionally lunge at an object, such as a finger, mistaking it for prey. This behaviour of huntsmen spiders is supported by our study. Forty percent of cases were directly a result of the spider being interfered with, and a further 36% were a result of the spider being picked up in an object or clothing (including shoes) and the majority occurred on distal limbs. There were no cases where the spider caused a bite without some sort of provocation. Interestingly, there were slightly more bites to male patients, which differs to other spiders, where females more commonly report bites (Isbister and Gray, 2002). Although the female preponderance in all spider bites is likely a reporting bias (Isbister and Gray, 2002), the reversal seen in huntsmen spider bites is significant and is probably due to more males having a tendency to interfere with or catch spiders.

Huntsmen spider bites were characterised by immediate pain that lasted for 5 min on average, associated with bleeding and/or puncture marks and local redness. Puncture marks and bleeding were significantly more common than other spiders. This is likely a function of the size of the spider fangs, huntsmen spiders being one of the larger araneomorph spiders (modern spiders), with proportionally large fangs.

The proportion of spiders with severe pain was not different to all other spiders, and the pain was less severe

and a much shorter duration than bites by red back spiders (*Latrodectus hasselti*) (Isbister and Gray, 2003). Except for puncture marks and bleeding, huntsmen spiders caused significantly less local effects than other spiders, including local redness and itchiness. They also caused significantly less systemic effects, occurring in only 4% of bites, compared to 15% of all other spider bites. Although evidence of secondary infection was uncommon in huntsmen spider bites, they accounted for 4 of 7 cases in the 750 bites by all Australian spiders (Isbister and Gray, 2002).

The clinical effects occurring from huntsmen spider bites in this study were not consistent with an envenoming syndrome. The majority of local effects were pain and puncture marks, which are far more consistent with a simple mechanical injury by the fangs. Similarly, few patients had systemic effects and none were severe. Headache and nausea are more likely a result of fear or anxiety following a spider bite, and although this cannot be proven beyond doubt, anxiety occurred in at least 9% of bites. Thus, spiders of the family Sparassidae do not cause envenoming in humans, but instead cause a minor mechanical injury. The lack of venomous effects of sparassid spiders is consistent with their feeding behaviour. Mealworms fed to captive huntsmen are often seen struggling for some time after the spider has commenced feeding, suggesting that the spider's venom is ineffective, or little if any was injected when the spider attacked it (personal observation of authors).

There have been a few studies on the venoms of sparassid spiders from both Australia and other parts of the world (Bettini and Brignoli, 1978; Sanguinetti et al., 1997; Korsznjak and Story, 1993; Atkinson, 1993; Atkinson and Wright, 1991). No cytotoxic or pharmacological effects consistent with these studies were seen in human bites, suggesting that either the toxins are not toxic to humans or they are in such small amounts that they do not cause any effect.

There were a number of commonly reported species in our study which are most likely due to the distribution of these spiders in relation to human habitation. The five commonest *Isopeda/Isopedella* species all occur in and around a capital city. *I. villosa* and *I. pessleri* are common in the Sydney area, *I. leishmanni* around Perth, *I. leai* in the Adelaide region and *I. flavida* in Brisbane and southern Queensland. These spiders would be regarded in each of these areas as common huntsmen spiders, and are difficult to distinguish by the non-expert.

White et al. reported 5 bites by *I. leai* (previously *Isopeda pessleri*) causing only minor local effects (White et al., 1989), which were similar to the 8 bites in our study by the same spider. *I. leai* is the commonest huntsmen in the Adelaide region and can be regarded as not dangerous based on these two studies. *I. villosa* was the single most common species of spider to cause bites. This is likely due to its preference for houses and distribution around Sydney. No bites have been previously reported by this spider to the Australian Museum (personal communication Mike Gray,

2003), which may be because no severe effects have ever occurred. Unidentified sparassid spider bites are reported in the Melbourne area according to Sutherland and Tibballs resulting in only moderate local pain (Sutherland and Tibballs, 2001). They report one case of severe pain unrelieved by opiates, but no spider was collected or identified to confirm this as a huntsman spider bite (Sutherland and Tibballs, 2001). There were few bites reported in our study from Victoria, and in particular Melbourne. This is in part due to no cases being recruited through the Victorian PIC which takes calls during daylight hours. The commonest species in Melbourne would appear to be *I. victorialis* which caused 5 bites in this study with no major effects. *I. montana* is also common around the northern outskirts of Melbourne and Dandenongs, and caused 2 bites in this study again with no major effects.

There has been one previous report of a bite by *D. cancerides* in Tasmania (Woo and Smart, 1999). This patient was reported to suffer pain radiating up the affected limb associated with a swollen, erythematous and tender bite site. The patient was inadvertently treated with red back antivenom for the radiating pain, despite the positive identification (Woo and Smart, 1999). There were 3 bites by *Delena* spp. in our study, all causing minor effects, with a red mark and pain lasting for 4 h, and itchiness in one case. In 1 of the 3 bites, the patient removed spines from around the bites site, likely to have broken off from the spider legs.

H. jugulans (7%) was the most common tropical huntsman to be reported in this study and the genus was only responsible for 14% of bites. This is likely due to the more southern distribution of human habitation in Australia. The genus is widespread throughout the tropics, but has been transported to many non-tropical parts of the world. *H. venatoria* is reported in many parts of the world and is often referred to as the banana spider (not to be confused with the armed spider or *Phoneutria nigrescens* of Brazil) because of its propensity to migrate with shipments of bananas. It has been reported in Europe and New Zealand (Sutherland and Tibballs, 2001; Stallybrass, 1969) but there are no records of confirmed bites. The 25 bites by *Heteropoda* spp. in our study all occurred in Queensland or Northern Territory (two were in far north NSW) (Fig. 3), so in either subtropical or a tropical climate. The bites by the NT species have been previously reported (Isbister et al., 2001).

Neosparassus spp. or badge huntsmen have had more severe effects attributed to them in the past (Raven and Gallon, 1987; Brunet, 1998; Sutherland and Tibballs, 2001; White et al., 1995) and that they should be considered dangerous (Sutherland and Tibballs, 2001). The two most commonly reported species in our study were *N. punctatus* and *N. calligaster*, the former occurring in Queensland and northern NSW, and the latter in southern NSW and the Australian Capital Territory. There are four previously reported confirmed bites by *Neosparassus* spiders where it was correctly identified (Musgrave, 1949; Southcott, 1976; White et al., 1989). Despite numerous systemic symptoms

being attributed to this spider, including irregular pulse, persistent nausea, diarrhoea, chills and sweating (Brunet, 1998; Raven and Gallon, 1987), this is not supported by these four confirmed bites (Musgrave, 1949; White et al., 1989; Southcott, 1976). The confirmed bites suggest that *Neosparassus* causes minor local effects and in two cases a mild and short duration systemic illness consisting mainly of nausea and vomiting (White et al., 1989; Musgrave, 1949; Southcott, 1976).

Our study demonstrates that there were no differences in the clinical effects between the different genera, and importantly effects of *Neosparassus* spp. bites were not more severe than other huntsmen. There were 12 bites by *N. punctatus* and 8 by *N. calligaster* (12% in total), the commonest badge huntsmen spiders to bite, and responsible for all previously reported bites (Musgrave, 1949; White et al., 1989; Southcott, 1976). There were no severe effects in these 20 bites, with pain, fang marks, bleeding and redness being reported. Two patients with *N. punctatus* bites had mild systemic effects. One 18 year female had nausea for 12 h, and headache and malaise for 24 h. The second was a 44 year old female who had a headache and lethargy for 12 h.

Neosparassus spiders were the second most common genus to cause bites in this study, and almost caused as many as the far more common *Isopeda* spp. It is known that *Neosparassus* spiders are difficult to capture (unpublished observation) and that they do not venture into houses as often as other genera. It seems unusual then that a spider that is less likely to encounter humans caused so many bites. However, the frequency of spider bites is related not only to the frequency of interaction between the spider type and humans, but also the propensity for the spider to bite (i.e. aggressiveness). It is therefore reasonable to postulate that the far more aggressive *Neosparassus* spiders caused more bites because they were more likely to bite when encountered, unlike the other genera that require significant provocation. This is also supported by the fact that prior to the study by White et al. (White et al., 1989), there were only confirmed reports of *Neosparassus* bites (Musgrave, 1949; Southcott, 1976), and none from other genera (White et al., 1995; Sutherland and Tibballs, 2001).

The majority of reports of huntsmen spider bites come from Australia, although the family occurs throughout the world. There have been a few reports of bites by *Palystes* spp. in South Africa that cause an initial localised burning pain for minutes, with slight swelling or barely perceptible oedema (Croeser, 1996; Newlands and Atkinson, 1988). No systemic effects were reported except in one case in which a woman suffered dizziness and vomiting, associated with local swelling (Croeser, 1996). Sparassids occur in Israel, such as *Sparassus* spp. but have not been reported to be dangerous to humans (Levy, 1989). There is one report of a bite by *Polybetes* spp. in the Americas by Burgh in 1909 which caused high fever, vomiting, insomnia for a week and an ulcer for 45 days (Bettini and Brignoli, 1978). There are no confirmed bites reported from North America (personal

communication, Vetter 2003). Although it is difficult to make any assessment from these few bites, the more recent reports from South Africa and Israel suggest that many other genera of huntsmen cause only minor effects. Early reports, particularly from Burgh, are more consistent with infection than envenoming, consistent with the slightly higher rate of infection in huntsmen bites versus all other spiders in our study.

There were a number of limitations of our study including biases introduced by the recruitment of patients. Firstly, patients needed to have collected the spider to be included. This is less biased than sampling from a population of hospital presentations only, which would exclude the majority of minor bites. In this study only eight cases were seen in hospital, the others were all calls to a PIC, none of which subsequently presented to hospital.

5. Conclusion

Huntsmen spider bites cause only minor effects and there are no differences between different genera within the family. Bites are characterised by immediate and transient pain, often associated with puncture marks or bleeding at the site, and local redness. Most bites occur on distal limbs and result from the spider being interfered with or inadvertently touched. Bites by *Neosparassus* were no different to other sparassid bites refuting previous information that they are dangerous spiders.

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