Troglobitic Spiders of the Nullarbor Plain

Norman Poulter OAM

INTRODUCTION

The first discovery of troglobitic spiders on the Nullarbor Plain occurred during 1966 when Jackie and David Lowry discovered the remains of a large mygalomorph spider, *Troglodiplura lowryi*, in Roaches Rest Cave (6N-58) and later in the same year an araneomorph troglobite, *Janusia muiri*, in Weebubbie Cave (6N-2).

The famed *Tartarus mullamullangensis*, was discovered in 1969, but it was to be 18 years before another species was discovered.

More recently another web building species at present attributed to the genus Icona was discovered in Nurina Cave (6N-46). It belongs to the “comb-footed spiders” (*Theridiidae*) and has troglophilic relatives in caves across southern Australia (Gray 1974 - then listed as "near Steatoda sp.")

During the intervening 36 years, the known range of most of the spiders has been vastly increased while knowledge of their life cycles and environmental needs has remained static. Living populations of the *T. lowryi* have been found in South Australia as well as Western Australia.

Spiders seem to be the dominant predators in the Nullarbor cave's food chain. This paper documents the ranges of the four known troglobitic spider species, where they seemingly overlap while speculating where new populations could be found.

TROGLODIPLURA LOWRYI MAIN 1969 (DIPLURIDAE) NULLARBOR CAVE TRAPDOOR SPIDER

In August 1966 David Lowry, then working for the WA Geological Survey, in company with his wife Jackie, discovered body parts of an undescribed troglobitic spider in Roaches Rest Cave (6N-58) which lies some 43km NE of Madura Roadhouse. The body parts were described by Dr Barbara York-Main of the University of WA's Dept. of Zoology and named *Troglodiplura lowryi* (Main 1969). Several body parts of the same spider species were collected from Old Homestead Cave (6N-83) by Graham Pilkington in 1986 and the Col area of Mullamullang Cave (6N-37) by Norman Poulter in 1992 (Poulter 1993).

In 1982 however, Adrian Davey observed and photographed the first live examples of *T. lowryi* in the cave 5N-253, NE of Nullarbor Roadhouse and permission was granted (the area being under the control of SANPWS) during 1991 to Dr Mike Gray of the Australian Museum for some specimens to be collected for study. The cave 5N-253 is some 350km east of the initial Roaches Rest (6N-58) discovery site. An outcome of the 1991 trip was the preparation of a National Estate listing proposal for Cave 5N-253 because of its association with the only living population of *T. lowryi*. This resulted in its listing upon the Register of the National Estate in 1994. *T. lowryi* is listed as a threatened species under the *Nature Conservation Act 1980*, "Fauna which is rare or likely to become extinct".

Live examples of *Troglodiplura* spiders were not seen in Western Australia until Michael Bradley (SRGWA) observed one walking across a damp intermittent streamway in the research cave 6N-327 on Mundrabilla Station during 1998 although they are now also suspected to be residing in nearby 6N-1384.

Following entry to the (now) research cave 6N-1327 on the Roe Plain section of Madura Plains Station in mid-1997, numerous body parts of *Troglodiplura* specimens were also found leading to speculation that it too, harboured live examples. This was confirmed when Stefan Eberhard visited the cave at the beginning of 2001 (Eberhard 2001). The cave 6N-1327 is the only cave that reaches the water table where *Troglodiplura* has been found - all other caves depend on surface seepage and runoff for moisture.

The few live specimens of *Troglodiplura* seen were simply observed wandering across the cave floors and no associated web or burrow has ever been found. While this suggests that these spiders are vagrant predators, far too little is known about their biology to make any definitive comments. The taxonomic status of the various and widespread populations of *Troglodiplura* remain uncertain although currently all are attributed to one species, *T. lowryi*. There remains some taxonomic uncertainty about the family placement of *Troglodiplura*. Main (1993) concluded that its affinities are with the family Dipluridae or curtain web spiders of eastern and south-western Australia.

JANUSIA MUIRI GRAY 1973 (CTENIDAE)

Again during 1966, the team of Jackie and David Lowry discovered another troglobitic spider, this time in Weebubbie Cave (6N-2) and a living species. The spider was also discovered some 240km away in Pannikin Plain Cave (6N-49) during 1972 by Mike Gray and Nick White of VSA. Both collections apparently took place close to the cave's entrance "near the junction of twilight and dark zones" (Gray 1973) although subsequent encounters have taken place well into the dark zones of caves. Norman Poulter collected a mature *J. muiri* from the far end of the Weebubbie lake in 1985.

Since then, examples of the nomadic *J. muiri* have been found in three other widely spaced and environmentally different caves, namely 6N-206, 6N-1327 and 6N-1536. The muiri spiders noted by Norman Poulter in the research cave 6N-1327 and 6N-206 appear to be much smaller than that found in Weebubbie Cave, being similar in size to those found by Paul Devine in 6N-1536 on Balgair Station near the Trans Australian Railway. The Weebubbie species could be 'ecologically' larger due to the abundance of food opportunistically provided by the external feeding habits of the resident population of (twilight nesting) birds and bat species (dark zone).

However, these smaller spiders could simply represent younger growth stages. The paucity of mature specimens and the absence of males makes assessment of the taxonomic status of these populations and of generic relationships extremely difficult. Gray and Thompson (2001) suggested that *Janusia* may be related to *Bengalla bertmaini*, a troglobitic species of Northwest Cape Peninsula.

THE GENUS _TARTARUS_

The species that was to become the most famous Nullarbor spider was found in the Dome chamber of Mullamullang Cave (6N-37) by Peter Hawkes in 1969. Initially it received scant coverage, merely "CEGSA found an unidentified live spider in the Dome, Mullamullang," as reported in the Down Under All Over section of issue 43 of the *ASF Newsletter* (Anon 1969). A description written by Alan Hill and a drawing of the spider appeared in the following issue (#44) although Hill made no mention of spiders when his paper "Caves of Australia #4, Mullamullang Cave" was published in the ASF Newsletter #52 in June 1971. The spider was ultimately named *Tartarus mullamullangensis* after the cave and its peculiar "lampshade" web was described (Gray, 1973). The spider's only food source appeared to be the blind cockroaches (*Trogloblattella nullarborensis*) observed in the Dome chamber. For almost 16 years this was the only residential address the spider had, and there was even speculation from the early 1980's that the spider may already be extinct, the last known sighting in the Dome being the mid-1970's.

1985 saw a minor explosion of *Tartarus* spider findings begin when members of the Murdoch University Outdoor Group, led by Wayne Tyson, found examples of the spiders to the north of Mullamullang in Murdoch Sink (6N-330) and Phyllistine Flattener (6N-194). At the same time, the Group voiced the first concern that the spider may be extinct in Mullamullang. Several months later, Norman Poulter, leading a trip of SRGWA members on behalf of UWA researcher Dr Brenton Knott, found a colony of *Tartarus* spiders in a newly discovered section of Nurina Cave (6N-46) while a single female was found in Thampanna Cave (6N-206) several days later by other SRGWA members. Subsequent research conducted by Dr Mike Gray revealed significantly different body variations in the respective spiders, enough to create three new species: *Tartarus murdochensis*, *T. nurinensis* and *T. thampannensis* (Gray, 1992).

The important point about this work was that it showed that these spiders, including *T. mullamullangensis*, are highly localized, with species distributions perhaps confined to single cave systems. This contrasts markedly with the tendency to assume wide Nullarbor cave distributions for other troglobitic species like the blind diplurid, *Troglodiplura lowryi*.

But it didn't stop there! *Tartarus* spiders now began to be found over an ever-widening range, seemingly spearheaded by members of CEGSA and SRGWA. Colonies were subsequently found in 6N-36 (CEGSA), 6N-53 (SRGWA), 6N-149 (WASG), 6N-206 (SRGWA) 6N-326 (?), 6N-327 (SRGWA), 6N-645 (CEGSA), 6N-707 (only remains found), 6N-747, 6N-1327 (SRGWA) and 6N-1384 (CEGSA). These caves are all in reasonable proximity to the Eyre Highway.

However, SRGWA member Paul Devine, operating from Kalgoorlie, began prospecting for caves along the Trans Australian Railway and during the late 1990's made some exciting discoveries of *Tartarus* spiders at 6N-1612, 6N-1556, 6N-1536 and 6N-1593 on Balgair Station near Rawlinna in addition to 6N-1759, 6N-1764, 6N-1773, 6N-1789 and 6N-1789 in the vicinity of Old Homestead Cave (6N-83) near Forrest. He found one enormous colony of 45-50 in 6N-1536 which was only recently topped by the 90 counted in the research cave 6N-327 on Mundrabilla Station during January 2002 (Poulter 2002).

There appears to be significant differences between the *Tartarus* spiders found close to the Eyre Highway and those in the vicinity of the Trans Australian Railway. Those found close to the Trans Australian Railway are smaller than their southern relatives and spin totally different webs. Reaction to prey also appears to be markedly different.

The typical female web made by southern Nullarbor species, like *T. mullamullangensis* and *T. nurinensis* is a gently widening cylinder (lampshade-shaped), established on horizontal or sloping roof, wall or boulder surfaces. The spider sits at the cylinder's base with legs spread out to touch the web's side wall from which it senses prey movement. The web in turn, due to its airborne structure, can, with it support lines, occupy several cubic metres of space. Apart from the capture silk, the web structure is virtually impossible to see with direct lighting and is highly susceptible to air turbulence. When prey encounter the web, there is instant reaction from the spider who lifts a portion of web and throws it over the prey while moving in for the kill. The females spin this web seemingly from birth, young spiders with a legspan that would barely cover a 1¢ piece have been seen in webs scaled to their size.

On the other hand, the northern *Tartarus* spin a flat, rectangular web (about 500 x 700mm) that hangs from the roof or steeply angled walls or rocks. To all intents, the spider sits underneath the web towards one corner and from observations so far, appears disinterested when prey become entangled in the web. Indeed, when on two occasions, cave wetas were guided into a web in 6N-1536, the spider showed no reaction at all, which allowed the weta in question to escape - twice. Another weta was not so lucky, thoroughly caught, it was consumed overnight, although again, the spider seemed disinterested with the initial ensnarement. Spiders utilising this web have been seen as far south as 6N-36, a short distance to the west of 6N-37.

Male *Tartarus* spiders, from limited observations in southern caves, appear to be nomadic. As they navigate in search of females they lay a silken thread across the ceiling rock between webs. Again, from limited observations, courtship appears to be a long, drawn-out affair with some indications that the female may have cannibalistic tendencies if the male doesn't perform to her liking. During courtship, the female's web can suffer considerable damage. Observation also suggests that when the female spider moves her web site, she may re-ingest the majority of her web as a possible energy-saving measure. Small suspended egg sacs, resembling Grecian urns have been found in the research caves 6N-327 and 6N-1327 that are suspected to be related to the *Tartarus* genus.

The *Tartarus* spider became a protected species under the *Wildlife Conservation Act 1950* as "Fauna which is rare or likely to become extinct" in 1994.

THE GENUS *ICONA* (FAMILY THERIDIIDAE)

A blind species of *Icona*, as yet undescribed, is the smallest of the Nullarbor troglobitic spiders with the most limited range, currently known from only two caves approximately 9km apart on the Roe Plain, Nurina Cave (6N-46) and the research cave 6N-1327. These spider belong to the "comb-footed spiders" (*Theridiidae*) and have relatives in caves across southern Australia, all of which are temporarily placed in *Icona*, but according to Mike Gray they will require a new genus.

The spider's body length is approximately 5mm with the legs extending about the same distance. It was first discovered in the Fauna Chamber of Nurina Cave in May 1987 (Poulter 1987) and 6N-1327 almost eleven years later (Poulter 1998). The spider builds a small complex horizontal suspended platform web and hangs underneath. The platform would be approximately 40 x 20 x 5mm which in turn is suspended a short distance from the rock ceiling or projection and has numerous support lines. Nothing is known of its prey preferences.

DISCUSSION

The Nullarbor Plain is a vast karst region of some 200,000km^2 whose troglobitic fauna have received scant scientific attention in either the more frequently visited forested southern sector or the more arid interior. The term "forested" is purely figurative, the correct term being closer to "woodland". However, the majority of discoveries have been made by members of speleological societies on a more-or-less opportunistic basis. Based on what has been found over the last fifteen years, the potential for further discoveries, especially microscopic or aquatic, would have to be rated high.

As shown by the accompanying simplistic diagrams, the ranges of three of the genera of troglobitic spiders and their prey species is quite large. The ranges were derived from drawing arbitrary boundary lines between the outermost caves in which the various spiders were discovered. These ranges indicate that if environmental conditions are right, a troglobitic faunal regime could exist in any cave within those boundaries - being careful not to exclude the possibility of finding more faunal caves beyond the existing boundaries. Quite obviously, speleological exploration in these regions need to be conducted with upmost care - particularly where a new cave is opened by excavation.

However, it will be noted that in several instances, boundaries overlap - where two or more spider species coexist in the same cave, do they occupy convenient, non-competitive food niches, or actively prey on each other? Only further long-term observation will yield an answer to that and other behavioral questions.

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FOOTNOTE

Since the presentation of this paper during January 2003, two spider discoveries of note have taken place. In cave 6N-2203, which lies within the area predicted where both the spiders *T. lowryi* and *Tartarus* genus could be found if conditions were suitable, a small co-existing colony was found by SRGWA members Paul Devine and Eve Taylor. The member of the *Tartarus* colony was of the sheet-web variety. Of greater significance however, was the discovery a short time later of the one sheet-web building *Tartarus* spider in 6N-2455, a small cave to the north of the Trans Australian Railroad in the vicinity of Loonganna – thus greatly increasing the range of this species of troglobitic spider, see updated maps.

REFERENCES

ANON. (1969). CEGSA - Down Under All Over. *ASF Newsletter* #43 page 7.

EBERHARD. S. (1999). The Biological Significance of Caves N46, N327 and N1327 on the Nullarbor Plain. Report to Speleological Research Group Western Australia Inc. and Department of Conservation & Land Management (Southeast Region) Republished in *Caver's Chronicle* Vol. 26 #1 pp 25-34.

GRAY M.R. (1973). Cavernicolous Spiders from the Nullarbor Plain and South-West Australia. *Journal of the Australian Entomological Society* Vol. 12 pp 207-221.

GRAY M.R. (1974). *Helictite*.

GRAY M.R. (1992). The Troglobitic Spider Genus *Tartarus* Gray with a Clasdistic Analysis of *Tartarus* and *Baimami Lehtinen* (Araneae: Stiphidiidae) *Proc. Linn. Soc. of NSW* 113: pp 165-173.

HAMILTON-SMITH E. Biological Aspects of Cave Conservation. 1970. *ASF Newsletter* #50 pp 7-14.

HILL A. (1969). Nullarbor 1969. *ASF Newsletter* #44. pp 4-8.

LOWRY J.W.J. (1970). Troglobitic Spiders from the Nullarbor. *ASF Newsletter* #47 pp 50.

POULTER N. (1987). Nullarbor (April 11 - May 3). *Caver's Chronicle*, Vol. 14 #1 pp 6-8.

POULTER N. (1993). Nullarbor (Dec.9-15, 1992). *Caver's Chronicle*, Vol. 20 #1: pp 4-5.

POULTER N. (1998). Nullarbor (26/12/1997 - 11/1/1998) *Caver's Chronicle*, Vol. 25 #1 pp 11-15.

POULTER N. (2002). Nullarbor - Various Caves. (28/12/2001 - 14/1/2002), *Caver's Chronicle* Vol. 29 #1 pp 6-9.

RICHARDS A. (1971). An ecological study of the cavernicolous fauna of the Nullarbor Plain Southern Australia. *Journal of Zoology* London 164: 1-60.

YORK-MAIN B. (1969). A blind mygalomorph spider from a Nullarbor Plain cave. *Journal of the Royal Society of WA* 52 (1): 9-11.

YORK-MAIN B. (1993). Biogeographic significance of the Nullarbor cave mygalomorph spider Troglodiplura and its taxonomic affinities. *Journal of the Royal Society of Western Australia* 76: pp 77-85.

Contact details

PO Box 120, Nedlands WA 6909.

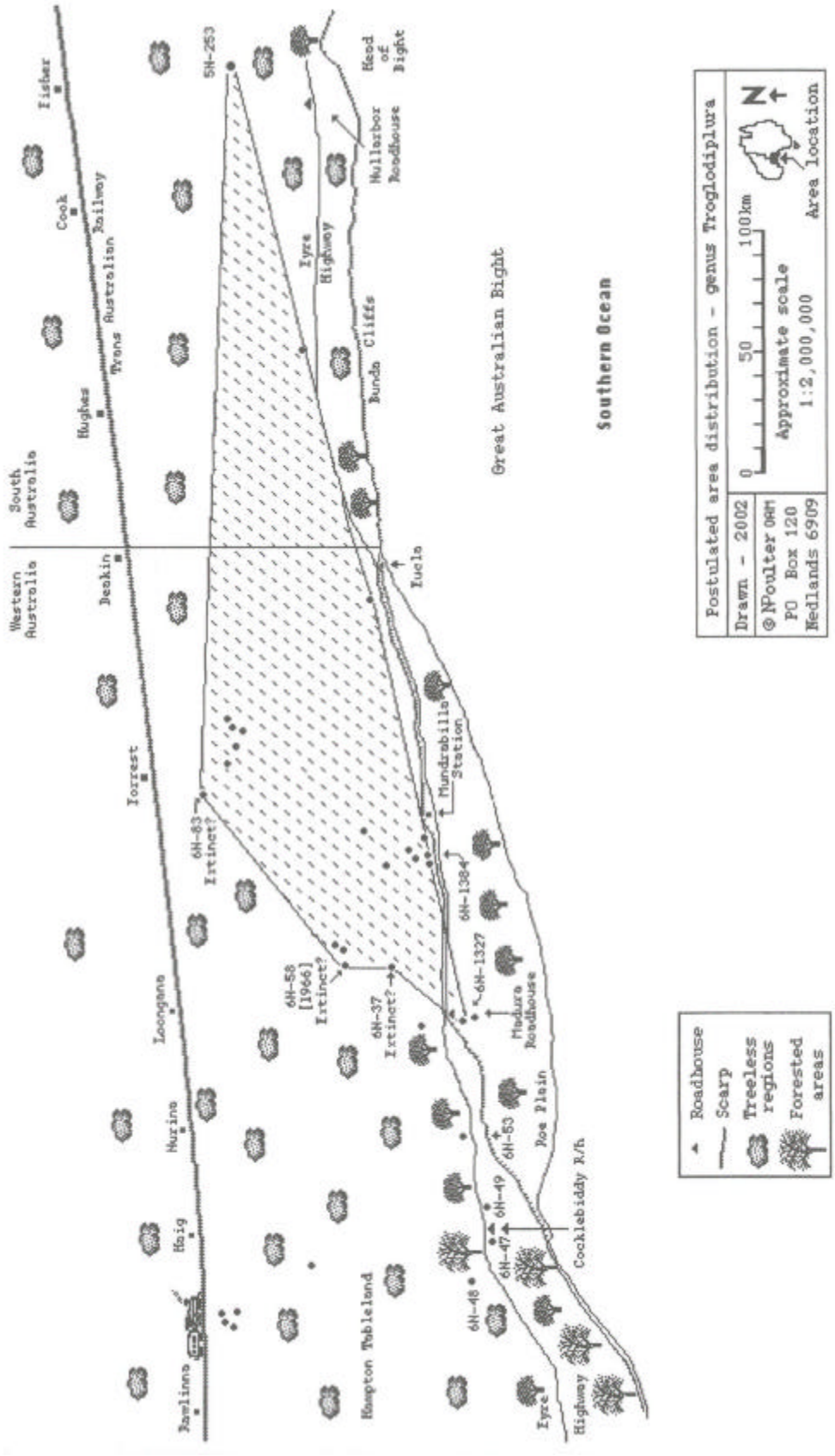

Figure 1 – Postulated Area Distribution – genus Troglodiplura

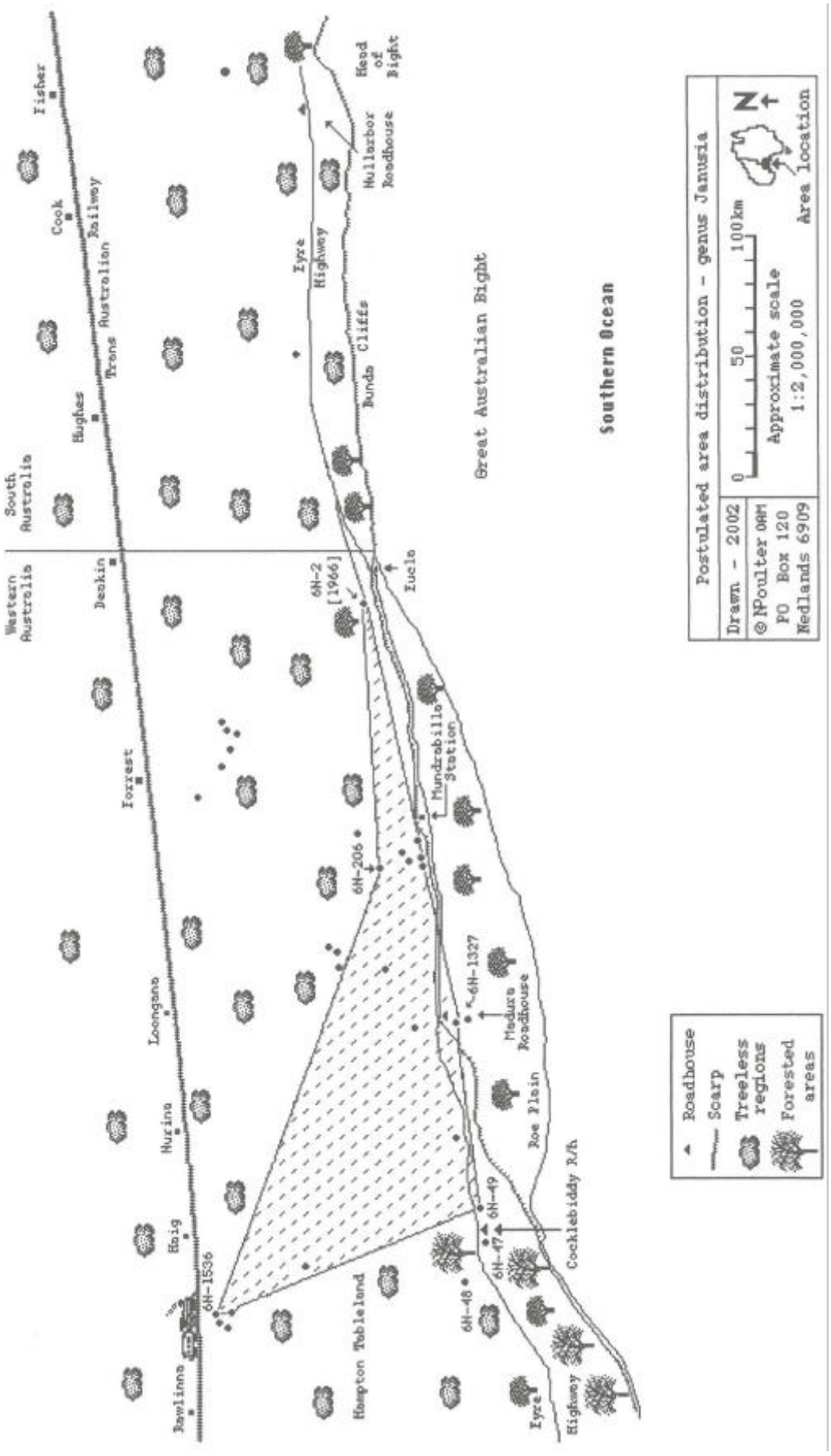

Figure 2 – Postulated Area Distribution – genus Janusia

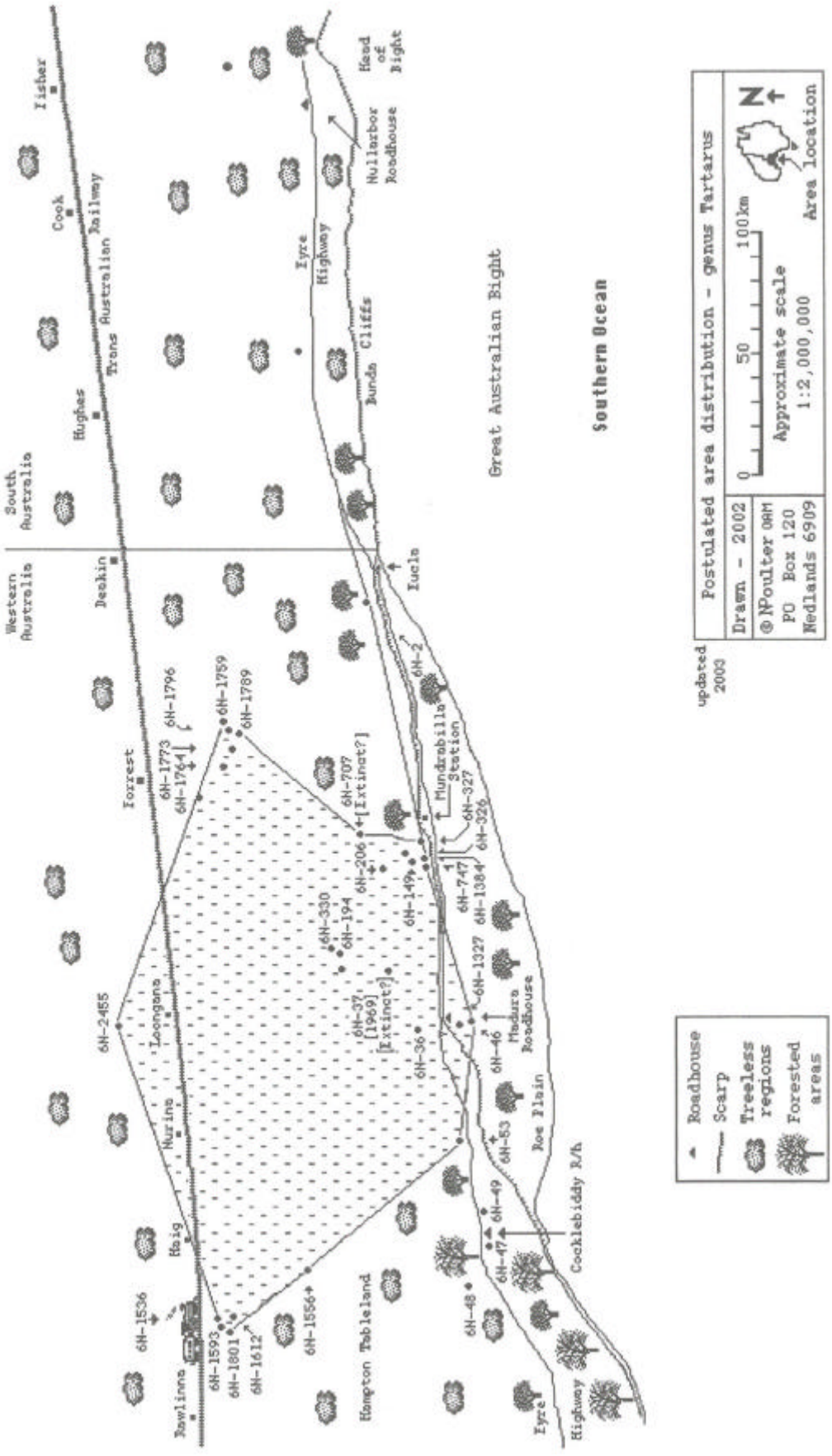

Figure 3 – Postulated Area Distribution – genus Tartarus

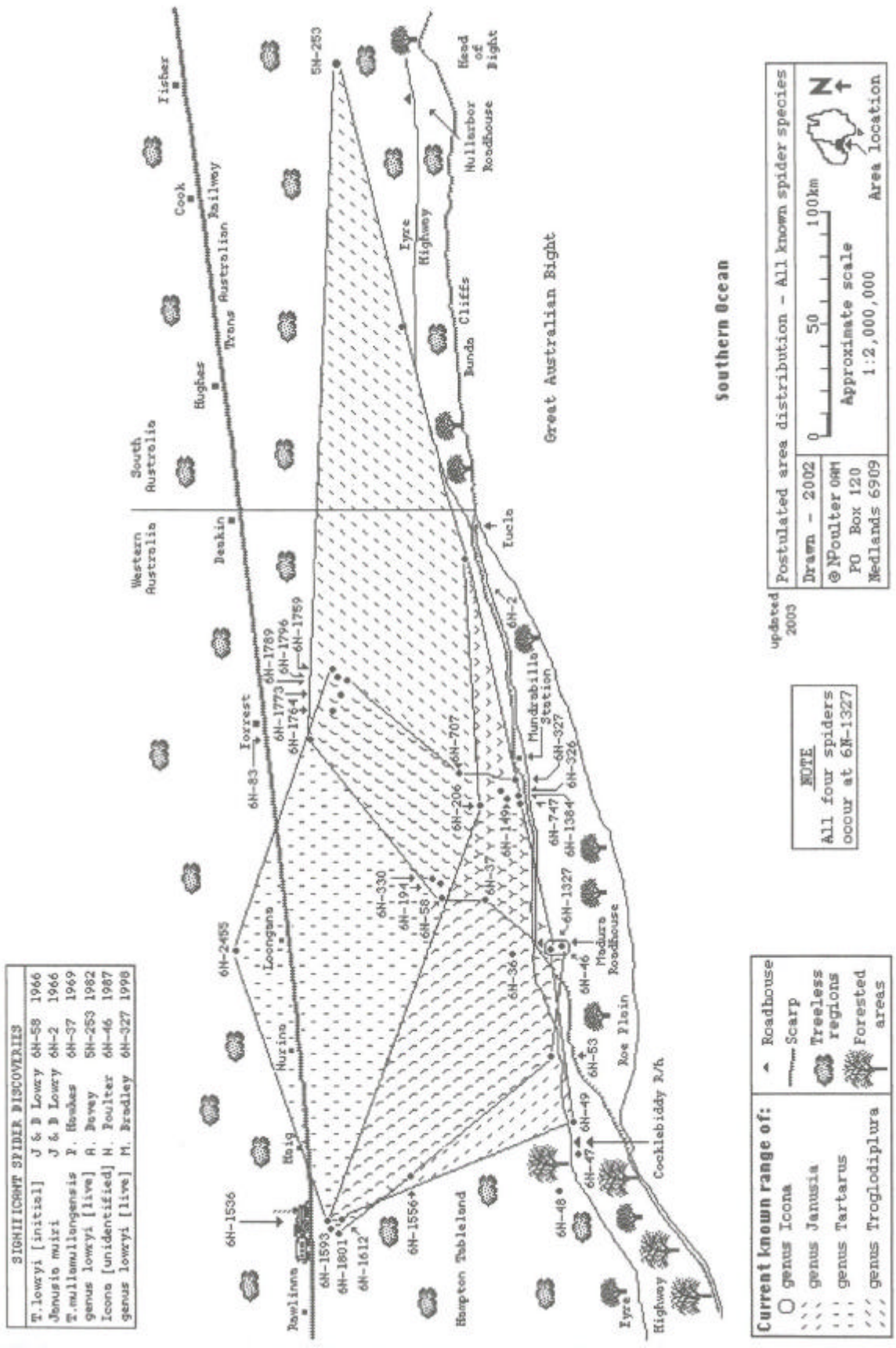

Figure 4 – Postulated Area Distribution – All known spider species