

THE WOLF SPIDERS OF AUSTRALIA (ARANEAE: LYCOSIDAE): 8.
TWO NEW SPECIES INHABITING SALT LAKES OF WESTERN AUSTRALIA

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ABSTRACT

Two new species of Wolf Spider, *Lycosa alteripa* and *Lycosa salifodina*, are described from salt lake habitats in Western Australia.

Australia, due largely to position, size and topography is, with the exception of Antarctica, the driest of the continents; about 93 per cent of the land mass receives less than 510 mm, and 37 per cent receives less than 250 mm of rainfall per year. The driest area is located in South Australia, around Lake Eyre, where on the average less than 125 mm of rain falls annually. Evaporation in inland Australia is exceedingly high, and therefore permanent bodies of standing water—lakes, lagoons, and ponds—are rare. Much of the land surface is of low topography and is characterised by ephemeral rivers draining into salt lakes, and vast areas of uncoordinated drainage.

This area of internal drainage has innumerable playas, some saline, others gypsiferous or clayey. The small claypans and salinas are the sumps for local drainage and periodically fill with the runoff from surrounding areas which may be very extensive during cyclonic rains; the water evaporates leaving brine swamps or expanses of salt-encrusted clay, devoid of vegetation or surrounded by samphire (*Arthrocnemum*) communities with salt-bush and spinifex zones more distant. Some claypans have a continuous samphire margin, the inner part of which breaks up into clumps, and then on to vast clay flats that progressively become encrusted with evaporites until a layer of salt is formed. The largest salt lakes are frequently near or below sea level, and those of Lake Eyre and Lake Frome form a giant internal drainage basin some 1,250,000 km² in area. The evaporites are predominantly sodium chloride (90–95%) with lesser amounts of magnesium sulphate (5–7%) magnesium chloride (up to 4%) and calcium sulphate (up to 2.5%) (Johns and Ludbrook 1963), and originate from 'rocks which crop out in the

catchment area and, carried dominantly by shallow groundwater to a hot arid region of interior drainage, has then been concentrated at various times during the Quaternary' (Wopfner and Twidale 1971, p. 138). The depth of the salt deposit varies from a thin encrustment to about 44 cm or more. Some playas or salinas are arranged in chains of white saltpans which may fill and have connected flow in periods of heavy rainfall, only to evaporate and redeposit the salt along the drainage system. The salt layer is therefore dissolved and reformed at irregular intervals, but may remain stable for many years during drought periods.

Figure 1 shows the extent of the uncoordinated drainage system in mainland Australia, and the major salt lake systems. The system is undoubtedly an ancient one and sufficiently stable to provide a suitable habitat for lycosid spiders. Hickman (1944) described *Pardosa eyrei* from the 'surface of North Lake Eyre two and a half miles from the shore' but no details were given concerning the burrow or life history. Immature *Lycosa* specimens have also been collected from lakes Callabonna, Ngapakaldia, and Palankarinna, in South Australia.

Two salt encrusted habitats were investigated in Western Australia; Lake Lefroy near Widgiemooltha, by Mr Athol Douglas of the Western Australian Museum, and a small claypan near the mouth of the Fitzgerald River by the author. The Wolf Spiders are readily captured using a head torch at night; the light is carried on the forehead, and by looking along the beam, the reflection of the light, appearing as pin points of pale emerald green, may be seen from spiders' eyes. On the surface of the salt lake the spiders are quite easily detected by this means, and individuals were



FIG. 1: Mainland Australia showing area of internal or uncoordinated drainage and distribution of salt lakes and claypans.

spotted a hundred yards out on the salt. Two quite unrelated species were discovered and are described below.

***Lycosa alteripa* sp. nov.**
(Fig. 2a-e)

MATERIAL EXAMINED

HOLOTYPE: Western Australian Museum WAM 71-40, ♂M (C.L. 9.6 mm), claypan near mouth of Fitzgerald River, W.A., collected by R. J. McKay and R. Prince, 11 July 1970. In spirit.

PARATYPES: Fitzgerald River (data as holotype), 1♀P 2♂M 2♂P 1J WAM 71-41-6. Claypan on road to Fitzgerald River—Susetta River junction, 13 July 1970, RJM, 1J WAM 71-47. Salt lake near Israelite Bay, W.A., 19 April 1974, A. V. Thomas, 1♀M WAM 74-501.

DESCRIPTION (Based on the holotype.)

Carapace pale grey to smoke white; radiating narrow wedges of charcoal grey originate near the white foveal area, almost reach the lateral margin, and have a pearl grey to white spot immediately behind or at their extremity; face silver grey; paturon smoke grey, fang black; labium and maxillae pale brown, sternum dark brown covered with grey hair; coxae pale grey-brown. Abdomen smoke grey above and below, an ornate pattern of charcoal grey is present on the dorsal surface (Fig. 2a), sides and venter uniform pale smoke grey. Legs pale grey-brown to pinkish grey with white hair and conspicuous dark brown spines; femora with two slightly darker brown blotches above, sides

and ventral surface pale; patellae with the proximal half mid-brown on the dorsal surface, pale below; tibiae of the first pair of legs dark charcoal brown, remaining leg segments dark brown; tibiae of the third and fourth legs with a basal dark half-band, a mid half-band of brown, and the extremity dark tipped; remaining leg segments pale brown; palp pale smoke grey, cymbium darker grey.

Anterior row of eyes procurved, AM larger than AL. Ratio of eyes AM:AL:PM:PL = 16:14:35:27; distance AM:AM 7, AM:AL 5, AM:PM 6, AL:PM 7, PM:PM 23. Clypeus to AM 10. Length of first eye row 75, length of second eye row 89 micrometer units.

Chelicerae with 3 promarginal teeth on the right side, the middle one largest; 4 promarginal teeth on the left side, the second one largest; three retro-marginal teeth of about equal size on both sides. Labium longer than wide.

The palpal organ differs from all the known Australian *Lycosa* species in having the secondary conductor sclerotised (Fig. 2b, d). The median apophysis has a recurved hook-like tip. A dissection of the male palp was not made, and therefore the structure remains to be studied in full when additional specimens are collected.

VARIATION: Males, females and juveniles are similarly patterned, the very small examples being somewhat more dark grey. Some specimens have the light background colour almost pure white with a grey-green pattern dorsally, occasionally tinged with mauve or pink. The undersurface of the abdomen is white without a pattern in males, but may be tinged with yellow in mature females.

The eye diameters and interspaces of the holotype and paratypes are given as a per cent of the total width of the first row of eyes, in Table 2; all specimens have the first row of eyes shorter than the second row.

The male palpal organ is illustrated in Fig. 2b, d; the epigynum of the female in Fig. 2c, and the internal genitalia of the female in Fig. 2e.

SIZE RANGE: Mature female 11.1 mm; Mature males 9.0 to 9.6 mm.

TABLE 1: MEASUREMENTS OF LEG SEGMENTS OF HOLOTYPE OF *L. alteripa* IN MM

Leg	Femur	Patella	Tibia	Metarsus	Tarsus
1	7.7	3.3	5.6	8.7	3.7
2	7.6	3.3	5.5	9.2	3.7
3	7.2	3.2	4.6	9.4	3.8
4	9.0	3.2	6.3	11.3	4.4
Palp	4.0	1.8	2.0	—	—

DIAGNOSIS: The mature female epigynum has a short median guide with a recurved transverse guide (Fig. 2c). The male palpal organ has a sclerotised secondary conductor with a hook-like median apophysis. All specimens are pale grey to smoke-white without a ventral pattern on the abdomen.

LIFE HISTORY

Unknown.

HABITAT

Claypans of southeastern Western Australia. All specimens were collected more than 2 to 3 metres from the margin of the claypan where the dried grey clay was encrusted with salt crystals. The mature males were found widely scattered over the middle of the dry claypan and none were seen near the samphire covered margins of the claypan where a rather robust brown *Lycosa* species (?*L. egena*) was very common.

BURROW

One juvenile was collected from a shallow open burrow near the middle of the claypan but as no other burrows were located it is possible that the burrows of mature specimens are closed with a tightly fitting door or lid.

DISTRIBUTION

Southeastern Western Australia, but possibly widespread on Western Australian inland and dry coastal claypans and saltpans.

DERIVATION

From the aboriginal 'alteripa' meaning claypan.

TABLE 2: EYE DIAMETERS AND INTERSPACES OF *Lycosa alteripa* CONVERTED TO PER CENT OF THE TOTAL WIDTH OF THE FIRST ROW OF EYES

Regd. No.	Sex	C.L.	AM	AL	PM	PL	AM:AM	AM:AL	PM:PM	AM:PM	AL:PM
Holotype	♂M	9.6	21	19	47	36	9	7	31	8	9
WAM74-501	♀M	11.1	20	15	45	40	10	10	34	11	11
WAM71-41	♂M	9.4	21	18	47	41	8	8	33	11	8
WAM71-42	♂M	9.0	20	17	47	44	10	9	36	9	9

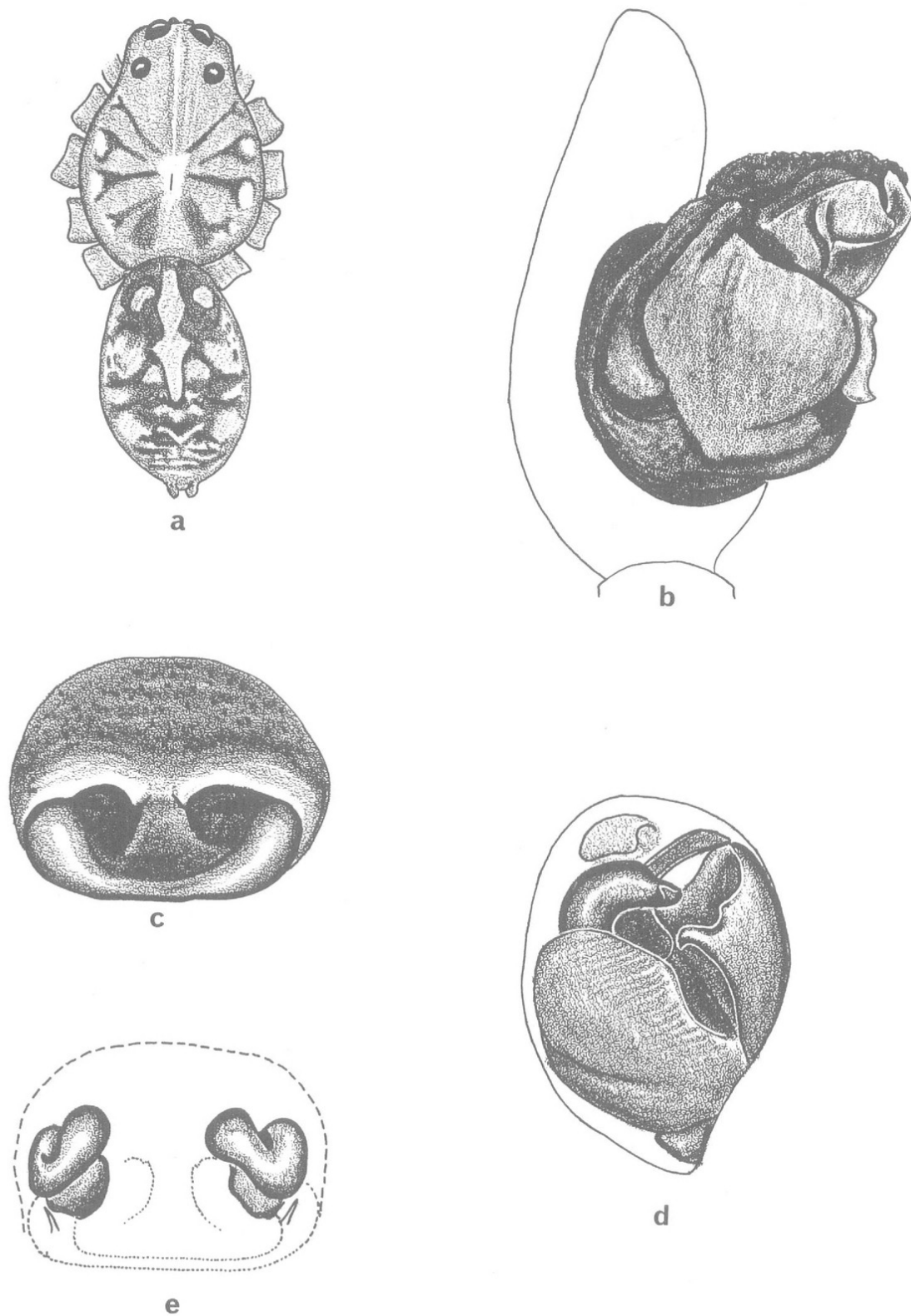


FIG. 2: *Lycosa alteripa*. a, holotype; b, male palpal organ of WAM 71-41 slightly expanded; c, epigynum of WAM 71-501; d, male palpal organ of WAM 71-41; e, internal genitalia of WAM 71-501.

Lycosa salifodina sp. nov.
(Fig. 3a-g)

MATERIAL EXAMINED

HOLOTYPE: Western Australian Museum WAM 69-369, ♀M (C.L. 14.1 mm), Lake Lefroy, Widgiemooltha, W.A., collected by A. M. Douglas and L. Koch, 24 January 1968. In spirit.

PARATYPES: Lake Lefroy, Widgiemooltha, W.A., 24 January 1968, A. M. Douglas, L. E. Koch, ♀M WAM 69-104, 3♀M WAM 69-366-8, 3♂M 2♂M 22J WAM 69-370-94; March 1970, A. M. Douglas, 4♀P WAM 70-56-9, ♀M WAM 71-1747; 11.iv.1971, A. M. Douglas, 1♀M 1J QM W4543.

DESCRIPTION (Based on the holotype.)

Carapace brown, covered with pink-tinged white hair; where the hair has been rubbed off some faint brown radial lines may be discerned, but these are not present in life; face white with a pink tinge; paturon white with the lower part black; labium and maxillae black; sternum and ventral surface of coxae black. Abdomen with the dorsal surface pink-white; a brownish longitudinal stripe reaching half length of abdomen with two white spots on each side at the middle; two pale-brown chevron-shaped transverse bars posteriorly; ventral surface pink to white with two dark brown to black-brown longitudinal stripes tapering posteriorly and fading before the spinnerets, the area between the two stripes is brownish-pink in life becoming very pale brown after preservation (Fig. 3a); area anterior to epigastric furrow and over lung-book covers brown, becoming dark brown after preservation. Legs pink to ash-grey, spines black; extremities of

VARIATION: Males and females are similarly coloured; juveniles lack the pattern on the ventral surface of the abdomen, and in mature specimens this pattern may consist of two dark-brown to black converging broad stripes or lines, sometimes with a faint dusky line or black bar between, or occasionally the area between the two or three bars is pigmented with grey, brown, or black to the extent that the pattern appears as a dark brown somewhat rectangular blotch with the lateral margins darker. Some specimens have the ventral tips of the tibiae dark brown, grey or black distally; in large males the anterior pairs of legs may have the tibiae, metatarsi and tarsi dark brown, greyish or almost black-brown with a greyish tinge. In life the spiders may be white, off-white or pink-white in colour.

Juveniles have very prominent PM and PL eyes. The eye diameters and interspaces of the holotype and six paratypes are recorded as a per cent of the total width of the first row of eyes in Table 4.

Little variation was found in the shape of the epigynum, that of the holotype and a paratype is the femora, tibiae and metatarsi with a dark brown to black edge; undersurface of metatarsi and tarsi brown, the anterior pair of legs with the distal half of the tibiae, the whole of the metatarsi and tarsi black below, becoming dark brown after preservation.

Anterior row of eyes procurved, AM larger than AL, PM eyes large and conspicuous measuring about 2 mm in diameter. Ratio of eyes AM:AL:PM:PL = 11:7:31:29; distance AM:AM 7, AM:AL 4, AM:PM 5.5, AL:PM 4, PM:PM 23. Clypeus to AM 7. Length of first eye row 51, length of second eye row 79 micrometer units.

Chelicerae with three promarginal teeth, the middle one largest; three retromarginal teeth of about equal size. Labium longer than wide.

Epigynum elongate with a well developed median guide somewhat expanded anteriorly and terminating in a moderately broad transverse guide (Fig. 3c).

TABLE 3: MEASUREMENTS OF LEG SEGMENTS OF HOLOTYPE OF *L. salifodina* IN MM

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus
1	10.3	5.3	7.5	8.7	3.5
2	9.7	5.0	7.5	9.0	3.5
3	9.8	4.5	6.5	8.8	3.9
4	11.2	4.8	7.9	11.6	4.1
Palp	5.2	2.5	3.2	—	3.3

TABLE 4: EYE DIAMETERS AND INTERSPACES OF *Lycosa salifodina* CONVERTED TO PER CENT OF THE TOTAL WIDTH OF THE FIRST ROW OF EYES

Regd No.	Sex	C.L.	AM	AL	PM	PL	AM:AM	AM:AL	PM:PM	AM:PM	AL:PM
Holotype	♀M	14.1	22	14	61	57	14	8	45	11	8
WAM69-104	♀M	13.8	22	14	62	56	12	10	46	11	11
WAM69-366	♀M	12.2	22	15	60	57	14	7	44	11	10
WAM69-367	♀M	13.2	22	14	63	53	13	12	44	11	8
WAM69-368	♀M	12.9	22	15	64	60	11	9	45	9	6
WAM69-370	♀M	13.2	23	12	63	51	10	12	43	10	8
WAM69-371	♂M	12.3	23	15	67	49	9	9	40	12	10

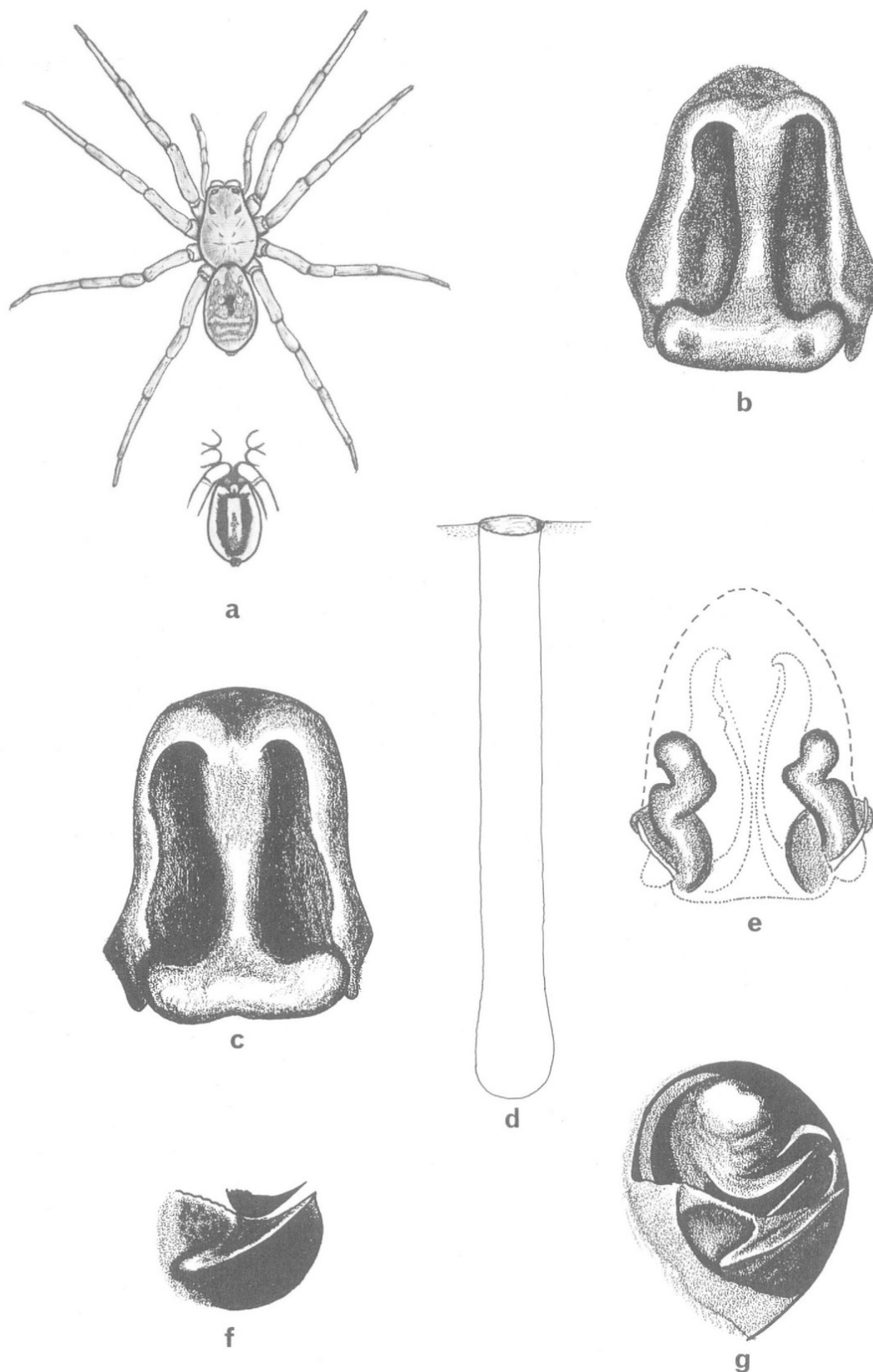


FIG. 3: *Lycosa salifodina*. a, holotype showing ventral surface of abdomen; b, epigynum of WAM 69-104; c, epigynum of holotype; d, burrow construction; e, internal genitalia of WAM 69-104; f, median apophysis and embolic guide of WAM 69-371; g, male palpal organ of WAM 69-371.

illustrated in Fig. 3c, b. The internal genitalia of one paratype female is shown in Fig. 3e. The male palpal organ has a blade-like median apophysis (Fig. 3f) and a curved pointed embolic guide (Fig. 3g). The structure of the palpal organ resembles that of some members of the bicolor group (McKay 1973) and is a fairly common basic type found in many of the larger *Lycosa* species.

SIZE RANGE: Mature females C.L. 12.1 to 13.8 mm. Mature males C.L. 11.8 to 12.3 mm.

DIAGNOSIS: A large species that inhabits salt-pans; the epigynum is elongate (Fig. 3c); the eyes are highly developed and quite prominent; the ventral surface of the abdomen has two converging dark brown bars in most mature specimens.

LIFE HISTORY

Mature males and females are present throughout the summer months; juveniles are common in April.

HABITAT

All specimens were collected from the open salt surface of Lake Lefroy, many being scattered all over the salt lake and only a few specimens near the periphery.

BURROW

Mr A. Douglas recorded the burrows as being open, vertical, and some 15 cm (5 to 6 inches) deep into the salt (Fig. 3d). The spiders were found to be 'sitting out in the middle of the lake perched directly over the burrow entrance'. Nothing is known about their behaviour, feeding habits, physiology, or how the spiders survive during rain or flood conditions.

DISTRIBUTION

Lake Lefroy, Widgiemooltha, Western Australia.

DERIVATION

From the latin meaning 'salt-mine'.

DISCUSSION

The salt lakes can be considered as 'island' habitats with infrequent or no contact with each other. These 'islands' vary in size from a few hectares to many km², and may be completely isolated or joined by dried watercourses or ribbons of salt encrusted clay deposits to form chains of lakes (Fig. 1). Such 'island' habitats provide valuable opportunities for studying the speciation of the salt lake Wolf Spiders, and are ideal for constructing models for the study of population dynamics.

Nothing is known of the biology of the salt lake species. The physiology of an animal that occupies a burrow constructed in salt, and is subject to extreme dessication, occasional floods, and high temperatures, is worthy of investigation. Much additional collecting is necessary to record the lycosid species on the salt lakes, and their distribution.

ACKNOWLEDGMENT

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