

FURTHER STUDIES ON THE SYSTEMATICS OF  
AUSTRALIAN DIPLURINAE (CHELICERATA:  
MYGALOMORPHAE: DIPLURIDAE): DESCRIPTION OF  
THE MALE OF *TROGLODIPLOURA LOWRYI*, WITH NOTES  
ON ITS AFFINITIES.

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INTRODUCTION

This paper<sup>3</sup> describes a recently discovered male specimen of the troglobitic *Troglodiplura lowryi* Main and attempts to place the genus in the taxonomic perspective of other Australian diplurines.

*Troglodiplura lowryi* was described by Main (1969) from fragments of a specimen of indeterminate sex collected by J. and D. Lowry from Roach's Rest Cave 43.5 km NE of Madura on the Nullarbor Plain, Western Australia. Because only dead arthropods and no living material of any taxa were known from Roach's Rest Cave, it was unknown whether *Troglodiplura lowryi* was an extant species. It is therefore of considerable interest that in addition to the collection of a dead male specimen, a living specimen has also been observed by A. D. Davey in an unconnected cave north of the Bight in South Australia.

OTHER RECORDS OF TROGLOBITIC MYGALOMORPHS

Although several other mygalomorphs are known to inhabit caves in Australia, *T. lowryi* is the only fully troglobitic species, i.e. completely cave-adapted species. Prior to Main (1969) recording *T. lowryi* only two other troglobitic mygalomorphs had been recorded from elsewhere: a diplurid, *Accola caeca* Simon from the Philippines (Simon, 1892), which species is now included in *Masteria*

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<sup>3</sup>This paper is the eighth in a series by one of us (BYM) dealing solely with the systematics of Australian Diplurinae. Earlier publications in the series and others in which new diplurine taxa were described are listed in Main (1983b).

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(Raven, 1979), and a barychelid, *Troglothelae caeca* Fage from Cuba (Fage, 1929). Since then Gertsch (1971; 1973; 1982) has recorded 10 additional species of blind or near blind cavernicolous mygalomorphs from the Americas. This brings to about 8 the total of known blind, and an additional five or more near blind cave-adapted mygalomorphs in the world.

#### AFFINITIES OF TROGLODIPLOURA LOWRYI WITH OTHER AUSTRALIAN DIPLURINAE

At the time *Troglodiplura* was described the Australian Diplurinae included six other genera: *Aname* Koch, *Ixamatus* Simon, *Chenistonia* Hogg, *Dekana* Hogg, *Sungenia* Rainbow & Pulleine and *Stanwellia* Rainbow & Pulleine. One species had also been attributed to the extra-limital genus *Brachythele* (Ausserer, 1875). Subsequent descriptions of new genera, and reviews of the Diplurinae (Main and Mascord, 1971; Main, 1972; 1975; 1983b; Raven, 1981; 1984) bring the total of accepted genera to eleven: *Aname*, *Ixamatus*, *Chenistonia* [synonymised with *Aname* (Raven, 1981; 1984) but recognized as distinct by Main (1982a,b, 1983b and here)], *Stanwellia*, *Troglodiplura* Main, *Kiama* Main and Mascord [doubtful placement in the Diplurinae (Main, 1981, p. 869)], *Teyl* Main, *Xamiatus* Raven, *Kwonkan* Main, *Merredinia* Main and *Namea* Raven. However, the affinities of *Troglodiplura* have remained unclear. It is now apparent that one character is shared with several other genera. This is the absence of cuspules from the maxillary heel (see Main, 1969, fig. 1D, and figs 1,3,5,6 here). This arrangement is characteristic of the following genera: *Ixamatus* and *Xamiatus* (Raven, 1981), *Kiama* (Main and Mascord, 1971, see fig. 2) and in part *Stanwellia*. Genera constituting the Anamini as delimited by Main (1983b) and the Teylini which contains the nominal genus *Teyl* (see Main, 1982c) and several undescribed genera (Main, 1983b) and *Namea* (herein included) all have the cuspules spread over the inner side of the maxillae including the modified, projecting heel. [The only exception in these groups is *Aname kirrama* Raven (Raven, 1984) which has the maxillary cuspules confined to the anterior ental region]. On this character then *Troglodiplura* has an affinity with *Ixamatus*, *Xamiatus*, *Kiama* and in part *Stanwellia*. Closer affinity with *Ixamatus* and *Xamiatus* is ruled out primarily due to the low tarsal organ in *Troglodiplura* (that is, not rod-like); with *Stanwellia*

because of the indented labium and absence of labial cusps in *Troglodiplura*; with *Kiama* due to the different configuration of the sternal sigilla and the U-shaped fovea in *Kiama*.

Collection of a male of *Troglodiplura* initially promised resolution of the relationships of the genus. Criteria used to distinguish male Australian diplurines are predominantly: configuration of the bulb and embolus, spination of the palpal tibia, armature of the first tibia and modifications of the first metatarsus. The Anamini (exclusive of *Merredinia*) comprise the only genera previously described and undescribed (Main in preparation), which bear a pronounced tibial spur on the foreleg, e.g. *Aname*, *Chenistonia*, *Kwonkan*. Some of the named Teylini (e.g. *Namea* which is here added to the tribe) may bear heavy spines that are sometimes raised on low spur-like protuberances on the first tibia, but which are never comparable to the single-spined spur of typical Anamini. *Troglodiplura* as described below is shown to have a large tibial spur in the male. However, because it has an unmodified maxillary heel which lacks cuspules the genus would appear not to be closely related to the Anamini and Teylini and the development of the tibial spur is therefore considered as a convergence. Furthermore there is an undescribed genus of the Teylini (Main in press b) in which a tibial spur has clearly arisen independently.

It appears that the tibial spur has convergently evolved at least three times in Australian Diplurinae. It is even possible that it may have evolved independently in several of the Anamini. Finally, *Aname kirrama* which has in combination maxillary cuspules confined to the anterior ental angle of the maxilla and a pronounced tibial spur, would appear to be more closely related to *Troglodiplura* than to *Aname*. However until more specimens are known with *Aname kirrama* affinities, this species is not transferred to *Troglodiplura*. An alternative solution would be to erect another monotypic genus. A disjunct distribution of related taxa, e.g. north Queensland (*Aname kirrama*) and the Nullarbor Plain (*Troglodiplura*) is not really surprising in view of similar distributions of mygalomorph taxa. For example the Homogoninae have representatives in eastern Australian montane areas and southwestern Australia (Main 1983a; description in press a).

It now seems from the morphological features of both male and female specimens that *Troglodiplura* is less anomalous than pre-

viously understood. Its main distinguishing features, e.g. lack of eyes, modified tarsi and elongated metatarsi, are associated with its cavernicolous habits. It is known that troglobitic features can evolve fairly rapidly, therefore other less adaptive characters also need to be considered in any postulated phylogeny.

An analogue of the suggested *Troglodiplura* and *Aname kirrama* affinity within the Araneomorphae is the blind *Baiami mullamullangensis* (Gray) from Mullamullang Cave on the Nullarbor Plain. This species was first placed in a new genus *Tartarus* (Gray, 1973) but later shown to have close affinity with species of *Baiami* distributed in southwest Australia, the Lofty Ranges in South Australia and in Victoria (Gray, 1981).

It is of biological interest that while other groups of mygalomorphs, e.g. *Stanwellia* and Homogoninae, which have disjunct east-west distributions (Main 1972, 1976 1983a and in press a) have clearly not been able to persist in the intervening arid central area subsequent to the extinction of humid forested regions prevalent in the early Tertiary, *Troglodiplura* and some araneomorphs, e.g. *Baiami* Lehtinen have survived by adapting to a cavernicolous existence.

#### Genus *Troglodiplura* Main

*Troglodiplura* Main, 1969: 9. Type species *Troglodiplura lowryi* Main, by monotypy. Raven, 1981: 340.

#### DIAGNOSIS

Distinguished by the following combination of characters: absence of eyes, labium with notch-like, anterior indentation, unmodified maxillae with cuspules on antero-ental angle only, dorsoventrally curved tarsi (without spines), male with pronounced tibial spur on first leg, long pear-shaped palpal bulb with tapering embolus in same axis.

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Figures 1-10. Figs 1-3. Holotype ♀ *Troglodiplura lowryi*, right maxilla. Figs 1 and 3 ventral aspect. Fig. 2. Antero-ectal angle. Figs 4-10. Metallotype ♂ *T. lowryi*. Fig. 4. Carapace and chelicerae. Fig. 5. Sternal area, maxillae, labium and chelicerae. Fig. 6. Maxillary marginal area. Fig. 7. Ridges on retrolateral side of chelicera. Fig. 8. Left fang, prolateral. Fig. 9. Right tarsus IV, prolateral aspect. Fig. 10. Right tarsus IV, retrolateral view, retroclaw. Scale bars = 1.0 mm; figs 2, 3, 6, 7, 8, 10 not to scale.

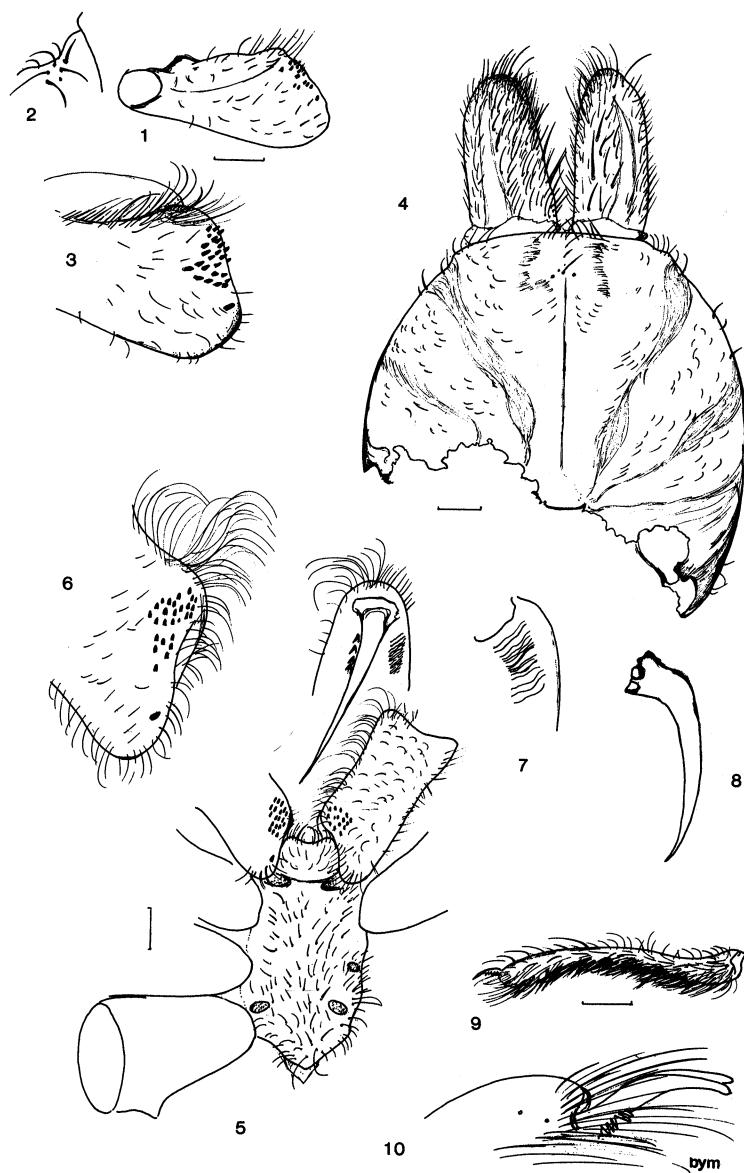


TABLE I. Approximate leg measurements of right legs.

	F	P	Ti	Mt	Ta	Total
Palp	8.1	3.9	6.7	—	3.6	22.3
I	12.3	5.8	11.3	14.3	6.7	50.4
II	12.1	5.4	12.1	14.6	6.2	50.4
III	10.7	4.0	10.2	14.0	5.0	43.9
IV	12.7	4.2(?)	12.6	18.3	5.0	52.8+
Width of patella I at knee = 1.6; Tibial index = 9.41.						

An absence of eyes distinguishes *Troglo diplura* from all other Australian Diplurinae. It is further distinguished from the Anamini and Teylini by the maxillary cuspule arrangement which it shares with *Ixamatus*, *Xamiatus*, *Stanwellia* (in part) and *Kiama*. It differs from these four genera by the presence of a tibial spur in the male.

*Troglo diplura lowryi* Main

Figs 1–18, Table 1

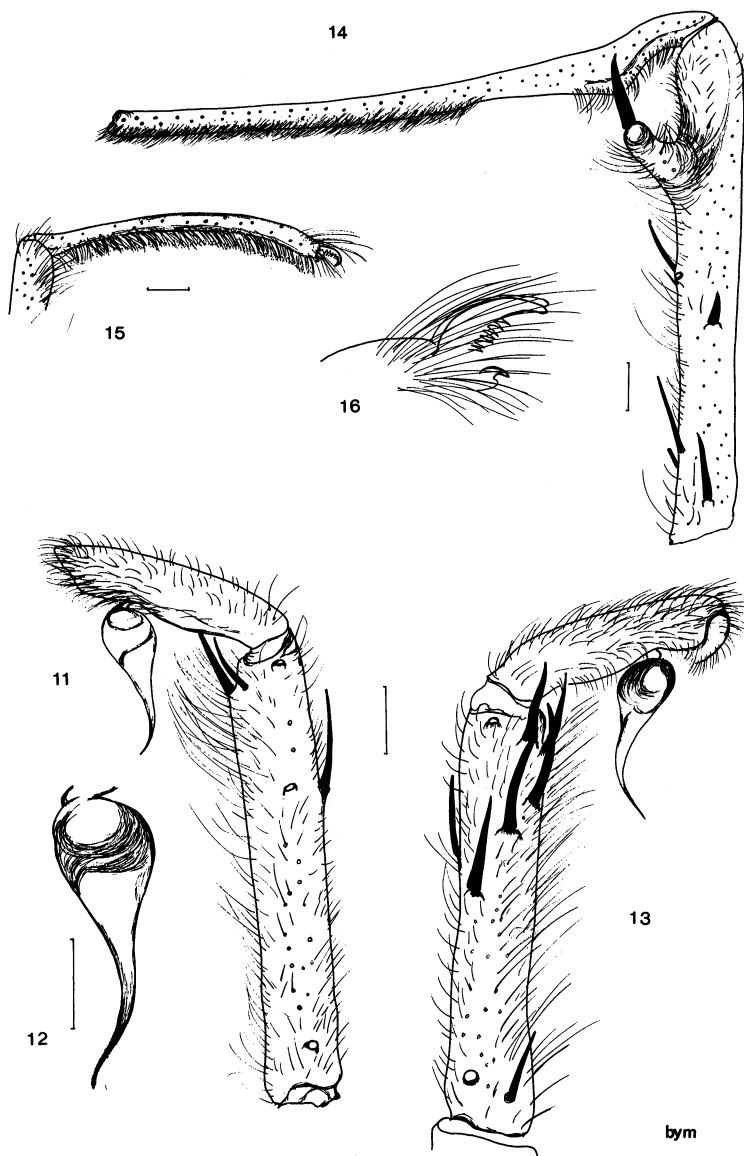
*Troglo diplura lowryi* Main, 1969: 9–11. Holotype, indeterminate sex, WESTERN AUSTRALIA: Roaches Rest Cave, NE Madura (Western Australian Museum)

*Metallotype*, ♂, AUSTRALIA: South Australia, Nullarbor Plain, Cave NR. 6 Bore NNW of head of BIGHT, 27.v.1982 (A.D. Davey) (Australian Museum KS 13389). [“Metallotype”—as defined by Smith, 1983].

Condition of specimen poor, dismembered parts of a dried carcase, some colour still apparent as the dark reddish brown of carapace, chelicerae and tibiae and metatarsi of first legs; many bristles, hairs and spines lost, including trichobothria. Carapace and sternum slightly distorted at margin; left posterior region of carapace missing. Abdomen absent.

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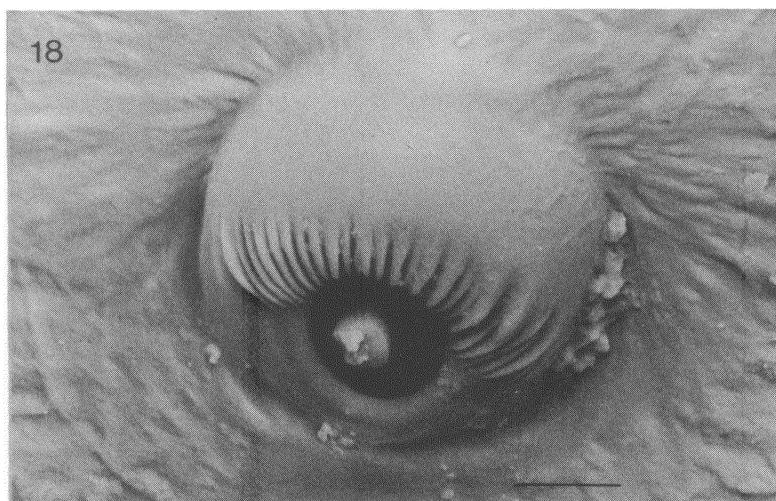
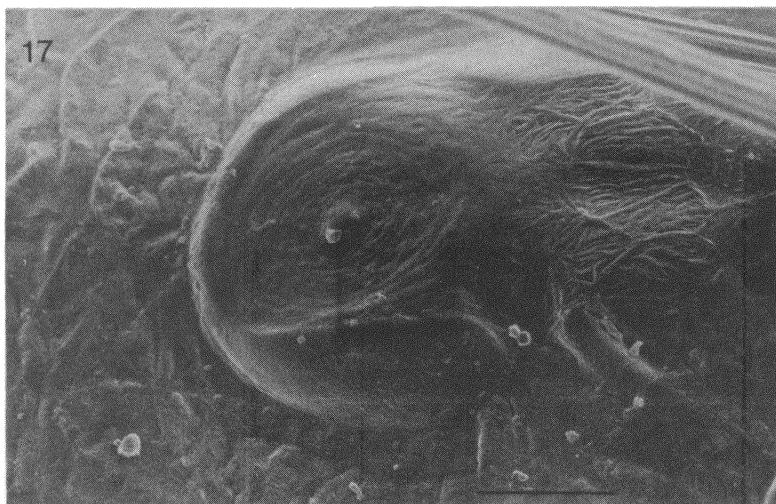
Figures 11–16. Metallotype ♂ *Troglo diplura lowryi*. Fig. 11. Left palp, retro-lateral aspect. Fig. 12. Bulb and embolus enlarged. Fig. 13. Left palp, pro-lateral aspect. Fig. 14. Left leg, retro-lateral aspect tibia and metatarsus. Fig. 15. Right tarsus I, retro-lateral aspect. Fig. 16. Right tarsus I, retro-lateral aspect of retroclaw. Scale bars = 1.0 mm; fig. 16 not to scale.



*Carapace* broad (9.3 mm wide), with cervical depressions, posteriorly damaged with left section missing; caput width 5.4. Probably glabrous in life, caput with thin scattering of golden hairs, finely granulated surface, possibly reticulated. Length from clypeus to fovea 6.5. Fovea very slightly procurved. Eyes absent, a fine bristle and sockets of two others in "ocular area" (Fig. 4); a group of bristle on clypeal margin. *Chelicerae* long and narrow, dark reddish-brown, with coarse, dorsal bristles, no rastellum; transverse ridges on outer (retrolateral face). Promargin of right chelicera with 10 teeth (9 on left), retromargin with at least 6 small basal teeth (11 on left chelicera) extending distally to opposite about teeth 4 and 5. *Maxillae* not indented around labium but with long angular heel obscuring it; cuspules on inner ental angle only (about 31 plus a large one on heel of right maxilla, left with about 26; some loosely attached, some detached). *Labium* broad and deeply indented at margin, length 1.0 mm, width at least 1.5 mm, without cuspules. *Sternum* distorted and curled under at edges, length 4.6. Sigilla separating labium divided. Posterior sigilla broad, roughly oval, well away from margin, median sigilla small, roundish, anterior pair obscured. *Legs*. Scopula complete on tarsi I, II and III, absent from tarsus IV, complete on metatarsus I but thin proximally, almost entire on metatarsi II, distal half only on metatarsus III, absent from metatarsus IV; tarsi with ventral median band of bristles; tarsus IV although lacking a true scopula has a dense brush of fine bristles intermixed with heavy spine-like bristles (Fig. 9).

Metatarsus I very long, ventrally depressed proximally and with pronounced "elbow" in proximal third. Tibia I with a spur, bearing a single megaspine, in apical third. Palp with long slender tibia with several heavy retro- and prolateral spines. Palpal bulb long, ovoid, with embolus arising on long axis; no demarcation between embolus and bulb (Figs 11-13).

*Spines* (right appendages except leg II). Approximations only. Palp, tarsus 0, tibia d 1, p 3 proximal (lost) 6 distal (lost), r 7 (3 lost), patella p 1 (lost), femur p 2 median adpressed bristle-like spines. Leg I, tarsus 0, metatarsus 0 (left p 1 lost), tibia v 2 + megaspine on spur, pv 2, p 2, d 2 (left pv 2 rv 2, p 2, r 2), patella p 2 (lost) (left p 2 lost), femur d 3, p 6 adpressed bristle-like spines, r 3 rd 1 (left d 4 lost), p 4 (lost), r 4 (lost). Leg II (left), metatarsus v 3 (2 lost), d 1, p 2 (lost), r 2, tibia v 1-2-2-3, p 3 (lost), r 3, patella p 2 (lost), femur d 3 or 4, rd



Figures 17, 18. Scanning electron microscope photographs, *T. lowryi*. Fig. 17. Tarsal organ. Fig. 18. Trichobothrial base. Scale bars = 10  $\mu\text{m}$ .

about 4, p about 6 (lost). Leg III, tarsus 0, metatarsus v about 10 (some lost), d about 5, p 6, r 4, tibia v about 10 (some lost), d 3, p 6, r about 4, patella p 2 (lost), r about 3, femur rd 4, p 9, r at least 4. Leg IV, tarsus v with long bristles, metatarsus v about 13, d about 5, p about 8, r 4, tibia v about 7, d about 4, p about 7, r 6, patella p about 3, r ?, femur d 4 or 5, p about 9, r about 5. Trichobothria generally lost, appear to have been less numerous than in most Australian diplurines. *Tarsal claws* all with double row of long and needle-like teeth (up to 9 or more in each row); inner rows of teeth begin distally to base of outer rows.

#### Remarks

The tarsal "spines" referred to by Main (1969) are not comparable to the usual heavy spines found on diplurine legs and as for the above specimen would be better described as "bristles".

#### ACKNOWLEDGEMENTS

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#### SUMMARY

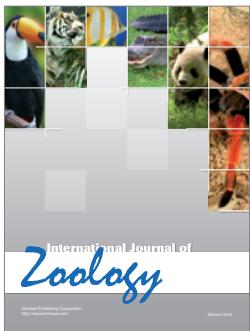
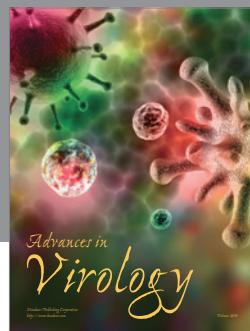
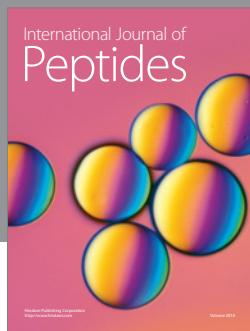
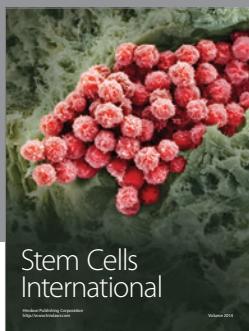
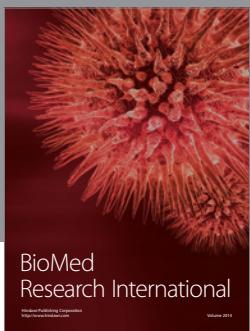
A male specimen of the cavernicolous genus *Troglodiplura* is described. It is suggested that a tibial spur, previously considered unique to the Anamini has arisen independently in *Troglodiplura*. Close affinity with other Australian Diplurinae is not recognized.

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