DISTRIBUTION OF TASMANIAN CAVE FAUNA

by

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Introduction

Only a few years ago the cave fauna of Tasmania was little known but especially during the last five years considerable collecting has been carried out by the writer and his wife while Bob Cockerill and Aleks Terauds of the Southern Caving Society have also made valuable contributions. As well a limited amount of collecting has been done by interstate visitors Dr Barry Moore, Dr Aola Richards, Elery Hamilton-Smith and Mrs Mary Mendum.

The writer does not pretend to be a professional zoologist and his collecting has been that of an amateur acquiring knowledge and understanding as he went along. He is very grateful to those zoologists who have offered encouragement by their identification and description of material.

A Geographical Approach

Being a geographer the writer's main interest is in determining the distribution patterns of cave species and the relationships of the Tasmanian cave fauna to that of mainland Australia and the other southern continents but this paper deals only with the first aspect. Cave animals are usually classified on an ecological basis using both distribution and physical characteristics. The first such classification was proposed by Schiner in 1852 (Richards, 1962) while the most recent modification is one suggested by Hamilton-Smith (1971). The author feels that there is an advantage in using a classification based only on known distribution characteristics. Tasmania being an island with a considerable number of isolated limestone areas provides an ideal situation to which such a classification can be applied. Tasmanian cave species can be grouped into six classes on this basis:

(1) **Accidental visitors.** They are generally regarded as of no interest to a student of cave fauna as they are surface species occasionally washed underground by floods or trapped in shafts and fissures. However, on occasion they prove to be of considerable interest in Tasmania where much of the surface fauna is poorly known. A good example is a beetle collected from Mystery Ck. Cave (Ida Bay) a few years ago which was found to belong to a sub-family (Adeliinae) not previously recorded from Tasmania.

(2) **Regular visitors with state-wide distribution.** Although regularly found in caves they also occur on the surface and range throughout the state wherever climatic conditions are suitable. An example is the Tasmanian Cave Spider *(Hickmania troglodytes)* first described from a cave at Mole Creek but now known to occur in caves throughout the state as well as in dark damp places on the surface. It belongs to a very small group of relict spiders (family: Hypochilidae) which are now found in four widely separated parts of the world: North America, China, Chile as well as Tasmania (Hickman, 1963).

Another well known example is the Tasmanian glow worm *Arachnocampa tasmaniensis.* The glow worms are luminous larvae of a primitive fly belonging to the family Mycetophilidae and large populations are found in some caves especially Exit Cave at Ida Bay. Not restricted to caves they are found in wet forest and mine adits throughout Tasmania.

(3) **Regular visitors with regional distribution.** Individual species are found only in a portion of the island but each species is found in more than one limestone area indicating that they are not confined to caves even though they may not have been collected on the surface. Two genera of cave crickets in Tasmania (family: Rhaphidophoridae) are good examples (figs. 1 and 2). The genus *Micropathus* has four species recorded from caves—three with a distinct and non-overlapping distribution in Western Tasmania while the fourth may be a relict occurring only at Mt Ronald Cross as far as known. The common occurrence of *Micropathus* spp. in mine adits supports the view that they are not confined to caves but due to their nocturnal habits are rarely collected on the surface. The second genus *Parvotettix* has three species recorded from caves.

Although neither genus contains species exclusively cave inhabiting, collecting from caves and mines is the easiest way to establish the approximate distribution pattern of each species. Cave collecting normally does not help to determine the exact location and nature of the boundary between two closely related species unless by chance such a boundary happens to pass through a limestone area – a situation existing at Loongana where two species of *Micropathus* are involved.

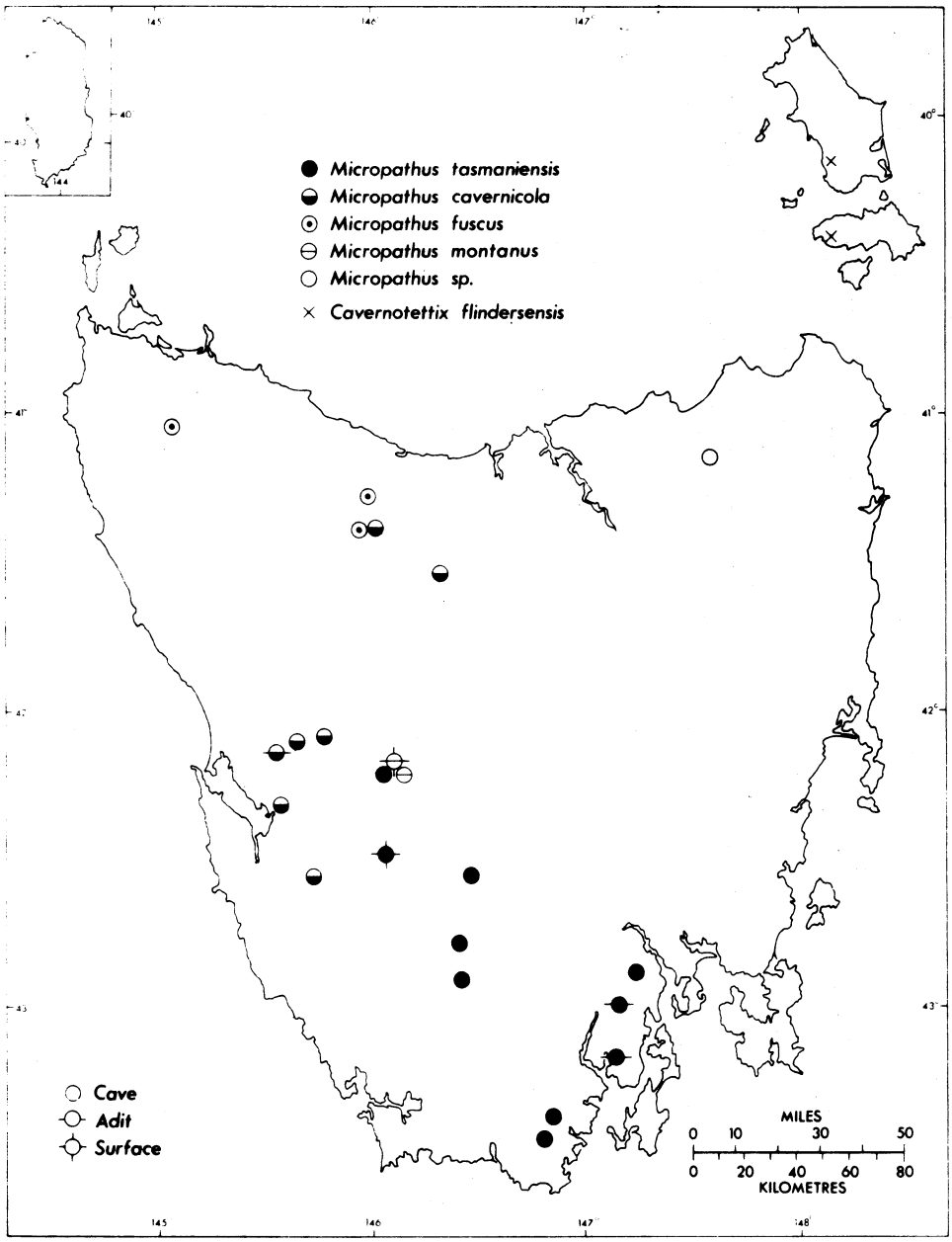

Figure 1: Distribution of the rhaphidophorid genera *Micropathus* and *Cavernotettix* in Tasmania.

The distribution map (fig. 1) indicates that *M. fuscus* is found in areas to the north while *M. cavernicola* occurs to the south. The limestone area at Loongana extends E.W. for a distance of 3 miles along both sides of the River Leven (fig. 3) and cave crickets have been collected from three caves. Contrary to expectation *M. cavernicola* was found in two caves on the northern side of the river while *M. fuscus* was found in one cave on the southern side. Rivers do not provide perfect barriers to the migration of cave crickets which are quite capable of moving over the surface of pools of standing water while logs may also provide crossing points. Nevertheless a large fast flowing river such as the Leven must present at least a partial and temporary barrier to a species extending its territory. In such a situation man made structures such as bridges would provide easy crossing points and it is particularly interesting to find that both Mostyn Hardy and Swallownest Caves are located close to the only two bridges in the area while Leven Cave is some distance away from either one.

This leads to the hypothesis that *M. cavernicola* is expanding its territory northwards at the expense of *M. fuscus* and has managed to establish itself north of the river where man made crossing points were available. If true the small population of *M. fuscus* in Leven Cave represents a relic of a once more extensive distribution and is likely to be replaced soon by *M. cavernicola*. Continued observation of the fauna of Leven Cave may provide further support for the hypothesis.

(4) Distinct but closely related species in separate limestone areas. When this situation occurs where two limestone areas are close together and yet separated by non-carbonate rocks there is a strong suggestion that the common ancestor to the two cave species is no longer present on the surface – at least not in the same area. The classical Tasmanian

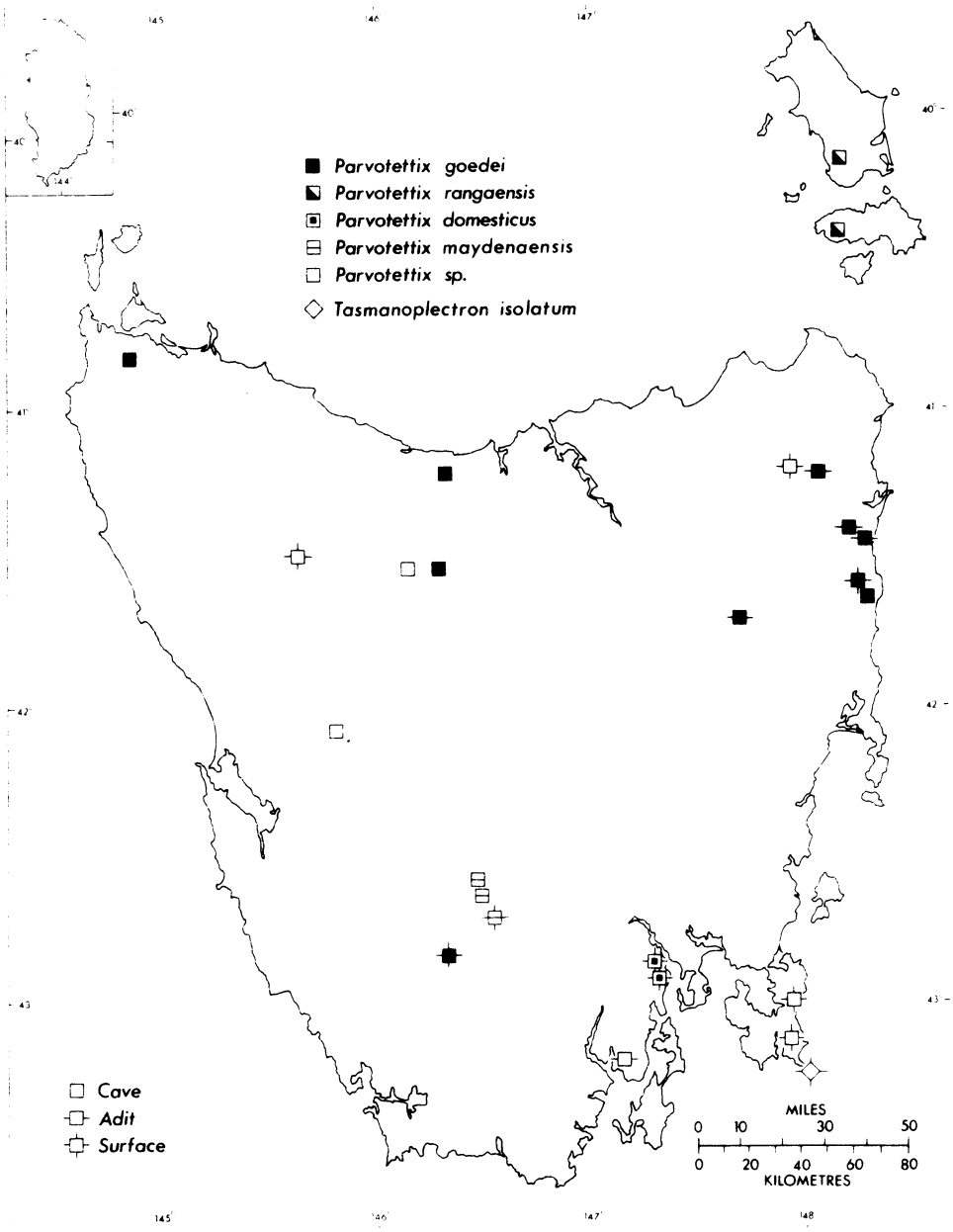

Figure 2: Distribution of the rhaphidophorid genera *Parvotettix* and *Tasmanoplectron*.

example is found at Ida Bay and Hastings which although only a few miles apart have caves developed in two different rock types not in contact with each other—cave development at Ida Bay has taken place in Ordovician limestone while at Hastings it has occurred in Precambrian dolomite.

Two distinct species of cave beetles both belonging to the genus *Idacarabus* (subfamily: Zolinae) are found in the two areas. *Idacarabus troglodytes* is known from six caves at Ida Bay while *Idacarabus cordicollis* has been recorded from three caves at Hastings. So far this is the only Tasmanian example for two limestone areas in close proximity to each other. It contrasts with the example of the harvestman *Monoxyomma cavaticum* which although known only from caves has been recorded from both the Hastings and Ida Bay areas.

(5) Species occurring in only one limestone area without close relatives in other areas. Two interesting examples have been recorded. From a stream cave at Mole Creek phreatoicids either belonging to or close to the genus *Crenoicus* have been collected. The genus is known only from Victoria and N.S.W. and its occurrence has not been recorded elsewhere in Tasmania. A new species of millipede belonging to a new genus in the family Dalodesmidae has been collected from several caves at Ida Bay where it is not uncommon but collecting in the Hastings caves has so far failed to turn up either this or a related species. If this distribution pattern holds true it provides strong evidence that the animal is a true cave dweller.

(6) Species occurring in only one cave or system of related caves within a limestone area. This category is difficult to demonstrate and requires detailed collecting in all known caves within an area. A possible example may be the occurrence of an eyeless form of the shrimp *Anaspides* in the Wolf Hole at Hastings. It may well be confined to this system only as collecting at Newdegate Cave in the same area has revealed only specimens with well developed eyes.

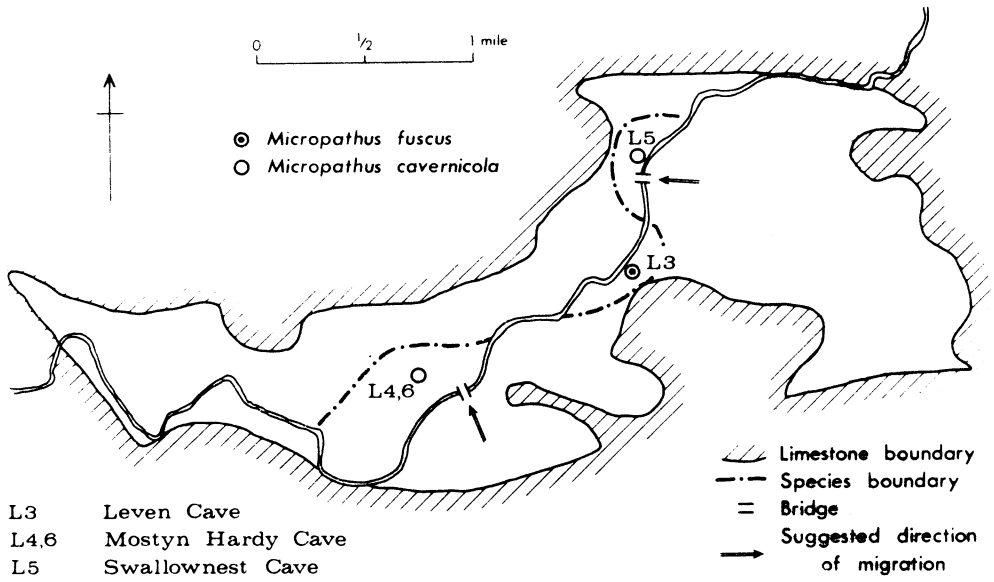

Figure 3: Occurrence of species of *Micropathus* in the Loongana area.

Distribution patterns versus morphological characteristics

Providing that distribution patterns are well known they are more reliable indicators of whether or not a particular animal is a true cave dweller than physical adaptations such as loss of eyes, long legs, sensory hairs and loss of pigment. Similar characteristics are shown by organisms in a number of other habitats such as leaf litter, soil and groundwater (Vandel, 1965) and such animals could easily be mistaken for true cave dwellers when found after having been accidentally washed underground by a flood.

The Ida Bay millipede although blind is not necessarily adapated specifically to the cave environment since all members of the family Dalodesmidae including surface species lack eyes. A number of species in the family are deep soil dwellers and the Ida Bay species was probably derived from a soil dwelling ancestor. Similarly the cave phreatoicid known from Mole Creek cannot be regarded as cave adapted because it is eyeless since many surface species belonging to this group also lack eyes.

In the last few years three new—apparently cave adapted—species of pseudoscorpions belonging to the genus *Pseudotyrannochthonius* have been collected from caves in three areas—Mole Creek, Hastings and the Florentine Valley, two of which have been described by Dartnall (1970). The Mole Creek species *(P. typhlus)* is completely eyeless but the Hastings species *(P. tasmanicus)* while lacking eyes was found to have a small pair of eye lenses present in the three specimens collected underground. However, a fourth specimen was found on the surface in a rotten log and this proved to be the only specimen without eye lenses making it apparently more cave adapted than the three specimens collected underground.

An entirely geographical classification of cave fauna avoids the thorny question of whether or not a particular species shows morphological adaptation to a cave environment and has the added advantage that it is much more easily grasped by the amateur speleologist who can make an important contribution by collecting both underground and on the surface in limestone areas.

References

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DISCUSSION

Q *You were saying that you used the fact that a species occurs at Ida Bay and not at Hastings as the criterion for a true cave dweller. Couldn't it be that the meteorological conditions within the cave or within the entrance of the caves at Hastings are different to Ida Bay and are unsuitable for this particular species or are there many other controls which would have to be considered before one can use this means to make that decision?*

A Loons Cave unlike the others at Ida Bay has, superficially at least, conditions much more like those at Hastings, and this is the one which has the largest population of millipedes. The limestone here is overlain by dolerite and the cave contains a lot of clay and appears to be very similar to the Hastings caves.

Q *It may be confounding the issue a bit but what happens if you shift a few of them from Ida Bay to Hastings . . .*

C Tut, tut (chorused interjection).

Q *. . . and determine whether or not they do fit in with the environment?*

A I think this would be criminal. By doing so you would destroy possible evidence.

C *A further difference between Ida Bay and Hastings is that the latter is in dolomite and Ida Bay is in Gordon limestone.*

A I am aware of that but I am doubtful that it would be very important in determining the distribution of the species.