SILVERFISH IN AUSTRALIAN CAVES

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Abstract

Silverfish as part of the world's cave fauna are briefly described. Cases of silverfish in Australian caves are given along with discussion of their status in the ecology of the cave. A comment is made on assessing an organism's adaptions to living in a cave when the entire family is normally depigmented and eyeless. Specimens of the Bungonia Caves silverfish are used as a case study of these animals and their behaviour.

Silverfish form only a small portion of the world's cave fauna.

As no machilids have been found in Australian caves and those found overseas are covered in Vandel (1965), I will restrict discussion to the Order Thysanura. With this restriction the only family of interest is the Nicoletiidae which has been reported from caves in Europe, Australia and North and Central America.

Vandel reports a species of *Nicoletia* was described from a cave in the department of Var (South France). Two others (genus *Nicoletia* and *Troglodromicus*) were described from caves in Karst. Ulrich (1902) described *Nicoletia exensis* from Texas (USA) but this was redescribed by Wygodzinsky (1973) under a new genus *Texoreddellia.* This is the most widely distributed troglobite in the southern states and Mexico. It exhibits little variation within a cave population but wide variations between caves. Vandel records another species, *Lepisma anopthalma,* from Mexico but believes this is better considered as Nicoletia. Mitchell and Reddell (1971) record 5 thysanurans from Texas. Three of these being accidentals, one *N. texensis* and the other an undescribed Nicoletiid of the genus *Trichatelura* (a South American genus). Reddell and Mitchell (1971) also record in their Checklist of the Cave Fauna of Mexico that the family Nicoletiidae is well represented by troglobites and troglophiles in the Sierra de el Abra, but definite generic assignment is awaiting revision which has not been completed.

A review of the Australian records also reveals that silverfish are not common. To date I have records of silverfish from six cave areas in Australia.[1]

Two of these were collected from the Nullarbor by Dr A. Richards in Murrawiginie No. 3 Cave (N9) and Lynch Cave (N60). These specimens have yet to be examined. The Murrawiginie caves are little more than rock shelters but Lynch Cave is well inland and perhaps one of the oldest of the Nullarbor Caves and the specimens may prove to be of much interest (Hamilton-Smith, pers. comm.).

V. Ryland collected a silverfish of the genus *Heterolepisma* (Family Lepismatidae) from the doline of Dingo Cave WA (N160). This has not been examined but I believe this is unlikely to be a cave dweller. A specimen of *Trinomura novaehollandiae* was collected by S. Lowry in Kinnenabbra Cave, Cervantes WA (SH40). This species was originally described by Silvestri (1908) from the material collected under rocks near Perth and hence is best considered as an accidental. J. Lowry writes that "despite extensive searches in caves north of Perth and in the Nullarbor she has only ever found the Kinnenabbra specimen" and so doesn't feel they will form a significant part of the cave fauna of that area.

The two remaining species are known only from caves. The first of these was collected from Russenden Cave, Texas, Qld by J. Toop. Only a few specimens were collected and I have no details of their habitat within the cave. They are small with very long antennae compared to all other Australian Nicoletiids. Their bodies are broad and have comparatively few setae. Unfortunately

[1] Since this paper was presented two further records of cave silverfish have come to light. A second species is recorded from Bungonia, NSW and an indeterminate species occurs at Naracoorte, SA.

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unless these are found as surface dwellers we may never see living specimens as Texas caves are currently being submerged by the waters of Pike Creek Dam. Without observations of live material no comment can readily be made on their ecological status e.g. troglobite, troglophile.

The last Australian cave species was first discovered in Phoneix Cave, Bungonia NSW (B60) (Smith 1976a) and later in Argyle Hole (B31) and UNSWSS Hole (B43) (Smith 1976b).A report by R. Reid of one in Grill (B44) is yet to be confirmed. It is also a Nicoletiid, of the genus *Nicoletia.*

From the above records it would appear that the Family Nicoletiidae is more suited to cave environments than other families. All members of the family are non-pigmented and anopthalmic. They are generally found free-living or in association with ant or termite nests. In appearance they are elongate parallel-sided insects, usually with long antennae, cerci and medium dorsal appendage. The legs are long and simple and the jaws are simple chewing types. The family is generally vegetarian.

Other families in Australia are eyed and pigmented or entirely restricted to sharing nests with termites and ants.

The Bungonia Caves Silverfish

This specimen is about 9mm body length with antennae, cerci and median dorsal appendage all about body length. The antennae are held apart and moved alternately up and down while the median dorsal appendage is carried appressed to the ground with the cerci held aloft as in the photograph.

The male of the species has a row of sensory structures along the inside ventral surface of the cerci. I believe these could be pheromone detectors or transmitters enabling location of the female. These structures are not known on any other silverfish.

In Phoenix Cave they appear to be restricted to below 8 m depth, which by coincidence or otherwise is the greatest depth at which the numerous cave crickets have been found. Their numbers decline markedly at greater depths (50-60m). Only one has been found at this depth and this was after recent heavy rains. In these regions the habitat appears suitable, but the levels of CO_2 are nearly always above 1–2%. Dr J.A.L. Watson has indicated to me that repeated doses of CO_2 on Lepismatid silverfish inhibited breeding and so this may put a limit on the spread of the population down the cave. They have not been found in the cave catchment area.

These insects are commonly found free roaming across gravel, sand and bedrock, or underneath rocks. Usually they are found singly but on two occasions pairs (♂ + ♀) have been found together under rocks. They can be observed in cracks in the walls or with just their antennae protruding beyond the edge of a rock as they cling upside down. None have been seen on the roof or in the isolated piles of organic debris throughout the cave.

Normally individuals appear to avoid one another but those that were together followed each other around when disturbed.

Determining the ecological status has presented problems in this case as the entire family is normally eyeless and unpigmented. J. Reddell writes that "A few species in Mexico and the Texas species are considered to be troglobites since their overall facies is unlike the usual termitophile or soil dwelling species. These are extremely large, slender, completely unpigmented, usually somewhat elongate and their habits include free-roaming across clay banks, rock wall, etc. We get many species under rocks or among organic debris and these usually look no different from epigean species," and with his work on japygids found heavier setation and more sensillae than in epigean forms. The Phoenix specimens are certainly larger, they are often found free-roaming and contain new sensory structures, but preliminary observations show that they are not more seteated than some epigean forms although much more so than the Russenden Cave species. Probably only physiological studies will enable status to be determined.

This population would benefit greatly from restriction of human access to the cave. On one trip several specimens were found in the cave on the way down to the deeper regions but after a party of cavers moving through after us had left, only two could be found. Their habit of living on the passage floor makes them very vulnerable. The populations in Argyle Hole and UNSWSS Hole are extremely small, probably due to heavy trafficking. This is not likely to decrease.

Overall, it is obvious that silverfish are not predominant in caves either in Australia or overseas. However, at Bungonia there appears to be a well established population existing in a number of caves. Despites its success, however, no real assessment of its adaptions to cave life can readily be made.

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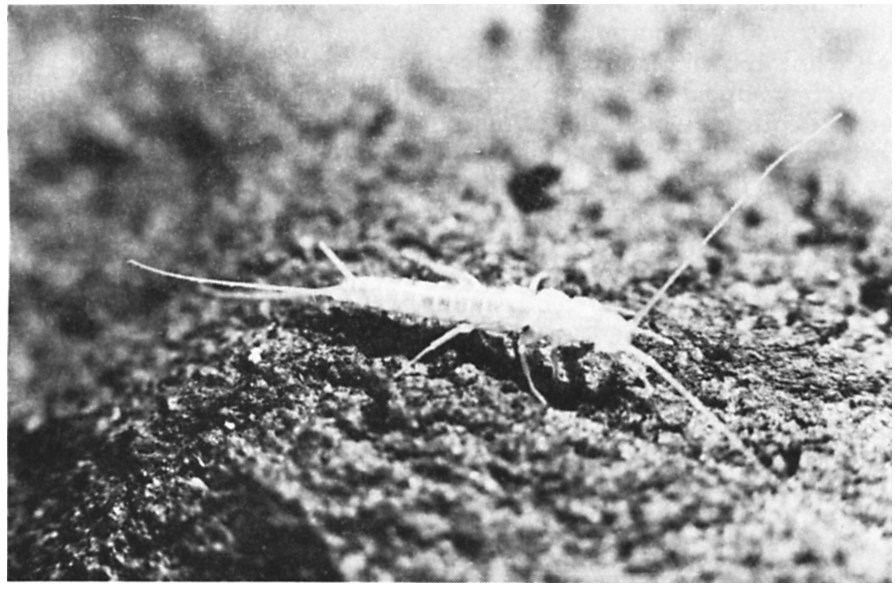

Plate 3. The Bungonia Caves silverfish.

A REVIEW OF THE BAT BANDING WORK OF BARBARA DEW

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Abstract

Barbara Dew died in 1968 and her last entry in her field notes is dated 4/5/68. Her first entry is the 30/10/60 where she banded 14 bats in the North Sydney Railway Tunnel. Over these 8 years she banded at Wombeyan, Bungonia, Jenolan, and Wellington all well known sites, but other areas such as Woni Tunnel, Katoomba Coal Mines, Seven Hills, Hill End and other areas are mentioned. This paper summarises all the areas visited by Barbara with details of banding, and subsequent recoveries.