

Changes in the Behaviour of Cave Living Vertebrates

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Animals living permanently in the total darkness of caves seem likely to share morphological and behavioural specialisations due to the lack of light and the more or less constant temperature. Within the various taxa of vertebrates and invertebrates which colonized caves successfully is a certain number with nocturnal activity already present in the epigeal relatives. It is not surprising that those animals survive in caves. But among the ancestors of cave-dwellers we also note many taxa with clear diurnal activity.

Thus the question arises what certain taxa enables to reproduce in caves and what the changes are in behavioural characters during cave colonisation. The following paper will cover the behaviour of cave vertebrates and their epigeal relatives only. Fishes and amphibians are the only two vertebrate groups in which specialised cave-dwelling species have evolved. At present we know six times more stygobiotic fishes than amphibians. The behaviour has been studied in some species only.

All the 15 fish species and the only salamander examined show despite being eyeless a negative phototactic behaviour. Some of the behavioural characters are more or less reduced: cave fish and salamanders lost their circadian locomotory activity, in two cave fish the tendency for schooling is significantly diminished, in the cave fish populations of the characid *Astyanax fasciatus* the dorsal light reaction is absent and the alarm behaviour is partly reduced. The situation for the aggressive behaviour is different. A quantitative reduction has been found in the cave population of the poeciliid fish *Poecilia mexicana* only. All other fish and salamander have an aggressive behaviour with patterns effective in darkness. Some develop a rankorder and some become territorial periodically. There is a tendency to reduce the territory size in darkness.

Potential cave-dwellers seem to need a preadaptation for cave life in their sexual behaviour which is mainly based on chemical communication. No reduction of a visual signal has been observed. In *P. mexicana* the females prefer bigger males and this preference persists in the cave population even in darkness.

Life histories in cave animals are characterized by increasing egg size and parental care, increased generation times associated with increased age at first reproduction, and longevity.

In some cases we are able to demonstrate on the basis of hybrid studies, that the differences between cave and epigeal forms are genetically based. I will discuss on the basis of the data presented, that for many behavioural changes in cave animals selection may play a minor role compared with the accumulation of neutral mutations.