FAUNA

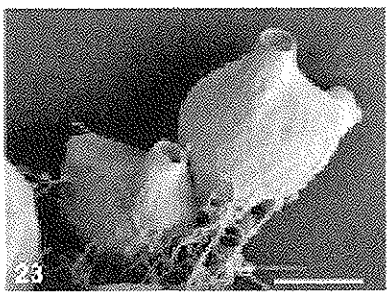
CHYTRID FUNGUS IN SOUTH-WEST FROGS

Karen Riley and Dale Roberts

A recent UWA study has revealed a high infection rate of the amphibian disease chytridiomycosis in a south-west frog species. The quacking frog (*Crinia georgiana*), a common species in forested areas across the south-west of WA, was found to have an overall infection rate of more than 75%. The study also expanded the known eastern range limit of the disease by some 400km, from Elleker near Albany to Esperance.

Chytridiomycosis is caused by an infection by the microscopic fungus *Batrachochytrium dendrobatidis*, which eats away at keratin in the frog's skin. The fungus was first discovered by Australian scientists in 1994 following frog population crashes in Queensland and Central America. It is believed to be responsible for the decline and extinction of several frog species worldwide. This included four Queensland species which have not been seen since suffering heavy population declines during a chytrid epidemic which began in the late 1980s. The fungus has been present in WA since at least 1985, however it does not seem to have had such devastating effects on our frog populations.

The UWA study attempted to determine any relationship between climate and chytrid infection rates in the quacking frog. The fungus has a waterborne stage in its life cycle and studies on east coast frog communities reveal an increase in disease prevalence in cool, wet conditions. The quacking frog was selected as it has a widespread distribution, from Gingin to Albany, and across the south west coast to Esperance. As a result it covers a range of temperature and rainfall, which can be compared to disease prevalence to reveal any influence



Two Chytrid zoosporangia, the larger with two spore discharge tubes. The scale bar is 10 microns (1/100h mm).
Ph: Lee Berger and Alex Hyatt, JCU.

of climate on chytrid growth. The quacking frog is also known to carry the fungus, although there is no evidence of chytrid related mortality in this species.

More than 570 quacking frogs were tested for chytrid from 15 sites across the south-west, with every site having at least one frog testing positive for the fungus. Six sites had infection rates above 90%, and the overall prevalence of the disease was 75.4%. Long-term climatic conditions were not found to influence the absolute distribution of chytrid fungus in the south-west. However, disease prevalence was found to be significantly greater in areas receiving high rainfall in the 30 days prior to sampling. This information is useful as it allows a prediction of when chytrid levels are highest. In the weeks following rains, extra vigilance can be exercised when working in the field in order to minimise the spread of the disease between sites.

Such a high rate of infection in the quacking frog was unexpected. Frog chytrid has a waterborne stage in its life cycle and cannot tolerate complete drying. As a result, species suffering the most from chytrid infection have been from high rainfall areas, and tend to spend a large proportion of their time in or around streams. The quacking frog on the other hand, spends most of the year burrowed under leaf litter in the forest, where conditions are too dry for chytrid to survive. The frog emerges only in winter to breed in temporary puddles formed after rains. So how does the disease persist at such high levels, on a host whose environment is dry for most of the year?

One possibility is that the fungus can produce a resistant spore that can tolerate drying. Scientists have long suspected that chytrid, like many related fungi, can produce a life stage with a tough outer coating to persist in harsh conditions. The existence of such a form in frog chytrid would explain how it has been able to spread and how it can remain in the environment for long periods. So far, however, no such life stage has been discovered. The quacking frog may be a good species in which to investigate the existence of this so far elusive resistant spore.

While the quacking frog does not seem to be adversely affected by chytrid fungal infection, the resistance of many other WA frog species remains unknown. This includes three threatened species which co-habit in parts of their range with the quacking frog. The quacking frog, by helping the fungus to persist at such high prevalence in frog communities, may be acting as a reservoir for chytrid, which could potentially contribute to the decline of less resistant frog species. It is important that more knowledge is gathered on the effects of the fungus on our local frogs, particularly in the face of an uncertain future threatened by climate change.

Karen Riley undertook this study as part of her Honours Degree in Zoology at UWA in 2008.