DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

WORKSHOP ON TWO THREATENED WESTERN AUSTRALIAN FROGS – WHITE-BELLIED FROG *GEOCRINIA ALBA* AND ORANGE-BELLIED FROG *GEOCRINIA VITELLINA*

CALM Wildlife Research Centre, Woodvale,
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SUMMARY OF ISSUES

BIOLOGY AND ECOLOGY OF GEOCRINIAS – Dr J. Dale Roberts and Mr Simon Conroy, UWA Zoology Department.

1. There are four WA species of *Geocrinia* – *G. rosea*, *G. lutea*, *G. alba* and *G. vitellina*. There may be two species within what is currently understood as *G. rosea*. *G. alba* and *G. vitellina* are very distinct species, not colour morphs of the same taxon. All Geocrinias have the same basic breeding biology – they have direct egg development with no free feeding tadpole stage. Tadpoles hatch from the egg capsule and develop in the jelly mass in a breeding burrow. They do not feed but depend on yolk from the egg which is incorporated into the gut during development. This means that there is no potential for tadpole dispersal. Males dig the burrows from which they call to attract a mate. The female lays the egg mass in the burrow and the male them moves a short distance, digs another burrow and tries to attract another female. Sex ratio is probably 1:1.
2. There are extremely large genetic differences between populations of all WA *Geocrinia* species – in fact they have the most genetically subdivided populations of any frogs in the world. Genetic studies indicate a long term pattern of population contraction and expansion. There is no evidence of significant adult or juvenile dispersal – most recaptures are within 20 m of the first capture point and the maximum movement recorded is about 50 m.
3. Both taxa have very small distributions. *G. vitellina* has an area of occupancy of approximately 5 ha – this is the smallest of any Australian mainland vertebrate and smaller than most threatened plants. *G. alba* is largely restricted to two creek systems within which there appears to be many suitable sites where it is absent. Both species live in a highly specialised habitat near creeks but not in open water. They may occur throughout the swamp system: adjacent to stream channels and in areas that are wet but with no free standing water.
4. *G. alba* occurs mostly on private land and more than 70% of its range has been cleared. Most *G. alba* populations are small with less than 20 calling males. Since work commenced (1983) there have been many local population extinctions. Extinctions are more likely if the adjacent land has been cleared, but have also occurred in natural areas. Extinctions have happened on publicly-owned and privately-owned land at equal rates.
5. All *G. vitellina* sites are within State forest and there have been no significant declines or local extinctions (but see point 9).
6. Fire research (mostly carried out on *G. lutea*) indicates that hot fires have significant long term effects on populations, possibly causing local extinctions. Cool, early spring fires have little effect on adult males or on egg masses, but do affect females and recruits, which are not in burrows. Post-fire monitoring data (incomplete) show a 30% population decline after a cool fire with a slow recovery and indicate that there should be 8-10 years between cool spring fires.
7. The September 1997 fire that affected two of the largest *G. vitellina* populations has resulted in a major decline in calling males. At these populations where there was about 100 calling males before the fire, numbers have dropped to less than 20. Another significant population not affected by the fire continues to increase in size.
8. Population extinction of small *G. alba* populations in the absence of hot fire may be due to loss of genetic diversity (inbreeding) or to stochastic events (chance) due to small size.

9. Data on survival of eggs and recruits indicates that large numbers of egg masses or juveniles must be introduced to a new area to have any real chance of establishment. Data indicate that about 60 egg masses must be translocated to a new site and this will need one person for three to four days per week during the whole breeding season (September to November). This number of egg masses can only be taken from sites with a relatively large number of calling males without having a major effect on the local population.
10. There is no indication that the chytrid fungus possibly implicated in frog declines in eastern Australia is causing the declines in *G. alba*.

RECOVERY PLAN IMPLEMENTATION - Kim Williams, CALM

The Recovery Plan was drafted in 1992 and published in 1995. Recovery Team members come from UWA Zoology, The Shire of Augusta - Margaret River, the Leeuwin Conservation Group, Environment Australia and CALM. A local LCDC was represented but the member resigned and has not been replaced. CALMScience has not had a member since 1996.

Major actions that have been implemented (apart from research actions discussed above) include:

1. Fencing of stream zones on private land. Voluntary agreements with landholders have resulted in 13 km of fencing being constructed at a cost of about $75,000. Ongoing maintenance means that yearly work is required. Farmers with fences are happy with the result but are not willing to advertise the fact that they are helping the frogs.
2. Pig control. Arrangements with a CALM Volunteers have ensured that pigs are controlled in the general area of *G. vitellina* populations. There has been no damage to frog habitat. This has cost about $3,500 over five years.
3. Population monitoring. Region and District staff have committed an increasing amount of time to this over the past two years and a reasonable quality database of sites and population size now exists.
4. Communication. All private property owners with *G. alba* populations have been given 'Frog Recovery Kits' that provide information about the frog and advice on land management issues, eg, fire and chemicals. A tape recording of frog calls is included. While there is interest in the Recovery Plan from local conservation groups there has been little opportunity for them to become involved in actual work and landholders are reluctant to let them onto their properties.
5. Translocations. Translocations are needed for both species – to extend the extremely small range of *G. vitellina* and to re-establish extinct populations of *G. alba*. Captive breeding was tried (by Melbourne Zoo) but with only limited success, and anyway large numbers of juvenile frogs would be required. Egg mass translocation seem to be the way to go. Noting that recruits move only a very small distance from the egg masses from which they emerged, it is possible that egg mass translocation may be required in order to 'imprint' recruits on their habitat.

FUTURE MANAGEMENT AND RESEARCH ISSUES

1. **Management of small populations**

   Some small populations have disappeared, others have increased in size. Reasons are unclear and data on possible threatening processes, eg, changes in size of swamps and hydrology following clearing or establishment of blue gum plantations, are lacking. More work is need to attempt to correlate extinctions with local environmental changes.

2. **Fire management**

   The long term fire experiment with *G. lutea* near Walpole needs to continue, but, with a

reduction in work by UWA, the project will need to be taken over by CALM.

3. **Landscape management and conservation**

   Connectivity between populations may be necessary for long term population survival. Some major *G. alba* populations are not protected. The best cluster of populations of *G. alba* is within Location 83, a privately-owned, large area of land that connects the main State forest block to the east with Forest Grove State forest. One attempt to purchase this land has failed and the major issue is cost – the area is valued at over $2 million. Planning schemes and State land clearing policies may be the best way of protecting the frog habitat.

4. **Resources**

   The Recovery Team has depended largely on UWA Zoology for research into Geocrinias over the past six years. No more PhD studies are likely in the short to medium future. Research input from CALM is needed to continue fire research and commence translocations.

   There is sufficient money available from the Environment Australia Endangered Species Program to continue fence maintenance, firebreak construction, etc. for another one to two years. An application for further Commonwealth funding will need to be developed in 1999.

5. **Conservation Status**

   G. vitellina is currently ranked as Vulnerable and this is unlikely to change unless there is no recovery from the 1997 fire or frequent fires affect its habitat. Should a decline be confirmed, it will move directly to Critically Endangered, because of the extremely small area of occupancy.

   G. alba is currently ranked as Endangered. In an 'in press' paper by Dale Roberts, Simon Conroy and Kim Williams it is stated that it meets IUCN 1994 Red List Criteria for Critically Endangered. If this is confirmed by the Threatened Species Scientific Committee and the Minister, it may have significant ramifications for CALM resources and public perceptions.