

9. Remarks on marking frogs

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Inflicting permanent or temporary marks on animals is a prerequisite of any method of determining abundance where animals may be encountered more than once. Marking amphibians presents particular problems on account of their sensitive, permeable skins and general fragility, which demands that handling be kept to an absolute minimum. In the present study toe-clipping, tagging and individual differences in pattern were used to prevent pseudoreplication in various parts of the study. Each method was initially tested by applying it to animals held in captivity for at least two days and noting any changes in their behaviour or appearance. No problems were encountered, but with the exception of toe-clipping for the very large frog *Hoplobatrachus tigerinus*, none were entirely satisfactory in the field and one was disastrous. Eight rhacophorid frogs marked with an elastic band around the waist disappeared the following night and only one was subsequently recaptured, several weeks later and showing evidence of rubbing wounds around the band. It is certain that the other animals perished as a result of marking. Several *Rana curtipes* marked by toe clipping were later observed to have developed swelling in the sumps of amputated fingers. Other individuals that had lost digits naturally were encountered and appeared in generally poor condition. Toe clipping is almost certainly a painful procedure, but anaesthetising animals in the field is not practical, in my experience. Identification based on individual appearance must refer only to pattern, not colouration, and is tenuous when populations are large or lack distinctive patterns. Furthermore it is time consuming and admits a large opportunity for error.

Conversations with other field workers support my belief that behavioural changes and detrimental effects of marking are under represented in the literature. Rigorous controls are required to demonstrate no effect when marking or attaching devices to animals, and the assumption that the manipulations are neutral because no adverse effects are noted is rarely justified in populations of wild animals.

The ideal method of marking would be applicable to all individuals in the community, regardless of size or habit. Of the variety of methods described in Heyer *et al.* (1994), those involving marking with dye seem most promising.