

NOTES ON THE SURVIVAL AND DEVELOPMENT OF PALLID TADPOLES OF THE NATTERJACK TOAD, *BUFO CALAMITA*, (LAURENTI), FROM A CUMBRIAN SALT MARSH POOL

BRIAN BANKS

School of Biology, University of Sussex, Falmer, Brighton, E. Sussex BN1 9QG

INTRODUCTION

Pallid and albino tadpoles of *Bufo calamita* have been recorded both from Europe (Flindt and Hemmer, 1969), and various parts of Britain, namely Hampshire (Beebee and Beebee, 1978), Norfolk (J. Buckley, pers comm) and from Cumbria (B. Banks, personal observations). Albino adults have not been recorded (Beebee, 1979), the inference being that pallid toadlets either die, or subsequently develop normal pigmentation.

During 1984 three pallid tadpoles were collected and reared to metamorphosis, allowing observations to be made on the subsequent development of the toadlets.

METHODS

The tadpoles were kept at room temperature and fed on commercial rabbit pellets. Following metamorphosis the toadlets were reared on aphids and later on larger insects. The animals were shielded from sunlight in case the effects of U.V. light were harmful. Observations on the colour of the toadlets were recorded at irregular intervals.

RESULTS

Observations on the colour and stage of development were as follows:

24th June 1984

Three tadpoles (stage 37, Limbaugh and Vulpe, 1957) were collected. Two of the specimens were a greyish white colour, while the third had a slight grey marbling, restricted to about 25% of the body surface.

12th July 1984

All three toadlets metamorphosed and were pale grey in colour. The vertebral stripe, characteristic of the species was not apparent. One of the toadlets died a few days later, a result of its having failed to feed since metamorphosis.

30th July 1984

The two remaining toadlets were 10 and 12mm in length. A pale stripe was just visible on both specimens, as were a number of orange/red markings on the warts. The general body colour was a very pale yellowish white.

30th August 1984

The toadlets now measured 20 and 24mm respectively, and had developed the external morphology characteristic of juvenile and adult natterjacks (Beebee, 1983). The skin was much darker, largely a result of extensive green marbling, reminiscent of that of the green toad *Bufo viridis*. As a result the yellow stripe was now very obvious, while the warts remained an orange colour, and the back-ground colour was a pale buff.

DISCUSSION

These specimens appeared to have a specific inability to produce melanin. The colouration that developed later was due to other pigments:— yellow and orange from lipophores, white from guanophores, and green from bufoviridine (Frazer, 1983). The results also indicate that the only pigment produced by natterjack tadpoles is melanin, the other pigments are not produced until at least a few days after metamorphosis.

Pallid natterjack toadlets are clearly capable of surviving beyond metamorphosis in the absence of natural sunlight. There is evidence that ultraviolet light can cause injury to animals (ie the abdominal cavity of some organisms), and so they shield themselves by dark pigmentation, or seek shaded microhabitats (Burt, 1979). It still remains to be seen if pallid natterjack toadlets in the field are capable of surviving natural levels of U.V. light in Britain, although the diurnal behaviour of the toadlets would render them vulnerable if there were side-effects. However, if such animals do survive they would not be recognised as pallid specimens, as the animals reared in this study resembled pale normally coloured adults 1½ months after metamorphosis.

The occurrence of dead white spawn has been attributed in the past to senility of the adults (Beebee, Bolwell, Corbett, Griffin, Preston and Webster, 1982), but such white eggs may possibly be produced by younger animals. A string of white spawn was noted this year at a site where natterjacks had only been introduced four years previously, (J. Buckley, pers comm), while I have found wild natterjacks aged 11 and 12 years old (Banks and Beebee, in press). At the introduction site pallid tadpoles had been noted during the first year of the introduction. Some pallid specimens reared in captivity did not survive long after metamorphosis. However, it is possible that some specimens survived in the wild. It may well be that if pallid natterjacks survive in the wild that these animals are responsible for the production of melanin-deficient spawn.

Further research is obviously required to determine if pallid natterjacks do survive the effects of sunlight, and if they lay white eggs. It may well be that the phenomenon of spawn strings consisting of white eggs is less straight-forward than present theories imply.

ACKNOWLEDGEMENTS

The tadpoles and toadlets were handled under license from the Nature Conservancy Council. I was kindly allowed access to Eskmeals Dunes Nature Reserve (where the tadpoles were collected) by the Cumbria Trust for Nature Conservation. Information from John Buckley was most useful in the writing of this report, as were discussions with Dr. Trevor Beebee.

REFERENCES

- Beebee, T.J.C. (1979). A review of scientific information pertaining to the Natterjack Toad *Bufo calamita* throughout its geographic range. *Biological Conservation* 16: 107-134.
- Beebee, T.J.C. (1983). *The Natterjack Toad*. Oxford University Press.
- Beebee, T.J.C. & Beebee, T.J.C. (1978). A quantitative study of metamorphosis in the Natterjack Toad *Bufo calamita*. *British Journal of Herpetology* 5: 689-693.
- Beebee, T.J.C., Bolwell, S., Buckley, J., Corbett, K., Griffin, J., Preston, M., & Webster, J. (1982). Observations and conservation of a relict population of the Natterjack Toad *Bufo calamita* (Laurenti) in southern England over the period 1972-81. *Amphibia-Reptilia* 3: 33-52.
- Burt, E.H.Jr. (1979). Tips on wings and other things from *The behavioural significance of color*. Ed Burt Jr., E.H. Garland. S.T.M. Press, New York and London, Pges 77-113.
- Flindt, R. & Hemmer, H. (1969). Larval kreuzkrote. *Aqua Terra*. 6: 46-48.
- Frazer, J.F.D. (1983). *Reptiles and amphibians in Britain*. Collins.
- Limbaugh, B.A. & Volpe, E.P. (1957). Early development of the gulf coast toad *Bufo valliceps* Wiegmann. In *Herpetology* by Porter, K.R. (1972). Philadelphia, Saunders.