OBSERVATIONS ON NEOTENY IN THE SMOOTH NEWT

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Neoteny in newts is the condition where the larvae fails to metamorphose, and in some species is able to breed in this condition, for instance as in the Axolotl. Many of the newts exhibit partial neoteny, a condition where the gonads fail to develop. This condition seems to be more common than true neoteny, and has been recorded in the Alpine Newt, and all three of the British species (Smith 1969). In some cases the specimens may be very pale in colour (Smith's book has a good photograph of such an individual), and this has been suggested to be due to a fault in the pituitary gland. In many cases, however, neoteny has been reported to be influenced by either diet, light, temperature or rainfall.

The object of this article is to note the observations I have made on neotenous newts at a pond near Sunderland since the tender age of 7! The neotenic individuals were found in two large cooling ponds at Ryhope Pumping Station, a steam engine once used by the Sunderland and South Shields Water Company who built it in the mid nineteenth century. The pumping station is now preserved by a conservation group, and run on bank holidays. The cooling ponds have vertical sides with an overhanging rim all the way round the edge, and are approximately 2m deep. I remember both being full of water in the 1960's, but since then one has started to leak, and is now dry, while the other is only half full. The ponds have held large populations of Smooth Newts for as long as I have been going there, and were also used by a breeding colony of Common Toads. Recently the base of the drained pool has tended to flood and form shallow pools, and is used by small numbers of Common Frogs. Quite how the various amphibians escape from these pools is difficult to imagine, particularly for the anurans, and it is the case that juvenile toads seem to linger about the wells of the pond, and can be seen clinging to projections on the limestone blocks used to construct the pool. Adult toads are only very rarely observed in the pond so that they obviously have some method of escape. Sometimes newts can be found hiding in crevices between the limestone block.

The first neotenous individual was caught in 1967, and was of adult size. The specimen was taken to school and kept on our nature table for a week, after which time it escaped and fell into a bucket of varnish (confessions of so-called conservationist time!). Another neotenous newt was captured in 1970 by a friend, but it was not until I read Malcolm Smith's book in 1974 that I realised the significance of these specimens. I returned to the ponds and from a sample of 27 newts that I captured, three were neotenous. These three specimens were taken home and kept in a warm aquarium. All three were over 7.5cm long and had thick bushy gills. After a period of about one week these were noticeably starting to be resorbed, and within a few days all three animals had metamorphosed. The interesting thing was that once metamorphosis was complete the secondary sexual characteristics immediately became very obvious (i.e. a more swollen, dark cloaca in the male, and the differently patterned bellies), unlike the situation in normal metamorphosing larvae, which retain colouration typical of the female for a number of years until they are mature. I do not know if the newts were mature before metamorphosis , but Walhovd (1975) reported a neotenous female of this species laying fertile eggs in captivity.

All the specimens therefore that I have collected have metamorphosed within a few weeks of removal from the ponds, and therefore these observations are similar to those reported by Frazer (1973) who found that large tadpoles of the Crested Newt when removed from steep sided pools metamorphosed within one week after being kept in an aquarium containing water from the same pond.

It seems to me that this condition is probably induced by low temperatures. Beebee (1983) noted that when Natterjack tadpoles were kept in cold water they grew much larger than siblings kept at higher temperatures, and similar observations for other amphibian species have been reported by other workers. Smith reported the suggestion that steep sided pools made it difficult for the newts, to escape, and so favoured the production of neotenous individuals. Although escape from the Ryhope pools was probably hindered by the steep sides, and the overhang, I feel that the condition was probably induced by low temperatures. In recent years I have used max — min thermometers to record temperature differences between steep sided and gently shelving pools. Between 17.4.84 and 12.5.84 the maximum and minimum temperatures recorded in the steep

sided pool ranged from 8.5-19C, while another pool with gently shelving edges ranged from 1.0-28C. Clearly the pool with vertical sides experienced higher minimum temperatures, and much lower maximum temperatures than the other pool. It is likely that the pools at Ryhope, which were twice as deep as the steep sided pool whose temperatures I noted above, and in the cooler climate of the north — east of England were even colder, and it was probably this factor that induced the partial neoteny in these animals.

It would be interesting to carry out further work on animals from this pond, but unfortunately, (as reported by Banks and Laverick, in press) since the mid 1970's the Sunderland and South Shields Water Company now empty the ponds each year for cleaning purposes. This used to be done in April, and the result of this was the extinction of the Common Toad at the site. Following a request by myself in 1980 these pools are now cleaned out at an earlier date, but this was too late to prevent the exinction of Common Toads at the site. The Smooth Newt still persists at lower densities in the pools, and with the co-operation of the water company should continue to thrive, but it is a great pity that any neotenous individuals will be killed when the pool is cleaned each winter.

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