

Albino Common toads (*Bufo bufo*)

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ABSTRACT – A number of albino Common toads were found in a small pond within a suburban garden in north-west London. Albino spawn was also found in the pond. The viability of this spawn was compared in a laboratory to that of spawn from normal toads. Although albino tadpoles hatched from the albino spawn, they progressively grew darker as they aged, until indistinguishable from normal tadpoles. Presumably one parent (the male) was normal. The viability of the tadpoles hatched from albino spawn was reduced compared to normal tadpoles, although some animals survived to metamorphosis. They were then released back into the wild. Possible reasons for this occurrences of albinism are discussed.

ALBINO individuals seem to occur in all families of both plants (due to a failure to produce chlorophyll) and animals (due to a failure to produce melanin), although the condition is usually very rare. It is generally assumed that they are at a selective disadvantage and hence few are thought to survive to adulthood, and reproduce. Nevertheless, some obviously do, for albino individuals of, for example, some species of black birds (e.g. Jackdaw, Blackbird) are occasionally but regularly reported in the UK, often in the popular press. In the case of amphibians and reptiles, albino individuals of most native UK species have been reported, though all are considered very rare (Beebee & Griffiths, 2000). It was thus of some surprise and interest that one of us (JS) should find a number of albino Common toads (*Bufo bufo*) in the pond of a suburban garden. That finding enabled us to conduct some initial experiments aimed at assessing the viability of spawn produced by albino toads.

MATERIALS AND METHODS

Location

The albino toads were found in a small (approximately 1.5 by 0.75m) pond (Figure 1) in a garden of a suburban house in Ruislip, southern England. The pond contained Goldfish and populations of Smooth newts (*Triturus vulgaris*) and Common frogs (*Rana temporaria*) besides various aquatic invertebrates and plants. The toads were not originally introduced; they arrived naturally shortly after construction of the pond.

Reproductive Success

In both 2004 and 2005, toads (albino and normal) spawned naturally in the pond, leaving strands of albino and normal eggs entangled in the vegetation.

In 2004, initial observations on development of the eggs were made. The majority of the albino spawn was removed from the pond and transferred to Brunel University, which has excellent facilities for maintaining both native and tropical amphibians. This allowed closer observations on development to be made. The spawn was kept in pond water maintained at approximately 20°C.

Based on this initial experience, a more scientific comparative study on development of albino and normal spawn was conducted in 2005. On 25th March, 2005, a few strands of both albino and normal Common toad spawn were collected from the pond and transferred to Brunel University. At this time some of the eggs appeared infertile and diseased. Three days later, the healthier looking strips of spawn were cut into lengths of 50 eggs and each transferred to an individual glass beaker. Four beakers with albino spawn and four beakers with normal spawn were set up, aerated, and maintained at approximately 18°C. The eggs were maintained initially in pond water, but this was steadily replaced by filtered tap water. Seven days after transfer to Brunel University the eggs hatched. From age 7 days, the tadpoles were fed Sera-Micron, a fine powdered aquatic food used for rearing *Xenopus laevis* tadpoles. At 16 days of age, all surviving albino tadpoles were pooled together into one large tank and all the normal tadpoles into another. Numbers of surviving tadpoles were determined regularly until metamorphosis.

	Number of eggs collected	Number of eggs hatched	Survival		
			7 days	14 days	At metamorphosis
Albino	200	36 (18%)	24 (12%)	22 (11%)	22 (11%)
Normal	200	69 (34.5%)	66 (33%)	62 (31%)	62 (31%)

Table 1. Comparison of the survival of eggs and toadlets of albino and normal toads.

RESULTS

Albino common toads were first discovered in March, 2004. One albino male and one albino female, the latter in amplexus with a normal male, were found. In the following year (2005), a large female albino toad in amplexus with a normal male (Figure 2) and at least two albino male toads were present in the pond. Several other, normal, toads were also present in the pond at the same time. The albino toads had a yellowish hue to their skin and pink eyes.

The albino female toad (or possibly toads) produced albino spawn (Figure 3) that contrasted markedly with the black eggs of normal toads. In the first year of study, only albino spawn was studied; no comparison with normal spawn was made. It was nevertheless demonstrated that development to hatching occurred and that albino (i.e. light coloured) tadpoles emerged. Within just a few days, however, around 50% of these 'albino' tadpoles had assumed a darker colouration. Once the tadpoles began swimming freely, it was noticed that they had motility problems and, within a few days, all had died.

Similar observations were made in the following year, when a comparison with the development of normal spawn was also made. Again, the tadpoles hatched from albino spawn were initially albino (Figure 4) but, at 6 days old (post hatch), started to darken, becoming greyish rather than the black colour of normal tadpoles. As time progressed, the 'albino' tadpoles darkened further, until they were indistinguishable in colour from normal tadpoles.

There was very considerable variability in the proportion of eggs that hatched within replicate beakers of both albino and normal eggs. Individual

values varied between 0% and 46% for albino eggs, and 0% to 72% for normal eggs. Fungal infections probably accounted for the total (100%) losses in some beakers. This infection in some but not all beakers made comparing the development of albino and normal eggs problematic. Nevertheless, mean survival of normal tadpoles was better than that of albino tadpoles. Not only did a higher percentage of normal eggs hatch, but subsequent survival was also better (Table 1). Most losses (deaths) occurred soon after hatching. Once tadpoles were 14 days old, all survived to metamorphosis. About three times as many tadpoles from normal spawn as from albino spawn reached metamorphosis, at which time they were released into a pond at the University.

DISCUSSION

One of the more interesting questions is why there should be such a high proportion of albino toads in one small pond in a suburban setting, especially as toads rarely spawn in small urban ponds (Beebee & Griffiths, 2000). Although there have been occasional reports of albino toads (e.g. Frazer, 1983; Beebee & Griffiths, 2000; BB0WT, 2004) to have a minimum of three in one location at the same time seems unprecedented. Only a single albino toad is usually recorded. Of further interest is that both male and female albino toads have been observed in this pond, suggesting that whatever is responsible for the albinism, it is not sex linked. There seems to be two explanations for the presence of a number of albino toads at one location. One is that a mutation (presumably in a gamete) led to a single albino toad, and that the albino toads reported here are some of the offspring of that animal. Alternatively, there is something extraordinary about the pond in question (such as a chemical in the water) that induces albinism in a proportion of the toads that



Figure 1. The garden pond in which the albino toads were discovered. Photograph © S. Pash.



Figure 2. An albino female Common toad in amplexus with a normal male. Photograph taken 24th March 2005. © S. Pash.



Figure 3. Spawn of both albino and normal common toads collected on 25th March, 2005, from a pond in Ruislip, southern England. © S. Pash.

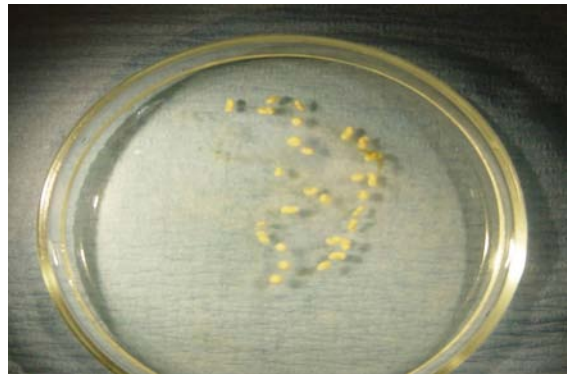


Figure 4. Albino tadpoles of the Common toad as they emerge from their eggs. © S. Pash.



develop from eggs spawned in the pond. Although this latter possibility might seem extremely unlikely, the appearance of an albino newt in the same pond in 2006 (Figure 5; see also page 11) might add some credence to it.

Albino toads (and other amphibians and reptiles) are said to be very rare (Beebee & Griffiths, 2000). Of course it is possible that albino toads other than those reported in the readily accessible literature have been found (e.g. BBOWT, 2004). Their rarity can be gauged from the fact that, in the last 8 years (1999 to 2006 inclusive), over 27,000 adult Common toads migrating to breeding ponds have been carried across a road linking Henley-on-Thames and Marlow in Buckinghamshire, England, and not one albino has been seen (our unpublished information). Even if some toads have been counted twice (because they migrated on two or more consecutive years), and

Figure 5. The albino Smooth newt (*Triturus vulgaris*) found in April, 2006. Note the pink eye and complete lack of body pigment (see also article on page 11). © J. Spooner.

hence the number of individual toads is somewhat less than 27,000, this example demonstrates the extreme rarity of albino adult toads.

Our data on the degree of successful development of albino and normal toads, although not unequivocal, do suggest that eggs and tadpoles of an albino parent (presumably the very pale 'albino' eggs came from an albino female) are not as viable as those of normal toads. The motility problems experienced by many of the albino tadpoles (such as swimming upside down, or round and round in tight circles) provided visual evidence of the developmental problems experienced by albino tadpoles. Some 'albino' tadpoles (they were by now quite dark) did survive, however, and metamorphosed into toadlets. Presumably some of these can survive in the wild (in a suburban setting) for a number of years, and reach sexual maturity. It has been reported that male Common toads first reach sexual maturity when 2 years old, and females are probably 3 years old when they first spawn, at least in a population in mid-Wales (Gittins *et al.*, 1985). It is generally considered that albinos (of any animal) are at a significant disadvantage as far as survival is concerned; they are presumably very visible, for example, to predators. Being largely nocturnal may reduce the risk. Perhaps albino toads survive better in a suburban setting than they would in more rural locations (where there may be more, and/or different, predators).

The tadpoles that hatched from albino spawn were initially very pale (i.e. albino in appearance), but soon become darker, and were a normal colour (black) when those that survived metamorphosed. This probably indicates that they were offspring of an albino female (hence the pale eggs) and a normal male. The latter would provide the genes required for melanin synthesis (such as the hormone melanocyte stimulating hormone from the pituitary gland). If albinism is due to a single gene defect (the most simple explanation) and that gene was recessive (as seems likely), then the albino female would have been homozygous for the gene defect and the normal male homozygous for the wild type (normal) gene. All offspring would therefore have been heterozygous, but presumably darkened through development due to the dominance of the wild type gene. These heterozygous toads, if they reach maturity and spawn, can potentially perpetuate the albino 'line'. The presence of both male and female albino toads in the pond for a number of years makes the continued existence of a 'line' of albino toads a distinct possibility.

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