

ORANGE FROGS: A WARNING SIGN?

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SUMMARY

The following report summarises information on 124 UK sites forwarded in response to national publicity surrounding the discovering of albino Common Frogs in Truro, Cornwall, in 1994 and subsequently. Most, but not all, records are recent in origin. A range of albino and partial albino conditions has been observed, resulting in orange frogs, typically, but also in a range of other colours. Patterns of development from spawn to adulthood are reported. Possible factors including albinism are suggested. A southerly bias to the records is shown which, it is argued, may be related to climatic differences. The potential of albino frogs as indicators of climatic change is discussed.

INTRODUCTION

In Spring 1994, a member of the public, Patrick Fielder, alerted the Cornwall Wildlife Trust to a bright orange frog in his garden in Truro. The creature turned out to be an albino variant of the Common Frog *Rana temporaria*. Albinos of this species have long been known, although Frazer (1983) describes them as typically golden yellow and Beebe (1985) as creamy yellow.

Seeing potential for publicising its work, the Trust issued a press release on the find. This led to extraordinarily heavy coverage by local and national television, radio, newspapers and magazines, and media interest was even stronger in 1995.

The resulting flood of calls and letters has brought to light a wealth of records, past and present. Three correspondents, in particular, had already made studies of unusually coloured frogs.

Ernest Ibbetson of Hertfordshire had regularly reared such creatures from spawn to adulthood over a number of years from 1972; his discoveries were in fact featured by several national television programmes in the 1980s.

Jean Webb of Somerset forwarded a copy of her 1975 article in *The Countryman*, which summarised records to date and reported on her own observations in Somerset and those of Arthur Price and CJ Leeke in Berkshire.

More recently, Jane Burton has been rearing albinos from tadpoles to adulthood at her home in Surrey since 1989; the last albino tadpoles appeared in 1984.

The information provided by these and many other contacts is summarised here with a view to presenting the phenomenon to a wider audience, seeking clarification and (where necessary) correction of interpretations suggested, and posing the question of whether the observations hold any ecological significance.

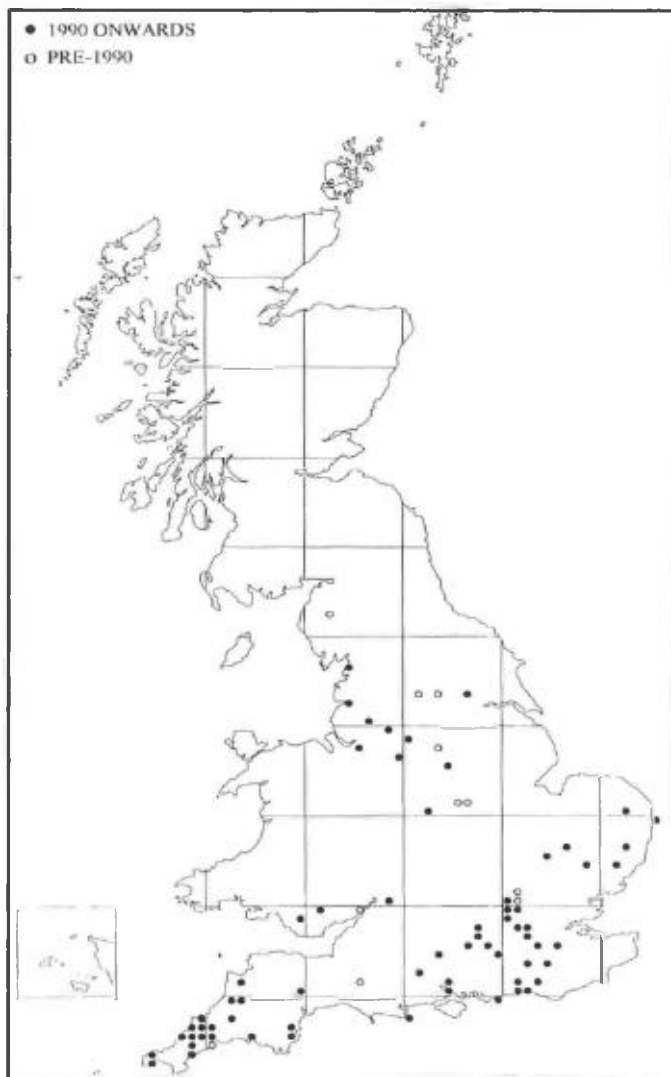


Fig. 1 Distribution of albino or partially albino Common Frogs

INFORMATION RECEIVED

SUMMARY OF RECORDS

Records of frogs considered to be albino or partially albino, or of albino spawn or tadpoles, have been received from 124 sites nationally. Some sites have yielded several (or many) albinos, sometimes over the course of several years. In the vast majority of cases (102) the earliest record for albinism at the site was from 1990 or later, although information was invited and received for older instances. Of the 22 "older" sites, only 7 records dated from earlier than 1960.



Fig. 2 Distribution of Common Frog as a whole

Fig. 3 Distribution of albino or partially albino Common Frog sites on a broad regional basis



COLOURS

Orange frogs have been mentioned at 73 of the sites, this being by far the most common colour for albinos reported here. In eight cases the colour was described as "peach" or "pinky orange", and in fact the original Truro frog turned this colour whenever subjected to prolonged light.

Yellow (or gold) was the next most popular colour, being mentioned for 23 sites, followed by pink (9), white (4) and cream (2), while three reports mentioned variegated colour patterns. There were also four instances in which frogs were described as having translucent skin and appearing pink (2), "golden" (1) or "pale" (1).

Sites at which the frogs were described as red have not been included within the 124 under discussion here, except for one in which the frog was confirmed to have red pupils to its eyes. Red (or pink) eyes have been taken as a sign of true albinism, while reddish skin is considered to fall within the "normal" colour range of the species. Frazer (1983) mentions that red frogs are particularly common in Scotland; the opposite appears to be the case for the skin colours considered as albino here (see later).

In most cases eye colour was not confirmed, but it appears that both red pupils and normal dark pupils are possible with any of the skin colours found. The red-eyed animals in the study have been described as true albinos, while those with "albino" skin but dark eyes are considered to be partial albinos.

Logically, it might be assumed that a frog with no pigmentation would have translucent skin through which the pink or red colour of its underlying flesh would be visible, as was the case in two of the sightings. Beebee (1985) attributes yellow colouring to lymph fluid under the skin. Close observation of normal frogs in the field shows that their undersides are often yellow, cream or white in colour. In the absence of the typical dark pigments, therefore, it would appear that a variety of other colouring and masking factors combine in different strengths to determine the overall appearance.

LIFE HISTORIES

Observations of mating by several recorders suggest that an albino female always produces albino spawn (i.e. with white or cream embryos), whatever the colour of her partner. This is perhaps to be expected, as the male's genes can have no influence until the embryos start to develop after external fertilisation.

In each of the "white spawn" cases described, every embryo in the clump of spawn was albino. Where development was studied, the white or cream spawn produced white tadpoles. At some sites, these gradually became normal in colour; presumably in these cases the male's genetic input was sufficient to make up for the deficiency. In other cases, the tadpoles became transparent - either colourless or with a red, orange or yellow tint. This allowed a very clear view of their internal organs. By the time of metamorphosis, the eventual adult colour appears to be fixed.

A different picture of development emerges from Ernest Ibbetson's frogs. These were said to arise from normal spawn with an almost imperceptible purple tint. The tadpoles appeared normal for at least their first ten weeks, and the adults (which included red, pink, white, orange, yellow and mixed-colour individuals) invariably had dark, not red, eyes. In Mr Ibbetson's view, an unusually coloured male would always pass its own colour on to its offspring.

Another case of male dominance was reported by Arthur Price, in which a pink frog with pink eyes fertilised black spawn. The tadpoles hatched black, but in some the melanin later broke into patches and then disappeared.

As well as lacking camouflage colouring, some albinos exhibit other deficiencies. Jean Webb sometimes found albinism to be linked with a distortion of the pelvic girdle, producing a kink in the tadpole's tail, while Arthur Price and CJ Leeke found that this led to a deformed shape in the adult. Kinked albino tadpole tails were also noted by Mark Cooper in Cheshire. In some cases the white tadpoles Jean Webb studied were less active than their normal counterparts and died a few days after hatching. Jane Burton found all of her albino adults to suffer from spinal deformities. Furthermore, they were *all* male.

Given the low survival rate of normal, camouflaged common frogs, it is surprising to find so many of these conspicuous creatures surviving in the wild at all, and that several recorders have observed the same (assumed) individual over three or four breeding seasons.

POSSIBLE CAUSES

The earliest albino records summarised by Jean Webb date from 1891, with several in the 1930s, so it can be assumed that this phenomenon was occurring long before pollution and other human abuses of the environment started to be blamed for aberrations in nature. Whether or not factors like pollution, increased ultra-violet radiation and global warming have increased the frequency of occurrence of the mutation causing albinism - or altered the survival chances of albinos - is another matter.

Ernest Ibbetson found unusually coloured frogs were a feature of most ponds in his home area, and blamed weedkillers for causing genetic changes.

To complicate matters, there is evidence that the unusual colours reported here can also be produced by directly environmental rather than genetic influences. Mrs P Wood recalled a population of white frogs being found in a boarded-up air raid shelter in Derbyshire in the 1950s; on release to a pond, they became darker. Andrew Greening told of the discovery of about 30 bright red frogs (albeit with normal eyes) trapped in an old drainage shaft; again the implication was that lack of light had affected pigmentation.

DISTRIBUTION

The distribution of albino sites on a 10km square basis is shown in fig. 1, while fig. 2 plots the distribution of *Rana temporaria* as a whole for comparison. Absence of albino records from Scotland and comparative rarity in the north of England are evident.

Numbers of albino sites are summarised on a broad regional basis in fig. 3. Even excluding the Cornwall records, whose numbers might be expected to be high due to local publicity, and the Devon records, which may have been influenced by publicity in Cornwall, there is a clear southern bias. The most northerly record received was from Keswick in Cumbria.

DISCUSSION

Comparison between the observed albino site distribution (fig. 1 and fig. 3) and the distribution of "normal" frogs (fig. 2) suggests that the southern bias suggested for albinism is not simply the result of recorder or pond distribution. Nor can it be argued to

be the result of proximity to Cornwall, the source of the original story, as the national publicity - by definition - covered all areas.

Perhaps the most obvious factor varying between north and south which might be used to explain this distribution is climate. Without dark pigments to help them absorb warmth from the sun, albino spawn and tadpoles are likely to develop more slowly than normal ones. In fact, Jean Webb did find that white spawn took longer to hatch than normal spawn in her study ponds.

Given this slower development, and the huge predation faced by frogs at their spawn and tadpole stages, it is surprising that any albino tadpoles survive to metamorphosis. Their chances of doing so, however, may be higher in the milder climate of the south, where warmth is not such a limiting factor.

Assuming that albino tadpole survival *is* higher in a warmer climate, it is perhaps logical to assume that numbers of albino frogs will be on the increase if global warming is taking place.

The information presented here cannot confirm whether albinism *is* becoming more common, but does lend support to such a notion.

The fact that so few of the reports related to older records is surprising if albino frogs have always been so common, as the presentation of "orange frogs" as a new phenomenon by the media tended to provoke contradiction by those who knew better.

Surely bright orange frogs must always have been a sufficiently alarming sight to be worthy of note, so why have so few been recorded or publicised before now if they are not actually more common today?

APPEAL FOR INFORMATION

Any information which might help yield a more accurate picture of what (if anything) is happening with regard to frog colouring, and why, will be much appreciated. Are there any other old records on naturalists' files? Has anyone seen an albino frog in the far north of England - or even Scotland? Does anyone have similar information from other countries?

Can anyone shed light on the physiological basis of colour variation in frogs? And have albino frog records been taken within a long-term pond study which might indicate trends (or otherwise) in their numbers?

ACKNOWLEDGEMENTS

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Photo: Jim Fisher (Frog life)

Plate 1. Orange tadpole of *Rana temporaria*



Photo: Stuart Hutchings

Plate 1. Orange froglets, *Rana temporaria*