

## **CAPTIVE REARING AND BREEDING OF NORFOLK NATTERJACKS, *BUFO CALAMITA***

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During 1980 I became interested in the possibility of rearing and breeding native Natterjacks, with a view to setting up or assisting with future conservation projects involving this species. Accordingly I applied for and was granted a licence from the Nature Conservancy Council and, armed with some preliminary advice from Trevor Beebee, in June 1981 I collected a dozen tadpoles from a duneland site on the Norfolk coast.

The survival rate was high and, at the beginning of December, I put nine well-grown toadlets into hibernation in a tank half full of sand, placed in my garden shed. At this point my luck ran out as I had failed to appreciate just how cold the winter of 1981/82 was going to become. The toadlets had dug into the sand which was about five inches deep, and which was overlaid by layers of slightly damp moss. However, the cold penetrated through the sides of the aquarium before it occurred to me to "lag" it, and the entire contents were frozen. The result was eight dead toadlets, and another which never really recovered, and which died shortly after emerging from hibernation the following March. It may be significant that this was the largest of the batch, and so may have been more resistant to cold.

In May 1982 I collected another batch of Natterjack tadpoles, 25 in all, which had just reached the free swimming stage. These came from the same site as the first batch and were collected a few from each dune-slack to minimise the chances of future inbreeding. My present breeding stock originates from this batch, as does Roger Gouldby's.

So far I have achieved a 100% survival rate with these toads and I have retained 15, having passed on 10 to Roger Gouldby (5 in 1983 and 5 in 1984).

The method of raising tadpoles and toadlets, which we have both adhered to, and which seems to work well, is as follows. The tadpoles, which can be reared from spawn quite easily, can either be kept in a large tank with a sandy bottom and an inch or two of water, or in a shallow p.v.c. "slack". In each case they need a good deal of sun and are happy in quite tepid water, as long as they are not overcrowded. Water plants are not necessary and, if present, should be kept sparse.

The tadpoles will feed on rabbit-pellets, which seem to provide a fully balanced diet. However, if crickets or earthworms fall into the water these will also be devoured.

It is a well known fact that Natterjack tadpoles develop rapidly and the spawn to toadlet cycle can be as little as five or six weeks. In my experience the most crucial time in rearing Natterjacks is during the transition stage from tadpole to toadlet. One cause of fatality is drowning; if the developing toadlets cannot leave the water with ease they will become exhausted very quickly and will go under. Therefore it is essential that a pond or slack has very gently sloping sides so that the toadlets can walk out of the water with the minimum of effort. A saucer-shaped profile is ideal. It is during metamorphosis that many of the weaker animals seem to succumb. The survivors do not attempt to feed until their tails have been completely reabsorbed. At this time they are capable of feeding on only the smallest of invertebrates, and getting this sort of food for them can be tricky. A method which I have found to be successful is to take a bucket and hold it under a hedge or nettle-patch whilst beating the vegetation with a coal-shovel. This will result in a large number of invertebrates of varying sizes, ranging from mites to hoverflies, all mixed in with dead leaves and twigs. These hedge-beatings can be tipped into a corner of the toadlets' tank, and the litter removed much later, when the toadlets have been through it and have selected the most manageable food-items. If one is not careful one can easily remove small toadlets when removing the litter, and it is also wise to keep an insect-proof lid on the tank during feeding to prevent the "beatings" from escaping all over the house. Hedge-beatings will be available until November, but they are difficult to collect from wet vegetation and this is important to remember, as the small toadlets need to be fed daily.

Natterjack toadlets can grow rapidly when provided with a plentiful food-supply and by the beginning of their first hibernation the average length of this batch was just under 3cm. One specimen reared by Roger Gouldby in 1983 measured 42mm prior to being hibernated, which must be a record for a Natterjack less than six months old. The average length of my toads at the end of the second year was just over 51mm.

It is best to rear toadlets in an indoor tank for at least the first year of their lives, and to get the best results it is vital not to keep too many. As they grow so do their appetites and, on two occasions I have found it necessary to pass on small numbers of rapidly-growing toads because I was having trouble in finding enough food to go round.

The newly-metamorphosed toadlets should be kept in a well-ventilated tank with an inch or two of sand on the bottom. Some loose moss should be provided at one end, and this should be kept damp, but not sodden. I consider that a water-tray is not necessary and may even be a hazard, and so I keep the tank interior slightly damp by judicious application of a plant-sprayer or atomiser. The interior of the tank should not be allowed to become humid but some sunshine can and should be allowed in. The toadlets should be kept in damper conditions for the first few days after metamorphosis than subsequently as at first their skin is damper and more delicate. However, after this time, the skin becomes lighter in colour and drier in texture and the toadlets then become more lively and mobile.

Hibernation is the next obstacle for the young toads, and their survival rate will largely be dependent on the provision of suitable quarters, and on their size and health. For their first two winters my Natterjacks have mostly been hibernated in tanks in one of my sheds. These tanks were furnished as previously described, and were placed on old kitchen units close to the single shed-window, where they received little direct sunlight. One batch spent the first winter in a coldroom at the University of East Anglia where they hibernated successfully at a constant low temperature, in a similarly furnished tank. Under these circumstances I have tended to put toads into hibernation at the end of October, and I have dug them out again in early to mid-March, as soon as the first animals have begun to emerge. The tanks have then been placed in a conservatory which receives afternoon sunshine.

Feeding Natterjacks seems to present no problems except that of finding enough food, as they have voracious appetites whatever age or size they are, and will feed readily as long as their body temperature is high enough. The adults will eat spiders, grasshoppers, crickets, mealworms, earthworms, caterpillars and moths, and I feel that it is important to provide Natterjacks with as varied a diet as possible at all times.

As for breeding Natterjacks in captivity, this has been reasonably straightforward, and seems to be dependent on:—

- a) Rearing robust healthy animals
- b) Providing conditions for breeding and living which are as similar to those of the toads' natural environment as possible.

Following emergence from their second hibernation in mid-April, my Natterjacks were kept in a large tank for about two weeks, and then transferred, a few at a time, into the outdoor enclosure which I had previously adapted to suit their needs. This enclosure, which forms part of a complex which includes two other larger ones, measures 6' x 7' with a two foot high wall and is placed to receive sunlight for the greater part of the day. The toads had previously spent several months in it during the previous summer, and had done well.

Interior landscaping has been designed to resemble a section of dune or heathland and the enclosure had to be filled to a depth of up to one foot in places with sand, to enable typical heathland plants to become established (our local soil is heavy and clayey, and quite unsuitable for such a flora). The raising of the interior level of the enclosure also countered the shading effect of the walls, increasing the amount of sunshine within. This is an important factor, as it is known that Natterjacks need sunlight and like to bask (Beebee, 1983). Plants chosen for the enclosure included *Festuca glauca*; *Erica carnea*; and cultivars of *Erica tetralix* and *Calluna vulgaris*. The sandy areas between the plants have been kept largely clear of weeds to enable the toads to dig freely, as they would in their natural environment, and there are a number of pieces of old gorse-wood and small logs scattered about, also for cover. A shallow p.v.c. liner "slack" approximately 2'6" x 3'6", and 4" maximum depth occupies a dip in the centre of the enclosure.

Following their re-introduction into the enclosure the male toads soon began to congregate in the slack and to call. This occurred mainly during the evenings and at night, but sometimes during the morning as well. The noise from over-flying jet aircraft seemed to act as a stimulant and would usually start off a spate of croaking. Probably no more than two or three males were ever calling at any one time, but even so, the noise was audible in the house even with the television on! Roger Gouldby experienced similar behaviour from his colony which were kept in a similarly landscaped but larger (9' x 11') enclosure. Females which ventured into the slack were quickly grasped by the males, which would maintain the amplex even if the female subsequently left the water. The sex ratio amongst my Natterjacks appears to be 9:6 in favour of the females, and Roger Gouldby also has a greater number of females than males.

Although a large proportion of the males appeared to be sexually mature and in breeding condition, the females seemed not to be so well developed, and the breeding activity resulted in only two spawn strings for my colony, and three for Roger's. The spawn strings laid in my enclosure were both largely fertile and were deposited at night on the 26th May and 26th June. The strings laid by Roger Gouldby's toads were laid on the 14th June, 26th June and 10th July. The first and third strings were mainly infertile but the second string was almost completely fertile.

The tadpoles which resulted from these spawnings were reared, both in the enclosure slacks and in aquariums to a stage where they were about to develop back legs and were then collected up and released at an introduction site in North-west Norfolk. Roger and I estimate that we released at least 6,000 well grown tadpoles, but this is a conservative guess. In addition I have passed on 55 toadlets to persons who expressed a desire to rear and hopefully breed from them. I originally kept back 100 tadpoles for rearing to toadlets, but following metamorphosis, I lost nearly half of these, simply because however much food was supplied, the smaller ones could not seem to compete with their larger brethren. As I passed on toadlets and reduced numbers in the tank so the smaller specimens received more intensive care and the survival rate increased accordingly. Once I got down to 20 or so, there were no more fatalities.

One observation of breeding Natterjacks, which was made by Roger one night when he was watching his toads by torchlight in the company of a photographer, may be of particular interest. A male was seen to be calling on the edge of the p.v.c. "slack". It would call for a few seconds and then swivel round a few degrees and commence to call again. Eventually the toad had completed a full circle in this way having called to all points of the compass.

At the time of writing my Natterjack colony is preparing to spend its first winter outdoors in the enclosure, and most individuals have now dug burrows into the sand or else have graduated towards the brickbuilt hibernation chamber located in one corner. It will be interesting to find out if they can succeed in breeding again, perhaps more successfully, in 1985.

#### REFERENCE

Beebee, T.J.C. (1983). *The Natterjack Toad* pp 60, 65-66. Oxford University Press.