

## FROGS BREEDING IN STREAMS

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The British amphibians are almost exclusively found to breed in still, rather than running, water. Surveys for native amphibians generally take the form of pond surveys (e.g. British Herpetological Society Conservation Committee, 1990). However, there are occasional records of native anurans breeding in streams (e.g. Cooke, 1975; Frazer, 1953). The present note reports some observations of Common Frogs (*Rana temporaria*) breeding in streams at sites in England and Wales.

Whilst visiting the Black Mountains in South Wales (1.9.95), we discovered large numbers of Common Frog tadpoles and metamorphs in a stream, Nant y Bwch, flowing off an upland area at 475-490 m altitude (Grid ref: SO 233 333). The tadpoles occurred in a rocky pool and riffle section of the stream, but were not confined to pool areas. They were abundant in flowing water. The tadpoles were very numerous (some several hundred) and well-grown. The stream supported no vegetation, except for algal periphyton growing over the rocks of the stream bed. Although it was possible for the tadpoles to hide away in the many refuges of the rocky bed, there were very conspicuous out in the open, shallow, clear water.

Although Common Frogs have long been noted in this area (Smith, 1964, notes that frogs have been found breeding on the summit of Waun Fâch [811 m]), it was possible that the tadpoles were introduced to the stream, as eggs or larvae, by people. To verify whether spawn was naturally deposited, the site was re-visited the following spring (7.4.96). The upper 1800 m of the stream and one of its tributaries were searched for frog spawn. 14 clumps of spawn were found along a 500 metre section of stream. No spawn was found in the tributary, which was faster flowing due to being on a steeper incline. Three clumps were singly deposited, while the remaining clumps were deposited in communal sites of four and seven clumps. The communal spawning sites were in slow-moving pockets of the stream, where the spawn was protected from the current by large rocks. However, even in these areas the water was not completely still. One clump was found under a flat stone, but it was impossible to tell whether it had been oviposited there, or whether it had been moved by water currents. Of the singly deposited clumps, one was deposited between two rocks, and the other two were deposited in the slower-moving water at the edge of the stream. All of the spawn clumps were recently deposited (none had reached the tail bud stage), which suggests that the search coincided with the early stages of the spawning period, and hence it is likely that not all of the frogs in the locality had spawned by the time of the survey visit.

At the same time (7.4.96), frogs were found to have spawned in a stream in the ancient Blean forest (situated on a dissected London Clay plateau of about 100 m altitude) of Northeast Kent. The River Sarre Penn (c. 65 m altitude) is intermittent, but frequently torrential at this time of year. Heavily shaded, aquatic vegetation is sparse, with some willow moss. The bed is comprised of shingle. Invertebrate predators of amphibians are few, but several fish are present: Three-Spined Stickleback, Minnow, Stone-Loach, Bullhead and Eel. The first four species survive periods of no flow by utilising persistent

pools in the stream bed; Eels are able to migrate. In previous years, frogs had spawned in a permanent pond (Grid Ref: TR 112 602); this contains the same fish species, as well as numerous invertebrate predators and abundant vegetation. On this occasion spawn was found in the adjacent shallow section of the stream, with spawn and tadpoles in a deeper pool below a bridge culvert (Grid Ref: TR 118 603). There was no evidence of spawning having taken place in the pond.

The breeding frogs in these streams raises several questions. First, how frequently do Common Frogs use streams as spawning sites and why do they more commonly seem to avoid breeding in streams? Predation by fish may generally prevent frogs from breeding in streams. Trout are found only in the lower reaches of the Nant y Bwch, which may allow the frogs to exploit the upper sections. Fish numbers in the River Sarre Penn may have been lowered as a consequence of drought, making the stream more attractive as a frog spawning site.

Alternatively, or in addition, it is possible that in most years the flow rate of streams is too unpredictable to allow successful reproduction. Fast flowing stream water may make external fertilisation difficult and may wash tadpoles downstream, into less favourable habitat. We have no quantitative data regarding changes in stream flow over past year, but it is possible that the recent sequence of years of relatively low rainfall may have allowed frogs to exploit streams for successful reproduction. At the Nant y Bwch, the stream flow was certainly not vigorous for the time of year. At the Sarre Penn site, although pond conditions appeared to be identical to previous years, the flow rate of the stream was unusually low, following a prolonged dry spell. Additionally, spawning at the latter site had been delayed by approximately one month, presumably as a result of the long cold winter. The late spring meant that many trees were not in leaf, reducing the shading effect. Low flow and lack of shade would both have contributed to elevated water temperatures, which may also be a reason for the change in behaviour of the frogs.

Are stream breeding sites overlooked by amphibian recorders because they tend to focus their efforts on ponds? Preliminary results from the BHS/Wildlife WATCH Frogwatch survey suggest that such sites may be of some significance. A World Wide Web page, dated 13.4.96, quoted about 100 records of frog spawn in 'flowing water', from a total of 1518 (c. 6.6%). Alternatively, is breeding in flowing water a successful strategy for frogs only in years of low water flow? Sections of streams that are relatively free of predators may be suitable for frog reproduction only in years when water flow is insufficient to either disrupt insemination of the ova, or to wash eggs and larvae into less suitable stretches of water. It would seem prudent for future surveys to consider flowing waters as potential spawning sites for Common Frogs.

## REFERENCES

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