

FURTHER OBSERVATIONS ON SPAWNING PARSLEY FROGS

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INTRODUCTION

Regular readers of the Bulletin may recall my article in the Spring 1990 issue (No. 31), in which I described successful captive spawnings of the Parsley Frog, *Pelodytes punctatus*, during 1988 and 1989. As a result of breeding this species since then, a number of noteworthy additions can now be made to those earlier observations. 1990 proved to be by far the most productive and interesting of subsequent years, so this will be covered in detail, with reference to the others being made only where necessary. In view of the considerable depth given to describing the various stages of my spawning method in the above mentioned article, excessive repetition will be avoided in the course of the following, so I would refer those requiring greater detail here to that earlier publication.

1989 METHOD SUCCESSFULLY REPEATED

For 1990, the main task was initially to discover whether the Parsley Frog breeding method arrived at in 1989 was a reliable one. As then, pairs of frogs were accommodated in 14" x 8" x 8" indoor aquaria which were furnished with an island built up from tiles and rocks from which clumps of grass hung into the water to a depth of 5-6" (12-15cm). The tanks were kept at room temperature, 50-68°F (10-19°C), and once attempted/actual amplexus was observed, frequent 1/2 - 1/4 water changes were made. Frogs came into condition as previously recounted, (Hartley, 1990), and spawnings were duly obtained from all but one of five mature females available. Spawning temperatures were between 54 and 65°F (12-18°C), mostly in the upper 50s, and only once was strong sunlight available, these features conforming to the pattern noted the previous year. With varying degrees of success, this was also the case subsequently, the only notable exception being one very late spawning obtained in mid-May (17th) last year (1992).

The experiment to discover if significantly more green individuals could be produced by raising tadpoles on green algae than on other foods was, however, inconclusive, with no real difference between each group, although those fed mainly on boiled lettuce, which had not been used previously, have been found both in 1990 and since to grow faster than ones raised on fish flakes. This year, 1993, a greater number of green froglets have so far emerged from tadpoles housed in a brightly lit outdoor shed than those kept indoors under less well lit conditions most of which have been brown, but again the difference is unlikely to be significant.

EARLY SPAWNINGS & INFERTILITY

Very early spawnings were one of the novel features of the 1990 season. At least two of the males were observed to have fully-developed nuptial pads, and most of the females appeared to be ripe with eggs, at the beginning of January, a month earlier than was the case in '89, though no typical breeding calls had yet been heard. On 2nd January a male and two females were moved to a breeding aquarium, and

amplexus was observed several times over the next 6 days. No further progress having been made, another female was introduced. 7 days later the least co-operative female was removed, but the pattern of periodic amplexus continued until the male stayed with the same female from 22nd to 26th, when breeding calls were heard from another male in the terrestrial vivarium. This one was added to the breeding tank, and both went into amplexus intermittently over the next week. On 2nd February, the pair introduced a month earlier finally spawned (producing c.700 eggs) at 56°F (c.13°C), and the other pair followed suit on 8th, (c.1,000 eggs) at 57-60°F (13-16°C). These spawnings were 5-6 weeks earlier than any of my own, or so far as I am aware, those of anyone else, in 1989.

However, the negative side of this apparent success was that within 2-3 days it was clear that each batch of eggs was totally infertile – something which had never occurred in the previous two years. Conditions were identical to those under which spawn had been laid and hatched in '89, (Hartley, 1990), so this did not appear to be the problem, and the frogs themselves were perfectly healthy, otherwise they would not have spawned at all. Was there a possibility that one or both sexes were not quite in full breeding condition after all, and had been stimulated to do so too early?

A possible answer was provided at the end of the month, when, using two males discovered by Howard Turner in his unheated greenhouse, and two of the non-spawning females, further spawnings were obtained on 27th (c.800 eggs) at 57°F (13°C), and 28th (c.50 eggs) at 57-60°F (13-16°C). These proved to be fertile, and developed normally, perhaps supporting the theory that the earlier individuals had not been in peak condition, or alternatively that the new males were more fertile than the others because they had come from a more natural environment. The certainty was that they were still 13 and 14 days respectively in advance of the first spawnings of 1989. However, the only subsequent February batch was produced in 1991 (on 27th), when approximately 60% of the eggs were fertile.

For reasons involving either insufficient conditioning of the adult frogs, or some other factor related to their captive environment, spawnings in which both the older and maturing young breeders showed an increasing rate of infertility, irrespective of when the eggs were laid, in 1991, and almost total infertility in 1992. This trend has also been noted by Howard Turner and Charles Snell, both of whose *Pelodytes* are maintained in different captive set-ups to my own. Any suggestions from readers as to the possible causes of the infertility would be very welcome.

SECOND SPAWNINGS BY FEMALES

Finally to the most interesting, unexpected and perhaps the most significant element of the 1990 breeding season. As with all other anurans, males of this species will mate with as many females as they can find throughout the course of the spawning period. However, there is to my knowledge no record of female Parsley Frogs producing more than a single large batch of eggs during that time, and even the earliest spawners in 1989 had ever looked like doing anything else.

By the beginning of April 1990, the females which had spawned in early February had put on sufficient weight to suggest that they might again be carrying eggs. All the males were still in breeding condition, so I decided to set them up to see if anything would happen. One of the males involved with the first spawnings, and one used in those at the end of February, were placed with the two females above on 4th. The usual behaviour pattern followed, with the result that spawning indeed took place on 6th (c.590 eggs), at 54°F (14°C), then 13th (c.870 eggs) at 56°F (13°C),

and finally a second batch was produced by the female which first spawned on 28th February (c.350 eggs) at 60-65°F (21-25°C), on the latter occasion using the other male which bred at the beginning of the season. In each case, there was a gap of 63, 64 and 47 days respectively between the first and second spawnings. The vast majority of each batch of eggs hatched normally, despite the involvement of those frogs whose spawnings were infertile. Perhaps this suggests that incomplete development of sperm and/or eggs was indeed to blame for the previous failures that year.

The above clearly shows that Parsleys are well capable of producing more than one batch of eggs in the course of the same breeding season, and if given sufficient time, might also do so in the wild state. According to Salvador (1985), they breed between November and March in southern Iberia, which is quite long enough for this to occur if conditions remain suitable, but he makes no specific reference to females spawning more than once. As the last of the 'second spawners' proved, it is also possible for two fertile batches to be produced. At least the 7 weeks required by that individual may be necessary for egg stocks to be replaced sufficiently to breed again, which partly explains why there were no second batches in '89. It should be noted that all three females received the same amount of food in that period as they had previously, so a significant increase in feeding is not necessary to bring them back into condition. The approximate number of eggs in the second batches were certainly not vastly inferior to those in the first ones. Note also that of the four females successfully spawned in 1990, only one failed to produce a second batch, further suggesting that the second spawnings were not just a freakish event.

In subsequent years, however, despite numerous attempts, none of my female *Pelodytes* have produced a second batch of eggs, largely because they refused to breed as early as in either 1990 or '91, thus (probably) leaving insufficient time to do so before the breeding males went out of condition, and in 1992 only one female spawned at all. This may of course be connected with the infertility problem, but it may also be that a combination of exceptionally good conditioning and some other factor/factors were responsible for the successes of '90.

SUMMARY

To conclude, the main features of the 1990 Parsley Frog breeding season can be outlined as follows.

- (1) The spawning method found to be successful in 1989 proved to be effective. The only difference in '90 was that spawnings took place at slightly lower temperatures, and none occurred at anywhere near the high 70s°F(20s°C) suggested as the upper limit in my previous article (Hartley, 1990). Spawnings in following years were produced under the same conditions, so it can be concluded that temperatures in the mid-upper 60s°F(c.20°C) are sufficient.
- (2) Successful (i.e. fertile) spawnings can be obtained earlier in the year than previously described, although the evidence does suggest the need for animals to be in absolute peak condition.
- (3) Parsleys are obviously able to produce a second batch of eggs during a spawning period of two-two and a half months, whatever the most crucial factor involved here, but this is still a discovery of considerable potential value both to those wishing to breed them and also those simply interested in obtaining additional

knowledge of their behaviour. Apart from not having been recorded from other captive collections, this seems to be another area in which sufficient information on the reproductive activity of wild populations is lacking, and would certainly be worth further investigation.

Since that very successful year, there has been a gradual decline in the fertility of spawn from both older and younger frogs, and also an increasing reluctance on the part of females especially to spawn. Fresh blood has been added to the stock over this period, so inbreeding can probably be ruled out as a main contributory cause. Experimental alternations in general husbandry will possibly prove to be the answer.

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