

**PROVISIONAL RESULTS FROM STUDY OF FACIAL
FEATURES AS A MEANS OF INDIVIDUAL IDENTIFICATION
IN *NATRIX NATRIX*.
(Abridged Version)**

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INTRODUCTION

The difficulties involved in 'tagging' or identifying individual snakes are well documented and any field study undertaken where migration or interaction between males, females, adults and juveniles is of particular interest, has in the past, required wholesale capture and recapture of the study group in order to maintain an accurate record of movements. This is primarily because the similarity between both sexes (although *Vipera berus* has some difference in colour/shade) and individuals has necessitated the use of methods, such as the removal and part removal of alternate scales along the snakes body, so as to determine each snake from the next, with identification only being possible by close inspection.

The major drawback to building a log of movements from this form of I.D. is that the movements themselves are, at best, interrupted, or at worst, completely altered, by the very process of identifying each snake as it is found. This may defeat the object, with the snakes being forced into unnatural behaviour, ie: moving away from their residence within a particular study area.

In the United Kingdom, we are perhaps fortunate that at least one of our own native species of snake may be able to offer an alternative to the problems mentioned above, for not only are the chequered markings on its ventral scales completely individualistic, but, it appears also to possess characteristics in its facial markings. *Natrix natrix*, the good old Grass Snake, may, at first glance, seem indistinguishable from its neighbour, but, careful examination reveals an almost limitless number of determining factors, both obvious and subtle. Everything and anything from size and shape of collar, both yellow and black; thicknesses and inclination of slashes around the eye and across the mouth, to the block patterns on the neck, all assist in the build up of a character profile, which is both of a permanent nature and as reliable as any other system of marking/I.D. Similar means of identification is now accepted as standard practice when considering groups of mammals such as the Killer Whale (*Orcinus orca*), but to my knowledge has never been attempted on a species of reptile. Indeed, there are instances where the ground colour alone is sufficient to identify an individual but these instances are few and far between. The beauty of using a photographic profile as a means of telling 'A' from 'B', is that field study can be carried out at distance, by using photographic equipment such as Macro and Telephoto lenses. It is then possible to transfer the profiles, by utilising the colour photocopying facilities that are available at many high street shops, enabling most enthusiasts to participate in and further advance this facet of Herpetology. It eliminates the need to unduly interrupt the snakes' chosen movements with unnecessary capture and possible injury to snake (especially when gravid, see plate 2) and herpetologist alike.

Anybody that has tried to corner *Natrix natrix* when in a pond will no doubt appreciate the difficulties involved in a repeated capture technique, especially when the pond is up to twenty feet deep, and it is here that the photographic option is preferable by being more practical. The study itself is only limited by the presence and height of herbage, especially in late Summer, and from experience, any similar studies should concentrate the strengths of the photographic option in the early Spring to early Summer before new growth has become established.

PHOTOGRAPHIC STUDY

The opportunity came to test the limitations of the photographic technique when, in 1994, a random search of several areas was carried out by the author, and revealed that a sizeable group of Grass Snakes was apparent in a location that could fairly easily be monitored for activities, such as mating. Readers may recall that 1994 had especially hot weather in March and April, but an exceptionally cold June, so that numbers of female Grass snakes died, apparently egg bound. It was during the search above that 3 mature females were found lifeless, but in a gravid condition, and an on site post mortem examination of one of the corpses revealed what appeared to be a ruptured spleen. Advice was sought from local snake keepers regarding this observation and the general consensus of opinion was that freak weather had been to blame. It was then decided that an attempt at a log record of the local population would require more than a simple number count, in order to monitor the group, and 'mug shots' seemed the ideal solution. Since that date it has been noted that the group appears to remain at around 20 in number, although, the reasons for this will be discussed later in the conclusions. It has also been noted that when considering this study group, although the faces of each individual have been found to be all but symmetrical, (see plates 3, 4 and 5), in rare instances the block patterns of the neck may differ slightly and would require both left and right profile 'mug shots' to be completely sure of identification.

Obviously, when *Natrix natrix* moves into water, the section of body most prominent and which is therefore clearly visible, is its head and neck; and this fact has greatly assisted this study, as the study area included a lake frequented by the group. It was, and is, relatively easy to record movement and interaction, from the moment that the group emerges from hibernation through to the early Summer migration to the lake, but throughout July becomes progressively more difficult with increasing obstructions to the line of sight. Since this study has started (in varying degrees of intensity since 1994), several interesting aspects, both physiological and behavioural, have been noted. The first and possibly most important, not least because of its implications in terms of predicting climatic change, is that mating can and does take place at lower temperatures than was previously considered. A mating pair were photographically recorded on the 18th of March 1998, when the temperature did not rise above 13°C. Previous estimates indicated that the male would only be 'triggered' into sexual activity at 18-21°C. Having established and recorded this lower trigger to sexual activity, the capture of a juvenile on May 28th 1996, which had just sloughed measuring 205mm and which was previously thought to be the result of an 'over wintered egg', may have been the result of an extremely late Autumn mating and egg laying in very early Spring. This would also provide a satisfactory explanation for the observations in plate 1, where a gravid female appeared awaiting ovulation on 5th June 1998, and yet displayed mating behaviour (a pronounced physical jerking and entwining of tails) just seven days later on the 12th June 1998. This is important in that it could point to the Grass Snakes being capable of "Double Clutches" in any one year, provided that conditions were suitable. It is doubtful that such observations and recordings could have been made using repeated capture techniques.

From the examples within the group of some sixteen positively identified individuals (and maybe four or so not yet photographed in sufficient detail to determine) in behavioural terms, it appeared far more common for the female to hiss as a form of defence, especially in the more mature individuals, which tend to protest in this manner long after capture. Both male and female discharged the usual foul smelling secretion that one expects in roughly equal quantities. Preliminary sexing was assumed visually, (which appears quite reliable in the field) as the mature female (it is more difficult with juveniles/sub adults) has a noticeably more triangular head as opposed to the rather more slender and elongated head of the male. Obviously, once a pair is identified in the mating process, both individuals are recorded photographically so that further sexing is unnecessary. Probing was not used as it was deemed to be unwise when mating would be imminent and the author wished to avoid inhibiting reproduction. Capture and recording of individuals was always most successful on generally overcast days, which were obviously too cool for the snakes to actively seek prey, but where intermittent sunshine provided the incentive for the snakes to bask continually. Occasionally when in the process of shedding, the Grass Snakes were found coiled in light drizzle and were disinclined to move, even when physically disturbed. The crucial factor appeared to be strength of wind. On any occasion where similar climatic conditions applied, but where the breeze had begun to move the surrounding grass and vegetation, all the snakes returned to their covered quarters. Quite often these quarters included large logs where splits and holes allowed access into the rotting timber behind the bark; within the roots systems of live trees as well as deep within the banks of mature Heather and Bramble. In Summer, these hideaways are often replaced by the simple bank overhangs around the lake, or beneath piles of old leaves.

LOCALITY INFORMATION ON STUDY AREA

The area of study chosen for the provisional examination of the photographic technique was an area of approximately six acres within Epping Forest, Essex, which stands as a scrubby clearing at the north, with an open aspect of grass, Heather (*Calluna vulgaris*), Bracken (*Pteridium aquilinum*), young Birch (*Betula pendula*) and occasional mature Oak (*Quercus robur*), which then enters heavier woodland as progress is made south, until reaching the valley's lake. The lake itself is "connected" to the scrubby clearer plain by two ditches, conveniently situated at each side of the plain and which each provide a "migration passageway" down to the lake, as they promote the growth of Bramble (*Rubus fruticosus*) and thick vegetation that, in turn, provides the essential cover to enable the snakes to overcome the clear floor of the heavy forest in-between. This is especially significant because at one stage along the route a car park is situated just a few metres distant which is visited regularly by members of the public. The lake is open to angling; however, the northern end has restrictions and has a healthy fringe of Reeds (*Phragmites communis*) with a boggy marsh like appearance and banks which overhang in places providing extra cover at intervals.

Hibernation takes place on the plain, in old Rabbit burrows that are situated at both the mid and northern ends of the clearing but only in those that have been excavated into slightly higher banks or mounds than that of the surrounding area in general. The first appearances in 1998 did not take place until the beginning of March, when the air temperature was 8°C, despite the warm February, however, as previously mentioned, mating followed shortly after in the surrounding Bracken and Heather. In previous years it has been noted that the majority of snakes start to move toward the lake in late April, early May, and further mating takes place in the fringes of the heavier woodland. More mature females are the last to be seen on the plain, as late as mid June, and this is

perhaps due to older individuals having a preference for particular egg laying sites, or that they have mated for a second time and will only move on when ovulation is complete. However, previous sightings also suggest that they at least visit the lake with the males and return to the plain in late May. Temporary migration? Such a complex pattern of movement can only be unravelled with time.

The lake is some 300 metres from the northern part of the plain, and it is therefore possible that migration is not too arduous a trek for adult females to endure more than once a year. What the study has set out to prove though, is that the twenty or so individuals that make this journey, do so year after year for the duration of their lifetimes and barring untimely interruption, are habitual in their activities. What is yet to be determined is where most of the twenty individuals migrate to between mid July and October as they appear to leave the pond to the newly hatched and yearlings/ juveniles. What is also unclear is why the size of the study group remains more or less constant, and what proportion of newly hatched go on to maintain the group or move away to other quarters in the forest. It is intended to promote a wider and wider search of the surrounding areas during this time until the fuller picture can be completed.

It should not be assumed that this group is in any way an average population by division per acre, as the suitable habitat found here is equalled only once or twice within the whole of Epping Forest, with vast areas of heavy woodland and spaces which are more accessible to the public for recreational purposes being void of a Grass Snake population. This study will not attempt to examine the peculiarities of the forest population as a whole as this may lead to a less intense study of actual behaviour within the group itself. Of those twenty or so group members there are only six exceptionally large females; however, when considering the losses of females in 1994, the ratio between the sexes appears to favour a higher count of females in each clutch. [see conclusions]

By monitoring the snakes by photographic means, the previous haphazard study of personal log sightings can be replaced with a far more complex picture of movements and interactions and it is possible, for instance, to record newer snakes to the area, and those individuals that did not reappear following hibernation. It can provide a much more exact information on mating habits and provide clues as to the incidence of 'inter breeding' (if any), and what effect this may have on the population. Ultimately, the continued study will reveal average longevity of male and female and exact weight per year ratios upon emergence. Weights and lengths have begun to be recorded within the study group and apologies are made for the approximation of measurements but this was because it proved difficult to pin point millimetres when the snakes would not keep still!!!

Up to this point in time, 'identical twins' have not been noted in the study area, and those that have strong similarities between facial markings have some tell tale giveaway in collar and neck; however, it may be fair to assume that if any example of 'twins' exists, then they may well be from the same clutch of eggs and indeed related. Occasionally, there are individuals that appear that do not need close inspection to be able to identify them, for example, one animal found was almost leucistic, with few markings, and another had two bold green stripes along the length of the back.

It is hoped that other members can offer advice if similar studies have been carried out and how this study may yet be refined further.

CONCLUSIONS

Several conclusions are to be made from the provisional study and which appear to contradict previous assumptions made in relation to *Natrix natrix*. Firstly, *Natrix natrix*, although tending to travel further afield than the Adder (*Vipera berus*) are nonetheless creatures of habit and predictable in their behaviour. Once the habitual tendencies of the study group have been established, over a period of several years if necessary, it is possible to predict where and when certain individuals will appear in relation to the study area, especially during Spring and early Summer.

It is apparent from the weight length ratios observed that females will definitely consume prey items before egg laying and during mating. How else can a female recorded at 5 centimetres shorter than another record a weight of nearly hundred grammes in excess. Although there is not a weight/length ratio for an individual snake, mainly because prey items can drastically affect the weight of a snake at any given time, if earlier studies are considered (ie. Malcolm Smith) using just a length measurement to determine age, then males are mating within three years from hatching and have an average length of 24 inches/61 cms. The average length of mating females this year were 38 1/2 inches/98cms in comparison. The largest female in the group measured 43 inches/ 110 cms. The longest confirmed male was 26 inches/66 cms.

Mating takes place at temperatures at around 13°C and above and is not necessarily interrupted when the snakes are disturbed. Both pairs shown in the attached plates were locked together, before, during, and after capture. Females may mate more than once a year! To the author's knowledge this has not been previously considered.

For the sake of more accurate study, it may be beneficial to install artificial egg laying sites within the study area which are fully accessible so that:-

- 1) Upon hatching, each snake can be photographically recorded and compared to other members of the same clutch to log similarities.
- 2) Accurate temperature readings can be taken daily during the incubation of the eggs, under normal climatic conditions, as this may determine the frequency of males/females in the sexes ratio. Previous studies on colubrid Milk Snakes (*Lampropeltis triangulum campbelli*) have suggested that lower average temperatures during incubation can produce higher rates of female offspring, and this would provide an explanation as to the fact that there seems to be an imbalance toward females within the study group in general despite female losses in 1994.
- 3) Accurate records of clutch sizes could be kept merely by logging each visit per female and then counting the eggs deposited. This would also assist in the calculation of length and age of individual to clutch size without the need to harm any of the study group for use in post mortem examinations.

Prey items may not be preferential but merely coincidental with the location of the study group and at any given time of year. In other words, it seems unlikely that *Natrix natrix* will pass up the opportunity to take a toad because a frog may be nearby. If this were the case, this would lead to the expectation of finding large numbers of Grass Snakes around ponds mainly inhabited by frogs, and several such ponds exist within the forest but which do not hold a Grass Snake population. Similarly, the expectation would also be of finding Grass Snakes only on clearings where there are frogs in sufficient numbers to sustain the group. Again, definitely not the case when considering this study group.

During four years of study there has not been a single sighting of a frog on the plain, although they appear in large numbers around the lake itself during the transition from aquatic to terrestrial froglets. This may of course hold the key to the study itself, in that migration in *Natrix natrix* may be a circular affair, constantly moving in the pursuit of prey throughout the year and leading inevitably back to the hibernation site. This would satisfy the observation that Grass Snakes make their way to the lake/pond as quick as they can, not only because newts are still active, but, because small fish tend to be spawning at this time of year and therefore easier to catch. It has been noted on more than one occasion that when a fish has been grasped/captured by *Natrix natrix*, it is usually held aloft until consumed. This sometimes involves the snake in a difficult turnaround procedure as it reverses tail first from the water's edge, presumably because the prey is too heavy to lift over the muddier fringes of the lake with forward motion.

Apart from the isolated instances of colour variation, no alien snakes have been noted within the area of study.

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Ed Note: the author provided a large number of plates and a map to illustrate this article and the points made therein, but because of inadequate resolution of the original material, it has been possible to reproduce only a few of these.



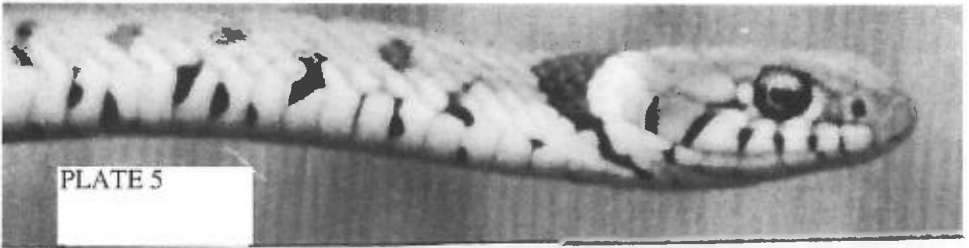
Plate 1: Female facing left displaying mating behaviour with 2 males. June 12th 1998, 7 days after egg laying. See also other gravid female centre right.



Plate 2: June 5th 1998. Female *Natrix natrix* awaiting ovulation late p.m.



Plates 3 and 4: Examples of *Natrix natrix* head markings referred to in text.



Plates 5 and 6: Examples of *Natrix natrix* head markings referred to in text.



Migration passageway from plain to lake.

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