

ELAPHE MANDARINA (CANTOR 1842): A PROGRESS REPORT ON A PROBLEMATIC SPECIES IN CAPTIVITY

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INTRODUCTION

Elaphe mandarina is considered by many herpetologists to represent the 'jewel in the crown' of Asian ratsnakes. It has also been the cause of much consternation as *E. mandarina* commonly languishes in captivity and often dies quickly. It is impossible to confuse *E. mandarina* with any other species. Their patterns and colours are unique and extremely distinctive. In appearance *E. mandarina* is typically grey with dramatic black saddles, each of which contains a bright yellow centre, bordered by yellow. The effect of this beautiful combination of colour and pattern is heightened by the polished appearance of the smooth scales. There can be a great variation between specimens and the grey body colour can show traces of red scales. Sometimes this occurs to an extensive degree and the animal appears to become bright reddish brown. The saddles are also variable in shape and intensity of pigment between specimens. Typically these saddles are diamond shaped and uniform; they can be so pronounced, however that they almost form tranverse crossbands, or so weak that the yellow pigment breaks through forming lacy patterns. There appear to be no geographical correlations regarding these variations. Specimens collected from one locality can exhibit a wide range of pattern and colour characteristics. The head is dramatically patterned with black bands, forming a typical 'bandit's mask and moustache' arrangement. The ventral surface is chequered with black, grey and white pigment. *E. mandarina* is a medium sized Colubrid, growing to lengths in excess of 1m; its body form suggests a semi-fossorial life style. In its most attractive colour phases, *E. mandarina* rivals any of the *Lampropeltis* 'tri colour' complex for aesthetic beauty.

There is little useful literature appertaining to natural history, biotope and captive care for *E. mandarina* and regimes devised on its behalf have amounted to little more than intelligent guesswork. After maintaining a pair of *E. mandarina* with limited success for a period of six months I decided to submit an appeal to keepers of this species via society journals in Britain, Europe and America. The aim of this appeal was to determine the current status of *E. mandarina*, assess common factors regarding successful husbandry and disseminate this information in the form of an article. Many positive responses were received and this article represents a synopsis of this new information, supplemented by my own observations and conclusions. I hope that enthusiasts who are currently maintaining *E. mandarina*, or who are considering this enigmatic species, will find some useful information here.

NATURAL HISTORY

The range for *E. mandarina* has been given as Upper Burma, South China (including Chekiang, Fukien, Kwangtung, Kweichow, Szechwan), North Vietnam (including the apparently fertile region for *Elaphe* sp., Tong King). (Pope, 1935; Smith, 1931).

It is acknowledged as a montane species occurring at elevations of 700-2300m. Little is known of *E. mandarina*'s habits; high lying mountain woods are given as typical habitat, especially in the vicinity of water, (lakes, etc.) By examining the habits of related species (*E. perlacea*, *E. conspiciata*) it is speculated that *E. mandarina* inhabits rodent burrows, also tunnelling beneath rocks and logs, and particularly matted grass.

Preferred prey items include small mice, voles and shrews.

Specimens are often nervously aggressive and extremely shy. Individuals can be decidedly feisty, striking and vibrating their tails; this may be considered a desirable trait when acquiring wild stock, as it is likely to reflect vigour.

SYSTEMATICS

There is common reference to *E. m. takasago* (Maki 1931) as a distinct subspecies, restricted in its range to Taiwan. Reddish coloured specimens have been wrongly attributed to this form. The three specimens collected apparently possessed higher ventral scale counts than the mainland forms and were similar in colour to specimens collected from Fukien.

As far as I can discover, these are the only records for *E. mandarina* on Taiwan. This species has apparently not been recorded prior to, or subsequent to Maki's discovery and this may challenge its credibility.

The most closely related species to *E. mandarina* are *E. perlacea* (Stejneger 1929) and *E. conspicillata*. They are found in Szechwan and Japan respectively. Neither species possesses the attractive markings of *E. mandarina*, but are similar in body form, habits and scutellation. The dramatic head patterns are similar in all three species.

CARE IN CAPTIVITY

A number of elaborate environmental regimes have been devised for *E. mandarina*. These have included naturalistic arrangements, outdoor vivaria, 'sweater box' type accommodation and foam rubber sheeting. A variety of substrates have been incorporated including soil, peat, bark mulch, sphagnum moss, pine shavings, vermiculite, etc. These have been selected to accommodate *E. mandarina*'s fossorial habits.

There have also been many experiments regarding heating, lighting and humidity.

The consistent factors for successful maintenance appear to be:

a) Security

The psychological needs of *E. mandarina* are such that it requires to feel totally secure before offering a positive feeding response. This has been accomplished by a number of means.

1. Loose substrates (for burrowing purposes).
2. Natural substrates with secure hiding sites.
3. Foam rubber (specimens hide and feed between sheets of foam).
4. Minimal disturbance.

b) Temperature

E. mandarina is a montane species which requires cooler conditions than typically associated with *Elaphe* sp. 'Hot spots' can be provided within the vivarium, but in conjunction with much cooler areas.

Hatchlings have also been successfully raised at lower temperatures, although they appear to be more adaptable in this respect, with specimens thriving under conditions provided for other Colubrid juveniles.

Most sources quote a temperature range of 20-27°C (day), 16-20°C (night). The ideal temperature considered by certain keepers is 25°C. When temperatures approach 29°C *E. mandarina* becomes very reluctant to feed.

It is possible to provide temperature gradients also. The ambient temperature in one keeper's vivarium was 27°C, while readings taken from hiding sites indicated 23-25°C. Heat tapes/cables restricted to one end of a vivarium have also been employed with success.

c) Humidity

Humidity is a poorly researched aspect of reptile husbandry. The indications are that *E. mandarina* requires a damp environment. This has been achieved in a variety of ways, most commonly by providing permanently moist areas within the vivarium (a minimum of 25% floor area has been recommended). Again hatchlings are less demanding in this respect.

d) Feeding

E. mandarina possesses a light appetite and a preference for small prey items. "Pink" or

“fuzzy” mice and “pink” rats are the most frequently accepted food items, with certain individuals accepting weaned mice. Attempts to feed other prey items in captivity (e.g. amphibians) have been largely unsuccessful. Live prey is sometimes demanded by imported specimens. I have found them to react badly to forcefeeding attempts.

e) Lighting

The role that lighting plays in the successful husbandry of *E. mandarina* is speculative. Certain specimens remain entirely nocturnal, whereas others will regularly bask, especially in the early morning. Certain enthusiasts have felt that U.V. lighting has been beneficial, while others consider its influence to be inconsequential. My own experiments in this respect did not reach any firm conclusions.

f) Health

The acquisition of healthy specimens is an obvious prerequisite for the successful maintenance of *E. mandarina*, or any species. For such a shy and specialised animal the route *E. mandarina* must take before arriving in a collection represents an extremely stressful experience. This may lower their resistance to disease and parasitic burdens. Importers/exporters frequently house species from different global localities within close proximity and a degree of cross infection can also be anticipated. Factors which adversely affect the health of specimens often confound the efforts of enthusiasts.

Problems which have been related have included dehydration, endo & ecto parasites, enteric necrosis, amoebic dysentery, bacterial infections and suspected organ removal. There have also been doubts raised over whether the disease or the ‘cure’ eventually killed certain specimens. Dehydration appears to be one of the major problems encountered by herpetologists. Individual specimens have suffered dehydration to the degree that they are beyond redemption, with certain organs being extensively damaged.

Recently imported specimens frequently experience problems with sloughing. One particular keeper found a specimen to have two previous sloughs still adhering to its body. Warm water soaking appears to be effective in cases such as these.

Oxfendazole and Levamisole HCL have proved effective in the treatment of worms, however one specimen developed a secondary bacterial infection after treatment (Golder, 1974). This condition responded to treatment with Spectinomycin.

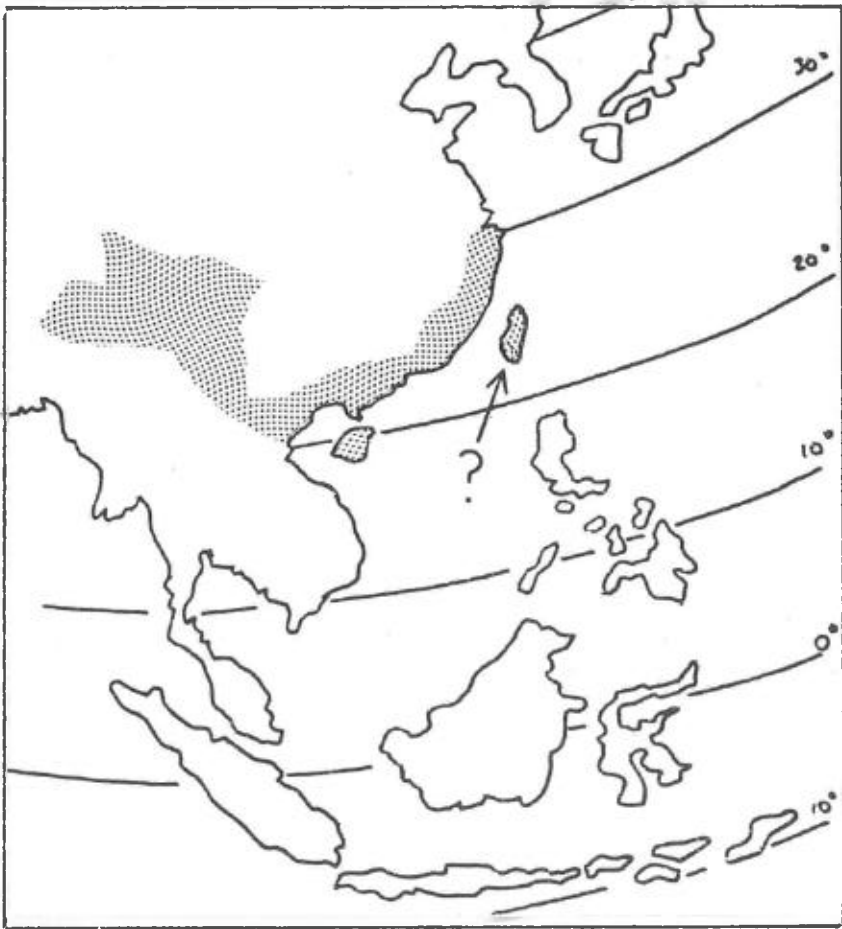
Although commonly alluded to, the practice of organ removal from live snakes before export (a practice personally witnessed by myself in a Chinese village) has not been substantiated by post mortem records. Veterinary advice I have received on the subject suggests that snakes thus mutilated (for their gall bladders) could survive for up to two months, and would exhibit the symptoms reported.

From my own observations it would appear that specimens of *E. mandarina* which have been imported into Britain recently have displayed an improvement in their physical condition. There are also more frequent shipments of this species it seems. I am aware of a number of recently imported animals which have adapted well to captivity and their potential is promising. However, specimens such as these remain in the minority and are easily outnumbered by specimens which have languished and eventually expired over a similar period.

To summarise, the most consistent factors appear to be: Secure hiding sites; cool conditions; high humidity; small prey items; naturalistic furnishings.

BREEDING

As with many species it appears that captive bred *E. mandarina* present few, if any, of the problems associated with their wild caught counterparts. All indications are that they are hardy, adaptable and thrive in similar conditions to those provided for other *Elaphe* juveniles. They remain, of course, at a premium, but inevitably more will be produced each year and will eventually become available to herpetologists in limited numbers. Most examples of captive born specimens are the result of imported females which have been gravid before purchase. There appears to be a high incidence of fertility associated with eggs laid in this manner, with 100% hatch rates being regularly recorded. I have heard of only one report where raising the resulting hatchlings has proved problematic.



E. mandarina



E. m. takasago

Fig. 1. Distribution of *Elaphe mandarina*

To my knowledge there has only been one incidence of true captive breeding with *E. mandarina*. This was accomplished by Bill Gillingham of California in 1988. Bill acquired two pairs of long term captive specimens via three other keepers (initiated by Mike Nolan), which had been in captivity since 1982. It is not unusual for species from highly seasonal environments to take a number of years to readjust their cycles before breeding behaviour can resume. Romer states a case where a pair of *E. porphyracea nigrofasciata* required nine years of captivity before breeding. Originally four specimens (2.2) were obtained in May 1987 and were housed separately for their first month. One of the females died from a respiratory infection during this period. The remaining animals were housed together in June 1987. The vivarium consisted of an all glass tank arranged in a 'naturalistic' manner. The substrate consisted of damp bark mulch and sphagnum moss; this was decorated with living plants and pieces of slate afforded hiding sites. Illumination was provided by a four foot "Grolux" tube. The room was space heated to 26°C, with a 4-5°C drop at night. Temperature readings taken from beneath the slate pieces indicated cooler conditions of about 22°C. All three snakes shared one primary hiding site. "Pink" and "fuzzy" mice were scattered within the vivarium during the evening and would be eaten overnight.



Plate 1. Adult *Elaphe mandarina*

(Bill Gillingham)



Plate 2. Hatching *Elaphe mandarina*

(Bill Gillingham)

The room was cooled during winter to 15.5-12°C. Heating was gradually re-instated from February onwards and feeding was resumed in March. By late March the female began to exhibit physical signs that she may be gravid. One of the males was not allowed to share the primary hiding site at this time. By April it was confirmed that she was indeed gravid. The post coital slough occurred on May 27th and the female was transferred to a plastic box containing damp vermiculite. Six eggs were laid on June 7th (eleven days after post-coital slough), which were removed for incubation. Incubation temperatures ranged from 27°C (day) to 24°C (night), lower than were provided for the other colubrids which were reproducing in the same room (28.3°C). Despite this cooler incubation regime the first egg began to hatch on July 26th, 49 days after being laid. The remaining eggs all hatched over a 36 hour period.

The hatchlings were identical to their parents and represented a perfect sex ratio of 3/3. They weighed 10-12 grams each and their total lengths were 30cm. Their neonatal skins were sloughed on August 4/5th (9 days after hatching) and they began to feed on "pink" mice without problems. The juveniles were raised in individual plastic boxes, containing damp bark mulch (later replaced by aspen bedding), a piece of bark as a hiding site and a small water bowl. A feeding regime of one "pink" mouse every 4-6 days was introduced; meals which were too large were rejected. They have continued to thrive and have attained lengths of 50cm after six months.

Factors which have contributed to true Captive Breeding

- a) Well acclimated and conditioned adults.
- b) Favourable environmental and psychological conditions.
- c) Hibernation.

Table 1. Breeding information

Source (keeper)	Clutch Size	Hatch Rate	Inc. Temp.	Inc. Period	Sex Ratio	Feeding
Gillingham	6	100%	24-27°C	49-52 d	3.3	+
Gillingham	2	100%	25.5.-27.7°	54 d	0.2	+
Bartz	N/K	N/K	N/K	N/K	1.0	+
Nolan	N/K	N/K	N/K	N/K	2.1	+
Schultz	N/K	N/K	N/K	N/K	3.2	+
Muezenmeir	6 + 5	100%	N/K	N/K	N/K	-

N/K = Not known

CONCLUSIONS AND COMMENTS

E. mandarina is arguably the most desirable Asian ratsnake in collections due to its beautiful colours and patterns. It is also one of the most demanding species to maintain successfully in captivity.

Wild caught specimens typically present problems regarding feeding, health and stress. Young specimens are more adaptable and less problematic than adults. Captive bred/born specimens present few, if any, problems, adapting well to captive conditions and feeding satisfactorily. Breeding captive reared specimens should be unproblematic.

E. mandarina exhibits variations in both colour and pattern. It is a montane species which requires cooler conditions than typically associated with *Elaphe* sp. It requires higher humidity levels than typically associated with *Elaphe* sp. It requires a high degree of security. Specimens are frequently aggressive.

E. mandarina possesses a light appetite and prefers small prey items. Specimens which feed voluntarily often do so on "pink", "fuzzy" or freshly weaned mice, or "pink" rats.

Breeding has been achieved following a prolonged period of captivity and hibernation.

As I had long suspected, the problems typically associated with *E. mandarina* have dissipated with the advent of an F.I generation.

A small population of captive raised juveniles are now in existence and represent a viable

gene pool for future breeding programmes. This population will inevitably increase over subsequent years through the accomplishment of true captive breeding, and the further acquisition of gravid females from the wild. These specimens should establish a foundation of healthy, vigorous stock which will adapt well to captivity, and hopefully breed as reliably as other members of the genus. This can only represent a welcome development due to the desirability of *E. mandarina*, and in providing a viable alternative to imported animals.

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REFERENCES

- Fleck, J. (1985). Bemerkungen zur Haltung von *Elaphe mandarina*. *Salamandra* **21**, 157-160.
- Golder, F. (1974). Zur Kenntnis von *Elaphe mandarina*. *Salamandra*. **10**, 22-26.
- Maki, K.M. (1931). A monograph of snakes of Japan pp 105-107. Tokyo.
- Pope, C.H. (1935). *The Reptiles of China*, New York. American Museum of Natural History.
- Romer, J.D. (1979). Captive care and breeding of a little known Chinese snake (*Elaphe porphyracea nigrofasciata*). *International Zoo Yearbook*. (9), 92-94.
- Schulz, K.D. (1989). Asian Rat Snakes of the *Elaphe* genus. Part XII, *Elaphe conspicillata* (Bole 1826). *The Snakekeeper*, Feb. 1989.
- Smith, M.A. (1931). *The fauna of British India, Ceylon and Burma, including the whole of the Indo-Chinese Subregion*. Vol. IV, Reptilia and Amphibia: Serpentes. Taylor & Francis, London.
- Stejneger, (1925). Chinese amphibians and reptiles in the United States National Museum. *Proceedings of the U.S. National Museum, Washington*, **66**, 84.