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MAINTENANCE AND BREEDING OF *TRITURUS KARELINI*

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INTRODUCTION

There is little available information concerning the care and captive breeding of any urodele, with the exception of the Axolotl (eg Nace et al 1974), under laboratory conditions (but see Verhoeff-de Fremery et al 1987 for details relevant to *T. cristatus*). Today, however, with increasing pressures on natural populations and a corresponding increase in legislation dealing with the collection of animals from the wild, there is perhaps a greater need for laboratories and private individuals to breed and rear their own animals.

The following notes were made during the breeding and maintenance of *Triturus karelini* in a laboratory.

T. karelini has been recognised as a full species within the *T. cristatus* group (Bucci-Innocenti et al. 1983). It occurs throughout northern Turkey and across to the south of the Caspian Sea, the Crimea and East Balkans (Engelmann et al. 1986).

METHOD

Adult newts were captured in 1987 at two sites, Karacabey and Adapazari, in North-west Turkey by Chris Raxworthy as part of a comparative study of the courtship of *Triturus* species. At the time of capture (early April) adult males were in courtship dress and females were already ovipositing.

On arrival in the laboratory newts were housed in a 90 x 45cm tank, water depth of 15cm. Large numbers of ova were deposited in a short period of time, during the first two weeks of April. The females preferred to oviposit on bunches of polythene strips (15 x 1cm) rather than on *Ceratophyllum demersum*, the only weed in the tank.

Care of Larvae. Larvae were reared in shallow water in plastic containers (30 x 24cm) filled to a depth of 6cm. They were initially fed on zooplankton netted from a local pond and strained through a small hand net. As soon as the larvae had grown large enough *Tubifex* was added to the diet. They also ate the larvae of *Triturus vittatus* that were housed in the same containers. The water in the containers was changed as necessary and replaced with unconditioned tap water with no apparent ill effects to the newt larvae.

Ten larvae were reared to metamorphosis. As each one attained this stage of development, it was anaesthetized in MS-222 (Sandoz) and measured to the nearest 0.5mm. Sizes of the metamorphs (mm) were as follows:

	Mean	Range
Total length	61	47-72
Snout-vent length	33	26-38

Care of Juveniles. After metamorphosis the juvenile newts were housed in plastic tanks (39 x 25 x 21cm) filled to depth of about 10cm. A piece of expanded polystyrene was floated on the water surface to allow the newts to leave the water. However, the animals remained aquatic for most of the time. Occasionally an individual would leave the water during the night but would usually return during the course of the following day. The tanks were kept in a warm laboratory, so that water temperature fluctuated around 20°C.

The newts were fed on earthworms, pieces of beef heart, maggots (as sold to anglers) and a food pellet ('ReptoMin', a Tetra product). Food items were offered roughly five days a week, only feeding quantities that would be eaten at once.

'Wintering' Period. On 11-12-87 each newt was placed in an individual margarine tub with some damp tissue paper. They were given a period of cooling by placing in an incubator cabinet at 12°C for a week. They were then transferred to a refrigerator where they were kept for a further 60 days at a temperature of 4°C. During the wintering period no food was offered, but the containers were checked every week or so to ensure that the paper did not dry out. Mean weight loss during the wintering period was 3%.

On emergence from 'wintering' the newts were placed in a 60 x 30cm aquarium filled to a depth of approximately 15cm, placed in an unheated shed. Thus the newts were exposed to a natural photoperiod and temperature fluctuations. Males developed fully grown crests in less than a week and these showed no signs of regression until 15-5-88, ie the males were in breeding dress for about three months. Ova were first seen on 23-4-88, 67 days after emergence from wintering.

Size of five animals (total and snout-vent length) at one year old were as follows:

Sex	Total Length	Snouth-Vent Length	Breeding
Male	104	58	Yes
Male	104	58	Yes
Male	100	55.5	No
Female	120	63.5	Yes
Female	107	59.5	No

DISCUSSION

There are two points of note. Firstly, under laboratory conditions this species can be grown to sexual maturity in one year. Secondly the animals reared in the laboratory behaved differently (see below) to wild caught animals that are temporarily maintained in the laboratory for observational work. There are implications to both of these points.

Minimum age at first breeding for *Triturus* species in a field situation is probably two years (Beebee 1980). Growth under the captive conditions described is much faster than growth rates inferred from the field. Trendelenburg is reported to have reared *T. cristatus* to maturity in nine months, also under laboratory conditions (Verhoeff-de-Fremery et al., 1987). The speed with which these animals grew to sexual maturity would suggest that sexual maturity is not age limited, but more subject to growth rate and body size.

The behavioural differences observed are manifest by the length of time the males retained their secondary sexual characteristics. Usually workers capture newts during the aquatic phase and transfer them to aquaria releasing them again after the breeding season. However this suffers from the drawback that most species rapidly lose condition. Verrell (1982) described a technique for maintaining *Notopthalmus viridescens* in breeding condition, but this regimen does not work for some other species. One problem encountered when trying to observe the courtship of *Triturus cristatus* at the Open University is the fact that, after capture, males' crests rapidly regress and the animals are very unwilling to court. The same was true of the original stock of adult *T. karelini.* Use of laboratory-reared stock could circumvent the problem of certain species not performing sexual behaviour in the laboratory.

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