

c prozentual weniger «stark besamte» und «überbesamte» Eier vorkommen als in b. Möglicherweise äußert sich hier eine schädigende Wirkung eines zu stark verdünnten Ejakulats auf das Eiplasma.

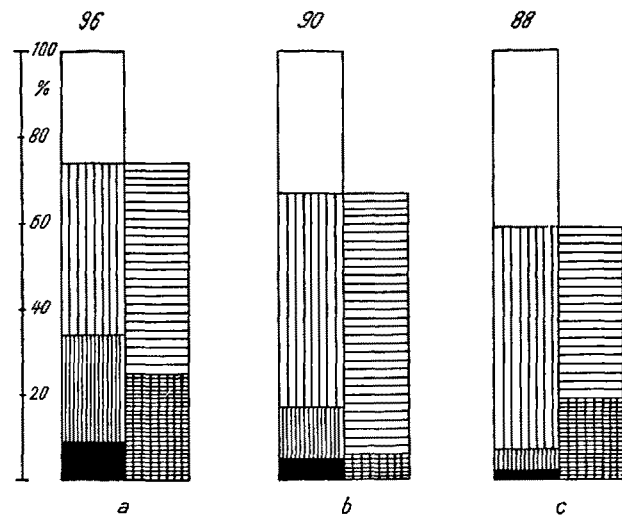


Abb. 3. Experiment 3a, b, c: Signaturen wie in Abb. 1.

Exp. 4a, b, c, d; Abb. 4. *Der Temperatureinfluß.* Bei diesen Versuchen wurden sowohl Eileiter wie Samenleiter herausgeschnitten und mit den eingeschlossenen Keimzellen für ca. 15 Minuten in einem Thermostaten auf die gewünschte Temperatur (18° bzw. 25°) gebracht. Danach erfolgte die künstliche Besamung mit unverdünntem Sperma. *Ergebnis:* Die Verteilung auf die verschiedenen Besamungsklassen wird deutlich nur durch die Eitemperatur beeinflusst. Verschiedene Spermatemperaturen erscheinen in dieser Beziehung im geprüften Be-

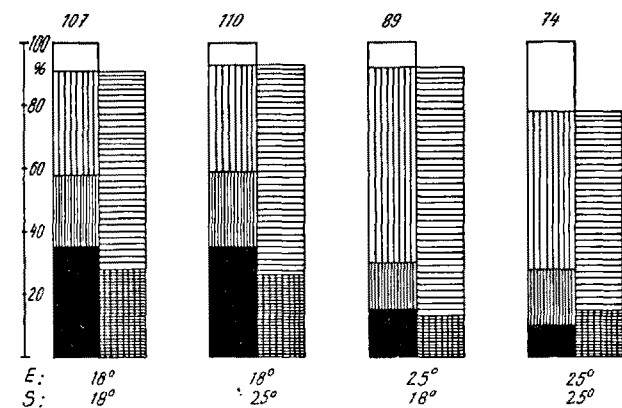


Abb. 4. Experiment 4a, b, c, d: Signaturen wie in Abb. 1. Je oben Temperatur der Eier (E); je unten Temperatur der Spermien (S).

reich wirkungslos. Bei niedriger Eitemperatur (a, b) ist der Polyspermiegrad höher als bei hoher Temperatur (c, d). Dementsprechend finden sich in der ersten Gruppe relativ mehr abnorm gefurchte Eier als in der zweiten. Werden Ei und Spermium auf 25° erwärmt (Serie d) bleibt die relative Verteilung auf die 3 Besamungsklassen zwar gleich wie in Serie c («warme» Eier und «kalte» Spermien); es steigt aber der Prozentsatz unbesamter Eier an.

Exp. 5a, b, c; Abb. 5. *Einfluß der Coelomflüssigkeit.* Für Serie a wurden die Eier so dem Eileiter entnommen,

daß kein Kontakt mit der Coelomflüssigkeit möglich war. In den Serien b und c tauchten wir die Eier vor der Besamung je für 5 bzw. 10 Minuten in Coelomflüssigkeit ein. *Ergebnis:* Einwirkung von Coelomflüssigkeit setzt

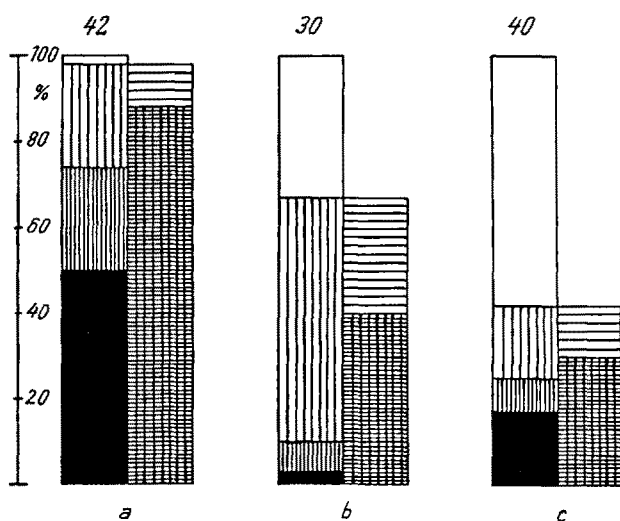


Abb. 5. Experiment 5a, b, c: Signaturen wie in Abb. 1.

den Besamungserfolg sehr deutlich herab; sie ist daher nach Möglichkeit zu vermeiden. Auffallend ist bei Serie 5a, daß der Prozentsatz der überbesamten und dadurch unregelmäßig sich furchenden Eier unverhältnismäßig viel höher ist als in anderen «gleichbehandelten» Normalserien (z. B. 2a, 3a). In solchen Unterschieden äußert sich die eingangs erwähnte individuelle Variabilität des Gametenmaterials, wenn dieses von verschiedenen Eltern stammt.

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Summary

Different problems arising from the artificial insemination of amphibians have been investigated on *Triton alpestris*. The influence of the following factors was tested:—

- (1) The length of time between insemination and the addition of water.
- (2) The length of time between the withdrawal of the eggs from the oviduct and the insemination.
- (3) The degree of dilution of sperms.
- (4) The temperature of eggs and sperms respectively.
- (5) The coelomic fluid.

We determined for every experimental series the total rate of insemination, the degree of "polyspermy", and the course of the cleavages.

Hybrids between some Members of the Rassenkreis *Triturus cristatus*

The great crested newts *Triturus cristatus* are divided into a number of subspecies inhabiting different geographical areas. Of these we have experimented with three, namely *T. c. cristatus* (from Chessington, Surrey and the New Forest, Hampshire, England), *T. c. carnifex* (from Naples, Italy) and *T. c. karelinii* (from Baku, Azerbaijan). We have obtained F_1 from *karelinii*

♀ × *cristatus* ♂♂ *carnifex* ♀ × *karelinii* ♂ and *carnifex* ♀ × *cristatus* ♂.

The first of these hybrids was obtained in 1946, and about 1 in 7 of the larvæ became exaggeratedly oedematous and died at metamorphosis. There is some evidence that this is not due to their hybrid nature. Only one male and one female have yet bred, though several males have courted. The other two hybrids, made in 1948, were extremely vigorous, members of each cross breeding when slightly less than a year old. The larval and metamorphic mortality among back-cross animals has been heavy in these two experiments, and it is unlikely that any members of the three kinds of *F*₂ family will survive metamorphosis.

The following were the mean chiasma frequencies per cell in spermatocyte meiosis:

<i>carnifex</i> :	30.7–32.1 (4 specimens)
<i>cristatus</i> :	36.5–38.5 (3 specimens)
<i>karelinii</i> :	39.5–42.2 (2 specimens)
<i>karelinii</i> ♀ × <i>cristatus</i> ♂♂:	21.2 (1 specimen)
<i>carnifex</i> ♀ × <i>karelinii</i> ♂:	15.1–21.2 (5 specimens)
<i>carnifex</i> ♀ × <i>cristatus</i> ♂:	16.1–21.9 (4 specimens)

The chiasma frequency per cell was much more variable within any one hybrid specimen than in the parent races. Whereas the parent races form their chiasmata without much restriction as to position in the chromosomes, the chiasmata formed by the hybrids mostly lie in the terminal regions: they show the same type of localization as is present in species such as *Triturus helveticus* and *T. vulgaris*.

Failure of pairing was very variable both within and between hybrid individuals: on a rough average rather less than half the meioses have all chromosomes paired. In the two hybrids involving *karelinii* multivalent chromosome associations were seen, but not in that between *carnifex* and *cristatus*. Single bridges and fragments were seen in occasional anaphases in all the hybrids. There is thus evidence that all three geographical subspecies differ from one another in respect of inversions while *karelinii* differs from the other two in respect of at least two translocations.

Although groups of hybrid spermatocytes enter first meiotic metaphase in unison, anaphase separation may be delayed for variable periods and thus the normal synchronism is lost in the later spermatogenic stages. No degeneration takes place before meiosis, but some degree of spermatid degeneration sets in after the second meiotic division. The extent of spermatid degeneration is exceedingly variable as between different hybrid individuals: this variation is not correlated with failure of chromosome pairing at meiosis; as in other Urodele hybrids which have been studied (WHITE¹, BENAZZI and LEPORI², it is due to physiological unbalance in the diploid, not to abnormal haploid complements resulting from irregularities of segregation.

In the Urodele hybrids which have been investigated by these other authors there has always been male sterility and complete or almost complete sperm degeneration. In our animals, although there is variable spermatid degeneration, some individuals show practically none, and all succeed in forming mature sperm. The translocations in hybrids involving *karelinii* would give rise to gametes with duplications or deficiencies even when meiosis was regular, thus accounting for the

mortality among larvæ of the second generation. The other cross might also be expected to give some aneuploid gametes, but the larval mortality may largely be due to unbalanced gene combinations in cytologically normal gametes.

We believe that this is the first instance in which evolutionary change involving translocations has been demonstrated within a vertebrate species. The failure to demonstrate similar translocations in the hybrids between more distant taxonomic units among the Urodeles is probably because the greater degree of failure of pairing observed in these prevents the formation of multivalents.

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Zusammenfassung

Meiose in männlichen Bastarden aus Kreuzungen zwischen *Triturus cristatus karelinii* ♀ × *T. c. cristatus* ♂♂, *T. c. carnifex* ♀ × *T. c. karelinii* ♂ und *T. c. carnifex* ♀ × *T. c. cristatus* ♂ wurde untersucht.

In den Bastarden waren die Chiasmafrequenzen und das Ausbleiben der Paarung sehr verschieden, sowohl innerhalb des einzelnen Bastards als auch zwischen Individuen. Der verschiedene Grad der Spermatiden-degeneration ist unabhängig vom Ausbleiben der Chromosomenpaarung.

Die mittleren Chiasmafrequenzen betrugen etwas mehr als die Hälfte derjenigen der elterlichen Unterarten.

Die drei Unterarten unterscheiden sich voneinander in bezug auf Inversionen, und *karelinii* ist von den beiden anderen in bezug auf mindestens zwei Translokationen verschieden.

Alle Bastardindividuen bilden funktionstüchtige Spermien, und einige brachten schon nach dem ersten Lebensjahr zusammen mit ihren Geschwistern Nachkommen hervor.

The Relation between Size of Mother and Number of Eggs and Young in some Spiders and its Significance for the Evolution of Size

In this investigation on the relation between body size and number of offspring some species of the family *Lycosidae* were used. If data of this sort are plotted in a graph, using a logarithmic scale, it gives straight regression lines according to the formula $\log y = \alpha \log x + \log b$ (HUXLEY¹, HUXLEY and TEISSIER²). Table I gives the data of the regression lines in the species investigated. Weight and cephalothorax length were positively correlated with number of offspring; there was not, however, any correlation between weight of mother and egg weight (0.4 > P > 0.3).

As the size of the mother is, to a certain extent, inherited, the positive correlation found indicates a selection pressure towards bigger size. This pressure will

¹ M. J. D. WHITE, J. Exp. Zool. 102, 179 (1946).

² M. BENAZZI and N. G. LEPORI, Scientia genetica 3, 113 (1949).

¹ J. HUXLEY, Problems of relative growth (London, 1932).

² J. HUXLEY and G. TEISSIER, Nature 137, 780 (1936).