♀ × *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 œdematous 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 backcross 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:

carnifex:	30·7–32·1	(4 specimens)
cristatus:	36·5–38·5	(3 specimens)
karelinii:	39·5–42·2	(2 specimens)
karelinii ♀ × *cristatus* ♂♂:	21·2	(1 specimen)
carnifex ♀ × *karelinii* ♂:	15·1–21·2	(5 specimens)
carnifex ♀ × *cristatus* ♂:	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 (White[1], Benazzi and Lepori[2], 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.

We wish to thank Mr. L. A. Lantz and Prof. G. Montalenti foı generous gifts of animals. Fuller details, including an account of the genetics of certain characters, will be published elsewhere.

H. Spurway and H. G. Callan

Department of Biometry, University College, London and Genetics Laboratory, Agricultural Research Council, Institute of Animal Genetics, Edinburgh, November 1, 1949.

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 Spermatidendegeneration 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.

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[1] M. J. D. White, J. Exp. Zool. *102*, 179 (1946).

[2] M. Benazzi and N. G. Lepori, Scientia genetica *3*, 113 (1949).

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 *Lycosidæ* 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 $\log y = \alpha \log x + \log b$ (Huxley[1], Huxley and Teissier[2]). 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 $(0{\cdot}4 > P > 0{\cdot}3)$.

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

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[1] J. Huxley, *Problems of relative growth* (London, 1932).

[2] J. Huxley and G. Teissier, Nature *137*, 780 (1936).

Data for covariation according to the formula $\log y = \log b + \alpha \log x$ in some spiders collected in the neighbourhood of Uppsala.

Species	y	x = Length of cephalothorax in mm						x = Weight of spider in mg					
		n	r	α	b	m_x	m_y	n	r	α	b	m_x	m_y
Lyc. palustris L.	Number of eggs and young 15–30/6	98	0·61	2·99	2·1	2·74	42·07	94	0·71	1·03	2·3	17·1	42·2
	Number of young 1/7–2/8	49	0·34	1·99	5·0	2·72	36·82						
	Mean egg weight in mg 15–30/6							61	–0·13	–0·11	0·46	17·3	0·34
Lyc. pullata (Cl.)	Number of eggs and young 15–30/6							23	0·82	1·34		10·6	26·9
Lyc. prativaga L. Koch	Number of eggs and young, beginning of July	21	0·61	3·1	1·8	2·60	35·7						

either lead to an evolution towards bigger size, or its effect will be abolished by counterselection. As the pressure has already worked for a long time, it is most probable that evolution has proceeded so far that selection and counterselection balance each other, more or less completely.

The counterselection can of course work in many different ways, but the sum of their effect must be that the death rate is higher in the offspring from big spiders than in those from small spiders. An attempt was made to test this possibility on two different points.

If the death rate is higher among big adult spiders than among small ones, this would also cause a difference in death rate in offspring, as the help of the mother is necessary to open the cocoon. No significant decrease in mean size of female spiders of *Lyc. palustris* (June 2·74, July 2·72 mm) was, however, found. The possibility that counterselection works in this way to any greater extent is therefore excluded.

The same fact also makes it improbable that small individuals form a second cocoon to a greater extent than big individuals.

Another possibility is that the death rate is higher in cocoons made by big mothers. In the sample of *Lyc. palustris* collected in July therefore, only cocoons with more advanced spiders were counted, or those which hatched from cocoons kept in test tubes.

If the death rate is higher in cocoons made by big mothers, this must mean that α for the second sample of *Lyc. palustris* must be lower than for the first one, even after correction of the first sample. (over its complete range) with the mean death ratio of the second sample.

Log y for log $x_{2\cdot72}$ is in the first sample 1·616; in the second sample 1·566. This gives a death ratio in logarithmic scale of 3·09%. If such a death ratio is present all over the first regression line, α will be changed from 2·99 ± 0·15 to 2·89. This hypothetical regression line is drawn broken in Fig. 1. The coefficient of regression actually found in the second sample is, however, only 1·99 ± 0·85. The difference is not significant ($0{\cdot}3 > P > 0{\cdot}2$), and it is of course not certain that the regression line of the second sample is straight. A detailed analysis will, however, be carried out when more material has been collected.

The positive correlation between size of mother and number of offspring is a rather general phenomenon in animals, and probably also in plants, as indicated by the results of Spooner[1] on *Gammarus* and those of Venge[2] on rabbits.

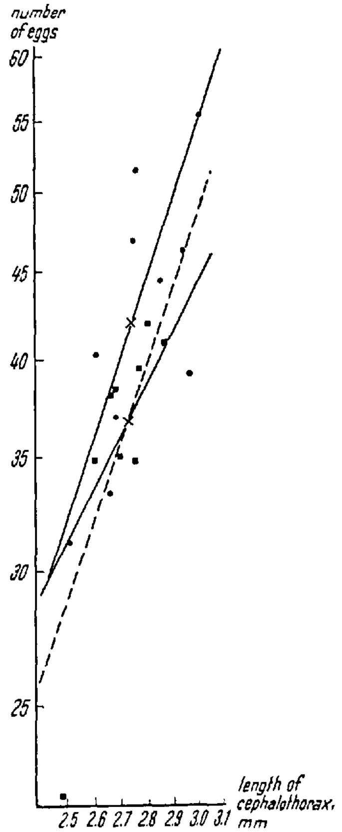

Fig. 1. – Covariation between length of cephalothorax and number of eggs and young in *Lyc. palustris*. The upper regression line (with dots) represents specimens collected between 15th–30th of June. The broken line shows the same covariation, if death rate is equal in cocoons from mothers of all sizes (cf. the text). The lower regression line (with squares) represents the covariation actually found in specimens collected between 1st of July and 2nd of August. The coefficient of regression is in the second sample lower than expected. The difference from that expected is however not significant.

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[1] G. M. Spooner, J. mar. biol. Ass. *27*, 1 (1947).

[2] O. Venge, Acta zool., *31*, 1 (1950), in press (Stockholm).

So the principle mentioned here might be one of the most important causing the evolutionary increase in size which is so obvious in many groups of animals, including the invertebrates as shown by NEWELL[1].

RENSCH[2] has shown that large-sized species of different groups of cold-blooded vertebrates have more eggs than small species of the same group. This increases the possibility for bigger species to survive.

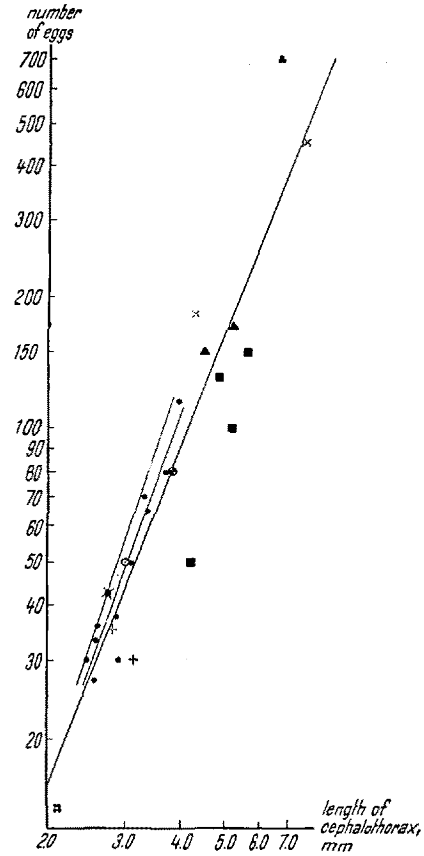

Fig. 2. – Covariation between length of cephalothorax and number of eggs in some species of the families *Lycosidæ* and *Pisauridæ*. The upper regression line represents *Lyc. palustris*, the middle line *Lycosa* ssp. ($\alpha = 2{\cdot}79$, $r = 0{\cdot}95$) and the lower line all species ($\alpha = 2{\cdot}53$, $r = 0{\cdot}94$). The genera are indicated by the following marks: *Lycosa* ●, *Pirata* ⊙, *Trochosa* ▴, *Tarentula* ■, *Arctosa* ∴, *Aulonia* ∷, *Xerolycosa* +, *Acantholycosa* ⦶, *Dolomedes* and *Pisaura* ×.

Similar conditions are present in spiders (cf. Fig. 2, where the data given in this paper are added to those of HOLM[3]).

BJÖRN PETERSEN

Zoological Institute, University of Uppsala, November 11, 1949.

Zusammenfassung

Eine positive Korrelation zwischen Größe der Mutter und Zahl der Nachkommen wurde in drei Arten der Spinnenfamilie *Lycosidae* gefunden. Da die Größe der Mutter zum Teil erblich bedingt ist, führt diese Korrelation automatisch zu einem Selektionsdruck gegen gesteigerte Körpergröße. Die Korrelation ist wahrscheinlich bei vielen Tier- und Pflanzengruppen vorhanden und ist einer der bedeutendsten Faktoren, die die Körpergrößenzunahme während der Evolution bewirkt haben.

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[1] N. D. NEWELL, Evolution *3*, 103 (1949).

[2] B. RENSCH, *Neuere Probleme der Abstammungslehre* (Stuttgart 1947).

[3] Å. HOLM, Svensk spindelfauna utgiven av entomologiska föreningen i Stockholm. 3. Egentliga spindlar. Araneæ. Fam. 8–10. Oxyopidæ, Lycosidæ och Pisauridæ (Stockholm, 1947).

On the Activity of Acid- and Alkaline Phosphatase during Tail Regeneration in *Triturus cristatus* (Laur.)

Very little is known about chemical processes during regeneration. This is especially true as far as regeneration in amphibia is concerned. So far research has been centered mainly on autolytic processes and on proteolytic activity in the regenerating tissues (BROMLEY and ORECHOWITSCH, OREKOWISTCH *et al.*, RYVKINA, STRIGANOVA, VLADIMIROVA[1]). Only more recently attention has been focused on respiratory changes and on the activity of some enzyme systems involved in phosphorus and nucleoprotein metabolism (JAEGER and BARTH, BARTH, MILLERS, BODIAN, BODIAN and MELLORS, CLEMENT-NOEL[2]).

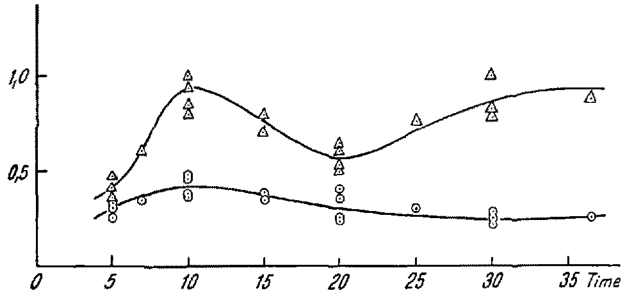

Fig. 1. – Activity of alkaline phosphatase during tail regeneration in *Triturus cristatus*. Ordinate: mg P split/mg N. Abscissa: days after amputation. Triangles: activity in the blastema; circles: activity in the underlying tissues.

The present paper brings the first results of a systematic investigation undertaken to study some chemical events during tail and limb regeneration in *Triturus cristatus*. The activity of acid and alkaline phosphatase has been investigated in various stages of tail regeneration. After amputation, the animals were kept in lots of ten or fifteen specimens at 16–18° C. At regular intervals the blastema were dissected and frozen at –50° C in dry ice. A small part of the underlying tissue was also collected after removal of the bones. Specimens were also prepared for histological control. Tissues were homogenized and extracted at +3° C for 24 hours in Na-veronal buffer 0·15 M (p_H 9·5 and 5·0). After centrifugation, the phosphatase activity was tested on Na-β-

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[1] N. W. BROMLEY and W. N. ORECHOWITSCH, Biochem. Z. *272*, 324 (1934); Biol. gen. *11*, 317 (1935). – W. N. ORECHOWITSCH, Z. physiol. Ch. *224*, 61 (1934); Biochem. Z. *286*, 91, 248, 285 (1936). – W. N. ORECHOWITSCH and N. W. BROMLEY, Biol. Zbl. *54*, 524 (1934). – W. N. ORECHOWITSCH, N. W. BROMLEY, and N. A. KUSMINA, Biochem. Z. *277*, 186 (1935). – W. N. ORECHOWITSCH and T. P. SOKOLOVA, CR. Acad. Sci. U.R.S.S. *28*, 747 (1940). – D. E. RYVKINA, CR. Acad. Sci. U.R.S.S. *27*, 380 (1940). – A. STRIGANOVA, CR. Acad. Sci. U.R.S.S. *27*, 385, 388 (1940). – E. VLADIMIROVA, CR. Acad. Sci. U.R.S.S. *3*, 479 (1934).

[2] L. JAEGER and L. G. BARTH, J. Cell. and Comp. Physiol. *32*, 319 (1948). – L. G. BARTH, Physiol. Zool. *11*, 179 (1938); Biol. Bull. *74*, 155 (1938); ib. *78*, 366 (1940). – J. A. MILLER, Biol. Bull. *73*, 369 (1937). – D. BODIAN, Symp. Soc. Exp. Biol. *1*, 163 (1947). – De BODIAN and R. C. MELLORS, Proc. Soc. Exp. Biol. and Med. *55*, 243 (1944). – H. CLEMENT-NOEL, Ann. Soc. Roy. Zool. Belg. *75*, 25 (1944).