

A case of natural triploidy in a Smooth Newt *Triturus vulgaris* (LINNAEUS, 1758), from Russia (Caudata: Salamandridae)

Ein Fall von natürlicher Triploidie
bei einem Teichmolch, *Triturus vulgaris* (LINNAEUS, 1758), aus Rußland
(Caudata: Salamandridae)

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KURZFASSUNG

Der beschriebene Fall von Autotriploidie eines Teichmolches, *Triturus vulgaris vulgaris* (LINNAEUS, 1758), aus dem Gebiet von St. Petersburg ist der erste Nachweis natürlicher Triploidie bei Schwanzlurchen für Rußland.

ABSTRACT

A case of autotriploidy described in a Smooth Newt, *Triturus vulgaris vulgaris* (LINNAEUS, 1758) from the St. Petersburg area is the first record of natural triploidy in urodelans from Russia.

KEY WORDS

Caudata, Salamandridae, *Triturus vulgaris vulgaris*; triploidy, DNA flow cytometry; St. Petersburg area, Russia.

For the last decade, the authors have been studying genome size variation in various amphibians. Special attention was paid to newts of the genus *Triturus*. On May 17, 1997, S. N. LITVINCHUK collected thirteen males of the Smooth Newt, *Triturus vulgaris vulgaris* (LINNAEUS, 1758), in small water bodies (quarries) near the village Taitsy, approximately 30 km south of St. Petersburg. One day later, genome size (the amount of nuclear DNA) from erythrocytes and sperm was measured by means of flow cytometry for each specimen. Erythrocytes of the Ribbed Newt *Pleurodeles waltl* MICHAELLES, 1830, were used as a standard. A detailed description of the technique applied was published by VINOGRADOV & al. (1991).

Among the sample of *T. vulgaris* studied, one male turned out to be triploid. Its genome size was 1.682 arbitrary units (as compared to *P. waltl*) while the average genome size in diploid *T. vulgaris* was 1.125 units (table 1). The triploid male had well-developed dorsal and caudal fins and the usual breeding colour pattern. However, the size of this specimen was smaller as compared to the diploid individuals from

the same site (table 2). Cell suspensions from testes of all newt males were analyzed by means of flow cytometry. Unlike diploids, no sperm was found in the triploid male. On June 9, one more sample was taken from the same site. All twenty individuals were diploid.

These water bodies are also inhabited by the Crested Newt, *T. cristatus* (LAURENTI, 1768). All twenty individuals of this species sampled there were diploid. The average genome size of the Crested Newts was 1.113 (table 1).

Genome size in both species is rather similar. Despite the wide overlap of their ranges and syntopic occurrence, natural hybrids between *T. vulgaris* and *T. cristatus* were never recorded. Hybrids that resulted from laboratory crosses are known to be inviable (MACGREGOR & al. 1990). Thus, we incline to classify the triploid specimen of *T. vulgaris* as a case of autotriploidy.

In the years 1989-1997, the authors examined a total of 304 specimens of various subspecies of *T. vulgaris* by means of DNA flow cytometry. All newts were diploids. Moreover, 612 specimens studied belonging to ten species of the genus *Tri-*

Table 1: Genome size variation in *Triturus vulgaris vulgaris* and *T. cristatus*. n - Sample size, Mean - arithmetic mean, Min - minimum, Max - maximum.

Tab. 1: Variabilität der Genomgröße bei *Triturus vulgaris vulgaris* und *T. cristatus*. n - Stichprobenumfang, Mean - arithmetisches Mittel, Min - Minimum, Max - Maximum.

Species / Art	Sample (locality) Stichprobe (Fundort)	n	Mean	Min	Max
<i>T. v. vulgaris</i>	(Taitsy)	12	1.127	1.119	1.135
	Total /Insgesamt	214	1.125	1.086	1.151
<i>T. cristatus</i>	E Europe, 24 localities	289	1.113	1.092	1.138

Table 2: Morphometric data in the triploid male and in diploid males of *Triturus vulgaris vulgaris* from Taitsy, St. Petersburg area. n - Sample size, Mean - arithmetic mean, SD - standard deviation, Min - minimum, Max - maximum.

Tab. 2: Morphometrische Daten zum triploiden und zu den diploiden Männchen von *Triturus vulgaris vulgaris* von Taitsy, St. Petersburger Gebiet. n - Stichprobenumfang, Mean - arithmetischen Mittel, SD - Standardabweichung, Min - Minimum, Max - Maximum).

Character / Merkmal	Triploid	n	Mean	Diploids		
				SD	Min	Max
Total length (mm) Gesamtlänge (mm)	63.0	20	76.2	6.1	66.7	88.0
Snout-vent length (mm) Kopf-Rumpflänge (mm)	27.7	21	34.3	3.4	29.5	40.0
Snout-vent length / Tail length Kopf-Rumpflänge / Schwanzlänge	0.78	20	0.81	0.06	0.67	0.89

turus were also diploid. Only once a triploid (*T. cristatus* from Transcarpathian Ukraine) has ever been found (BORKIN & al. 1996).

As far as is known, triploidy in urodelans is a quite rare phenomenon. Unlike induced triploidy, spontaneous triploids have been recorded for eleven species only, namely, five species of ambystomatids, one plethodontid, and five species of salamandrids (see review in BORKIN & al. 1996). By that the latter family is represented by *Cynops pyrrhogaster* (BOIE, 1826), *Notophthalmus viridescens* (RAFINESQUE, 1820), and three European newts *T. cristatus*, *T. helveticus* (RAZOUOWSKY, 1789) and *T. vulgaris*. The incidence of autotriploidy ranges between 0.16 and 5.1% in urodelans, and between 0.5 and 1.896 % in salamandrids. Based on our data, the incidence of autotriploidy in *T. vulgaris* (0.3%) is closer to the lower limit.

Three kinds of spontaneous triploidy

have been recognized: i) natural triploidy which is detected in individuals collected in the field; ii) quasi-natural triploidy recorded in progeny of wild animals, and iii) laboratory triploidy when triploids are found in progeny of cross(es) of laboratory animals (BORKIN & al. 1996).

BÖÖK (1940, 1945) published the first case of triploidy in *T. vulgaris* (as "*Triton taeniatus*") from Sweden. However, he did not provide detailed information about the origin and number of specimens studied. Other cases of spontaneous triploidy reported in salamandrids cannot be classified as natural with certainty. Thus, the St. Petersburg case is not only the first record of triploidy in urodelans of Russia but, probably, the first confirmed record of natural triploidy for the family. The specimen is deposited at the collection of the Zoological Institute, Russian Academy of Sciences, St. Petersburg - ZISP.5979).

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REFERENCES

BÖÖK, J. A. (1940): Triploidy in *Triton taeniatum* LAUR: (Preliminary report).- Hereditas, Lund; 26 (1-2): 107-114.

BÖÖK, J. A. (1945): Cytological studies in *Triton*.- Hereditas, Lund; 31 (1-2): 177-220.

BORKIN, L. J. & LITVINCHUK, S. N. & ROSANOV, J. M. (1996): Spontaneous triploidy in the crested newt, *Triturus cristatus* (Salamandridae).- Russian J. Herpetol., Moscow; 3 (2): 152-156.

MACGREGOR, H. C. & SESSIONS, S. H. & ARNTZEN, J. W. (1990): An integrative analysis of phylogenetic relationships among newts of the genus *Triturus* (family Salamandridae), using comparative biochemistry, cytogenetics, and reproductive interactions.- J. Evol. Biol., Basel; 3: 329-373.

MACGREGOR, H. C. & SESSIONS, S. H. & ARNTZEN, J. W. (1990): An integrative analysis of phylogenetic relationships among newts of the genus *Triturus* (family Salamandridae), using comparative biochemistry, cytogenetics, and reproductive interactions.- J. Evol. Biol., Basel; 3: 329-373.

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