Data Collection on Intergeneric Hybrids and Basic Types: AMPHIBIA

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AMPHIBIA

3 orders, 68 families, 420 genera, 8500 (extant) species

Systematics according to en.wikipedia 2024/2025
Anura: 48 families
Gymnophiona: 10 families
Urodela = Caudata: 9 families

Abbreviations:

° = taxa actually not accepted in the rank of a genus, e. g. *Cerasus*° (= *Prunus* p. p.)
10: 50 etc. The numbers behind the names of families etc. refer to extant genera and species
IS = interspecific hybrid. **IG** = intergeneric hybrid. **IST** = intersubtribal hybrid.
IT = intertribal hybrid. **ISF** = intersubfamilial hybrid. **IF** = interfamilial hybrid.
SO = somatic hybrid by cell fusion; normally these hybrids are asymmetric
AS = asymmetric hybrids, they do not equally express maternal and paternal features.
HY = assumed intergeneric hybridogeneous origin of a taxon.
nat. hyb. = natural hybrid **art. hyb.** = artificial hybrid.

Colours within the crosses:

Red letters: intergeneric hybrids (incl. former IG).
Gray letters: hybridity unconfirmed or erroneous.
Green letters: notes on tribes, subfamilies etc. involved in the hybridization.

Yellow shaded: Notes concerning basic types.

Anura = Salientia 3 suborders, 48 families, 325 genera, 7500 species

frogs and toads = Froschlurche

Archaeobatrachia: 4 families, 7 genera
Mesobatrachia: 6 families, 18 genera
Neobatrachia: 38 families, 300 genera

Anura: Bufonidae 35: 600 (suborder Neobatrachia)

true toads = Kröten

Bufo communis × *Hyla arborea* Bufonidae × Hylidae Hertwig 1918 (larvae early dying + parthogenetic frogs, true hybrids only interspecific)

Bufo calamita × *Hyla arborea* **IF** Bufonidae × Hylidae Zhu 1934
Bufo vulgaris × *Rana°* (= *Pelobates*) *fusca* **IF** Bufonidae × Pelobatidae Born 1883, 1886 (only up to the gastrula stage), Zhu 1934, see also Bogart et al. 1969

References:

Bogart JP, Blair WF & Hubbs CV (1969) Comments on the „cytologically verified" hybrids between *Bufo* and *Rana*, two genera of anura amphibians. Cytogenetics 8, 30–34.

Born G (1883) Beiträge zur Bastardierung zwischen den einheimischen Anurenarten. Pflügers Archiv für Physiologie 32, 453–518.

Born G (1886) Biologische Untersuchungen. II. Weitere Beiträge zur Bastardierung zwischen den einheimischen Anuren. Archiv für mikroskopische Anatomie 27, 192. Only interspecific hybrids succeed the gastrula-stage.

Hertwig G (1918) Kreuzungsversuche an Amphibien I. Wahre und falsche Bastarde. [Cross-breeding tests on amphibians. Real and fake bastards.] Archiv für Mikroskopische Anatomie 91, 203–271. https://link.springer.com/article/10.1007/BF02978933

Zhu X (1934) Research on Guanhzhou frogs interbreed. [in Chinese] Scient. Nat. Univ. Sunyatswni 6, 219–262.

Anura: Dicroglossidae 15: 212 (suborder Neobatrachia)

Alam MS, Islam MM, Khan MMR et al. (2012) Postmating isolation in six species of three Genera (*Hoplobatrachus*, *Euphlyctis* and *Fejervarya*) from family Dicroglossidae (Anura), with special reference to spontaneous production of allotriploids. Zool. Science 29 (11), 743–752.

Anura: Hylidae 38: 1036 (suborder Neobatrachia)

treefrogs = Baumfrösche

3 subfamilies.
Hyla × *Pseudacris* Hylinae Wilson et al. 1974

References:

Wilson AC, Maxson LR & Sarich VM (1974) Two types of molecular evolution: evidence from studies of interspecific hybridization. Proc. Natl. Acad. Sci. USA 71, 2843–2847. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC388568/pdf/pnas00060-0257.pdf

Anura: Leptodactylidae s. l. 50: 2129 (suborder Neobatrachia)

southern frogs = Südfrösche

5 subfamilies (sometimes Ceratophryinae elevated in family rank: 3: 12)

Ceratophrys cranwelli × *Lepidobatrachus ilanensis* (→ *Chacophrys pierottii*)

Ceratophryinae Lynch 1982 („probable"), but Fritzsch et al. 1987 and Maxson et al. 1987 demonstrate that *Chacophrys* is not an intergeneric hybrid between these two genera.

References:

Fritzsch B, Drewes R & Ruibal R (1987) The retention of the lateral-line nucleus in adult anurans. Copeia 1987, 127–135.

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Maxson RD, Moberg KD & Maxson LR (1987) Data from hybrid species supporting the MC'F assortment-exclusion hypothesis. Mol. Biol. Evol. 4, 70–73. http://mbe.oxfordjournals.org/cgi/reprint/4/1/70.pdf

Anura: Ranidae s. l. 50: 850 (suborder Neobatrachia)

true frogs = Echte Frösche

Ranidae s. str. 20 genera!
9 subfamilies.

References:

Hertwig G (1918) Kreuzungsversuche an Amphibien I. Wahre und falsche Bastarde. [Cross-breeding tests on amphibians. Real and fake bastards.] Archiv für Mikroskopische Anatomie 91, 203–271. https://link.springer.com/article/10.1007/BF02978933

Moore JA (1946). Studies in the development of frog hybrids. I. Embryonic development in the cross *Rana pipiens* × *Rana sylvatica.* J. Exp. Zool. 101, 173–220.

Moore JA (1958). Transplantation of nuclei between *Rana pipiens* and *Rana sylvatica.* Exp. Cell Res. 14, 532–540.

Gymnophiona 10 families, 33 genera, 214 species

caecilians = Schleichenlurche

Urodela = Caudata 3 suborders, 9 extant families, 62 genera, 760 species

salamanders and newts = Schwanzlurche

3 suborders

Cryptobranchoideae 1 family
Salamandroidea 7 extant families
Sirenoidea 1 family, 2 genera,

Urodela: Ambystomatidae 2: 36 (suborder Salamandroidea)

Querzahnmolche

Ambystoma 32, Dicamptodon 4.

Axolotl etc. = *Ambystoma mexicana*, Gey barredtiger salamander = *Ambystoma mavortium*

IS: interspecific hybrids (Melander & Mueller 2020): *Ambystoma* 9, *Dicamptodon 1* – en.wikpipeia 2025: *Ambystoma platineum* is a hybrid. Hybrid all-female populations are the result of hybridization. – *Ambystoma mexicana* × *A. mavortium* (art. hyb., internet) – Hybrid salamanders are a problem in nature (see internet).

Urodela: Cryptobranchidae 2: 8 (suborder Cryptobranchoidea)

Riesensalamander

Andrias 7, Cryptobranchus 1

IS: interspecific hybrids (Melander & Mueller 2020, Takaye et al. 2023. https://doi.org/10.1002/ece3.10698): *Andrias 1*

Urodela: Hynobiidae 9: 90 (suborder Cryptobranchoidea)

Asiatic salamanders = Winkelzahnmolche

IS: interspecific hybrids (Melander & Mueller 2020): *Hynobius 1, Onychodactylus 1, Salamandrella 1*

Urodela: Plethodontidae 28: 500 (suborder Salamandroidea)

lungless slamanders = Lungenlose Salamander

IS: interspecific hybrids (Melander & Mueller 2020): *Aneides 1, Batrochoseps 1, Bolitoglossa 1, Desmamognathus 4, (Ensatina), Eurycea 3, Hydromantes 1, Plethodon 20*

Urodela Proteidae 2: 9 (suborder Salamandroidea)

IS: interspecific hybrids (Melander & Mueller 2020): *Necturus 1.*

Urodela: Salamandridae 21: 140 + extinct taxa (suborder Salamandroidea)

true salamanders and newts = Echte Salamander und Molche

3 subfamilies:

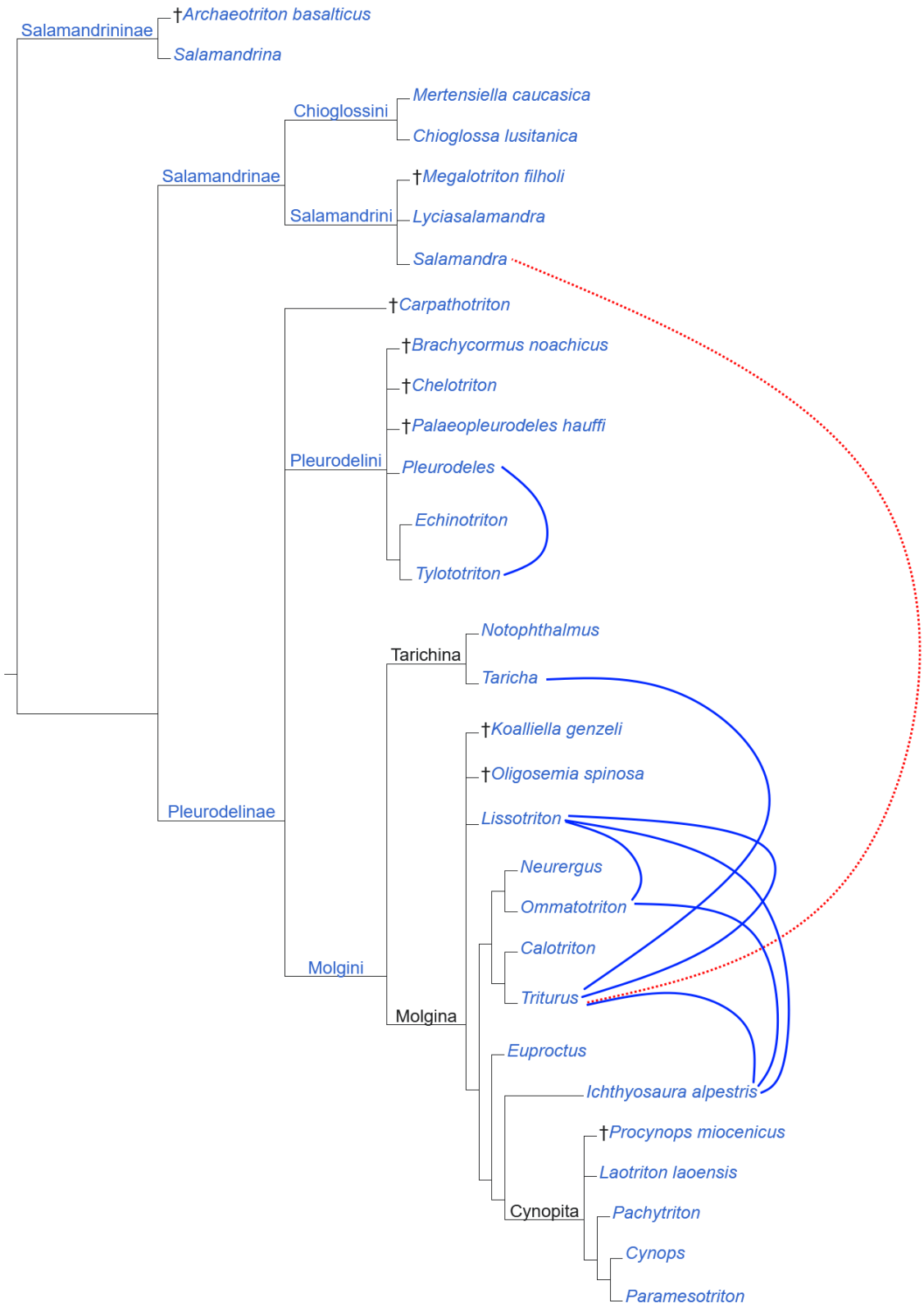
Pleurodelinae 16: 122 *Calotriton 2, Cynops 10, Echinotriton 3, Euproctus 2, Ichthyosaura 1* (= *Mesotriton 1*), *Lissotriton 10, Neurergus 5, Notophthalmus 3, Ommatotriton 3, Pachytriton 10, Paramesotriton 14, Pleurodeles 3 Taricha 4, Triturus 9, Tylototriton* 25

Salamandrinae 4: 16 *Chioglossa 1, Lyciasalamandra 7, Mertensiella 1, Salamandra* 7
Salamandrinidae 1: 2 *Salamandrina* 2
IS: interspecific hybrids (Melander & Mueller 2020): *Chioglossa 1, Cynops 1, Lissotriton 3, Natophthalmus 1, Ommatotriton 2, Pleurodeles 1, Salamandra 3, Salamandrina 1, Taricha 3, Triturus 9 – Triturus* IS (Arntzen 2024)

The members of tribe Molgini in the Salamandridae subfamily Pleurodelinae are connected by hybridization and belong to the same basic type. This is the largest part of the family. It is very probable, that the basic type covers the whole family. Some hybrids (e.g. in Ferrier 1967) connecting subfamily Salamandrinae do not succeed early (maternal) stages of development and do not include expression of chromosomes of both parents, but in the case of *Triturus* × *Salamandra* the hybrid is reported to be a true hybrid.

Ambystoma × *Pleurodeles* **IF** Ambystomatidae × Salamandridae Ferrier 1967 („dies soonest")
Diemyctilus° (= *Triturus* p. p.) × *Triturus* **IS** Pleurodelinae Brandom 1962
Euproctus asper × *Pleurodeles waltlii* Pleurodelinae Ferrier 1967 (only up to early stages of development)
Ichthyosaura × *Lissotriton* Pleurodelinae (Schreitmüller 1910; Wolterstorff 1925: 280, 289; Bataillon 1927; Bataillon & Tchou Su 1932; Lantz 1934; Pariser 1935, 1936; Mancino et al. 1976; Macgregor et al. 1990); all citations from Dubois & Raffaelli 2009
Ichthyosaura × *Ommatotriton* Pleurodelinae Macgregor et al. 1990; cited by Dubois & Raffaelli 2009
Ichthyosaura × *Triturus* Pleurodelinae (Bataillon 1927; Bataillon & Tchou Su 1932; Pariser 1935, 1936); all citations from Dubois & Raffaelli 2009
Lissotriton × *Ommatriton* (= *Triturus* p. p.) Pleurodelinae Wolterstorff, 1925: 279; Macgregor et al. 1990, cited by Dubois & Raffaelli 2009
Lissotriton × *Triturus* Pleurodelinae Poll 1909; Wolterstorff 1909a-b, 1910, 1911, 1925: 279; Bataillon 1927; Bataillon & Tchou Su 1932; Pariser 1932, 1935, 1936; Hamburger 1935; Mancino et al. 1976, 1977, 1978, 1979; Macgregor et al. 1990) Mancino et al. 1997 (*L. meridionalis* × *T. carnifex*) cited by Dubois & Raffaelli 2009
Pleurodeles waltlii × *Triturus* Pleurodelinae Ferrier 1967 (only until early stages of development)
Pleurodeles waltlii × *Tylototriton verrucosus* Pleurodelinae Ferrier et al. 1971 (viable)
Pleurodeles waltlii × *Salamandra salamandra* **ISF** Pleurodelinae × Salamandrinae Ferrier 1967 (only until early stages of development)
Salamandra salamandra × *Triturus* (= *Triton*°) *helveticus* **ISF** Salamandrinae × Pleurodelinae Baltzer et al. 1938, Schönmann 1938 (lethal, true hybrid, until the very young gastrula stage), Baltzer & Schönmann 1951, Ferrier 1967 (only until early stages of development)
Taricha (= *Triturus* p. p.) × *Triturus* Pleurodelinae Brandom 1962

Cladograms based on the work of Pyron and Wiens (2011)[4] and modified using Mikko Haaramo [5]



Family Salamandridae: Cladogram based on Pyron & Wiens (2011, doi:10.1016/j.ympev.2011.06.012) and Haaramo (2011, http://www.helsinki.fi/~mhaaramo/metazoa/deuterostoma/chordata/amphibia/lissamphibia/urodela/urodela.html#

Cryptobranchoidei) from en.wikipedia (2025, CC-BY-SA 4.0) and intergeneric crossing affinities. The red dotted line marks a true hybrid lethal at a very early state of development.

References on Salamandridae:

Arntzen JW (2024) Hybridization and introgression in deeply differentiated salamander species – molecular genetics and a reappraisal of Dr. Louis Vallée's osteological data. Contrib. Zool. https://doi.org/10.1163/18759866-bja10067

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