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Frog: Understanding the Taxonomy, Scientific Research

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Commentary

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DESCRIPTION

About 88% of amphibian species are classified in the order Anura. These include over 7,500 species in 55 families, of which the *Craugastoridae* (850 spp.), *Hylidae* (724 spp.), *Microhylidae* (688 spp.), and *Bufonidae* (621 spp.) are the richest in species. The Anura include all modern frogs and any fossil species that fit within the anuran definition. The characteristics of anuran adults include: 9 or fewer presacral vertebrae, the presence of a urostyle formed of fused vertebrae, no tail, a long and forward-sloping ilium, shorter fore limbs than hind limbs, radius and ulna fused, tibia and fibula fused, elongated ankle bones, absence of a prefrontal bone, presence of a hyoid plate, a lower jaw without teeth (with the exception of *Gastrotheca guentheri*) consisting of three pairs of bones (angulosplenial, dentary, and mentomeckelian, with the last pair being absent in Pipoidea), an unsupported tongue, lymph spaces underneath the skin, and a muscle, the protractor lentis, attached to the lens of the eye.

The anuran larva or tadpole has a single central respiratory spiracle and mouthparts consisting of keratinous beaks and denticles. Frogs and toads are broadly classified into three suborders: *Archaeobatrachia*, which includes four families of primitive frogs; *Mesobatrachia*, which includes five families of more evolutionary intermediate frogs; and *Neobatrachia*, by far the largest group, which contains the remaining families of modern frogs, including most common species throughout the world. The suborder *Neobatrachia* is further divided into the two superfamilies Hyloidea and Ranoidea. This classification is based on such morphological features as the number of vertebrae, the structure of the pectoral girdle, and the morphology of tadpoles. While this classification is largely accepted, relationships among families of frogs are still debated.

Some species of anurans hybridize readily. For instance, the edible frog (*Pelophylax esculentus*) is a hybrid between the pool frog (*P. lessonae*) and the marsh frog (*P. ridibundus*). The fire-bellied toads Bombina bombina and *B. variegata* are similar in forming hybrids. These are less fertile than their parents, giving rise to a hybrid zone where the hybrids are prevalent.

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Frogs are used for dissections in high school and university anatomy classes, often first being injected with coloured substances to enhance contrasts among the biological systems. This practice is declining due to animal welfare concerns, and "digital frogs" are now available for virtual dissection.

Frogs have served as experimental animals throughout the history of science. Eighteenth-century biologist Luigi Galvani discovered the link between electricity and the nervous system by studying frogs. He created one of the first tools for measuring electric current out of a frog leg. In 1852, H.F. Stannius used a frog's heart in a procedure called a Stannius ligature to demonstrate the ventricle and atria beat independently of each other and at different rates. The African clawed frog or platanna (*Xenopus laevis*) was first widely used in laboratories in pregnancy tests in the first half of the 20th century. A sample of urine from a pregnant woman injected into a female frog induces it to lay eggs, a discovery made by English zoologist Lancelot Hogben. This is because a hormone, human chorionic gonadotropin, is present in substantial quantities in the urine of women during pregnancy. In 1952, Robert Briggs and Thomas J. King cloned a frog by somatic cell nuclear transfer. This same technique was later used to create Dolly the sheep, and their experiment was the first time a successful nuclear transplantation had been accomplished in higher animals.