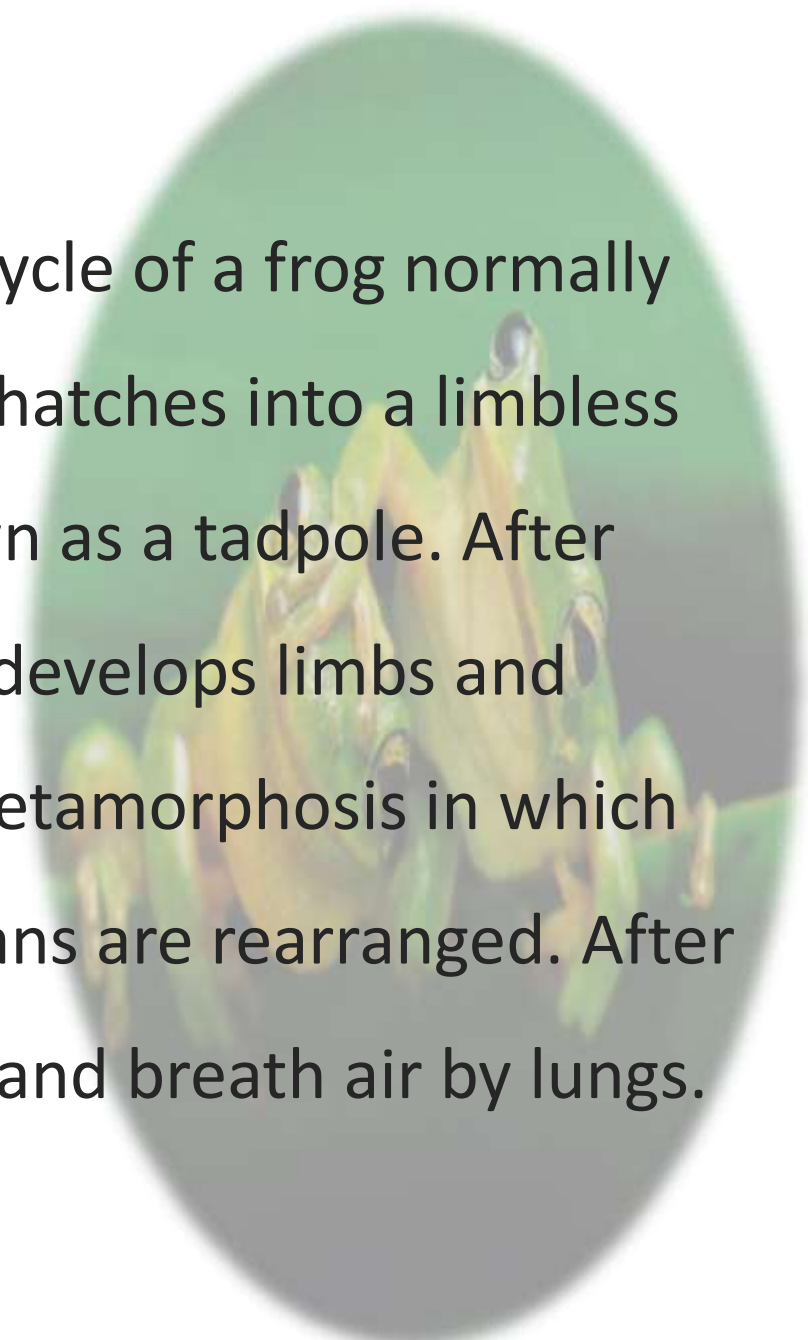


Reproductive physiology of amphibian



Life cycle of frog

Like other amphibians, the life cycle of a frog normally starts in water with an egg that hatches into a limbless larva with gills, commonly known as a tadpole. After further growth, during which it develops limbs and lungs, the tadpole undergoes metamorphosis in which its appearance and internal organs are rearranged. After this it is able to leave the water and breath air by lungs.



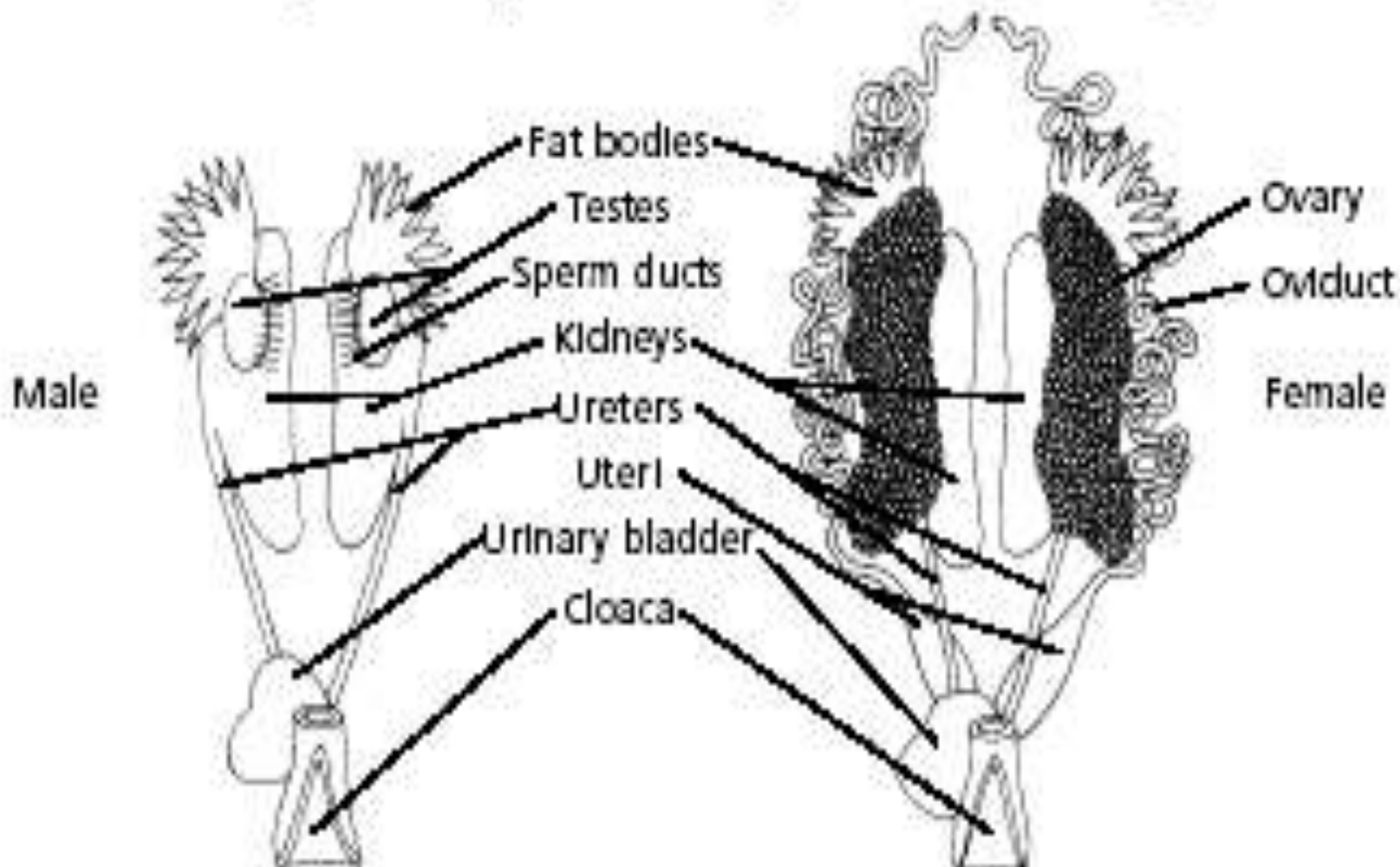
Sexual maturation

In some species females may take a year or two to reach maturity independent of their size or condition. However, good nutritional regimes and temperatures can mature the males of some species over periods of less than six months. However, many species of amphibians can take years to reach maturity.

Reproductive system of frogs

The male and female frog can be distinguished even by their external morphological characters. The organs concerned with the production of gametes (sperms and ova) are called principal reproductive organs. The organs concerned with the transport of gametes further from the gonads are called accessory reproductive organs.

Urinary and Reproductive Systems of the Frog

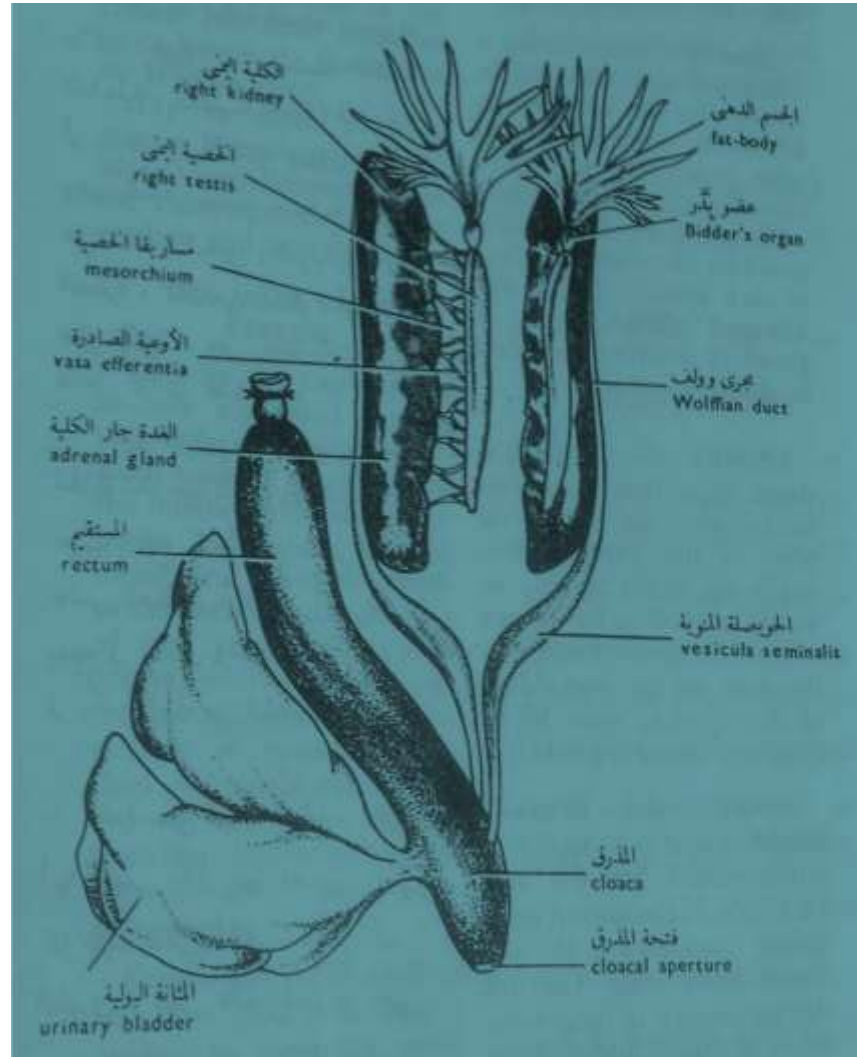


REPRODUCTIVE ORGANS OF MALE FROG

In the male frog the primary reproductive organs are a pair of

testes and the accessory organs are:

- Vasa Efferentia,
- Urinogenital Ducts



The testis:

Male reproductive organs consists of a pair of testes, as two elongated bodies yellowish white in colour . Each testis is connected to the median edge of the opposite kidney by a thin membrane called the mesorchium.

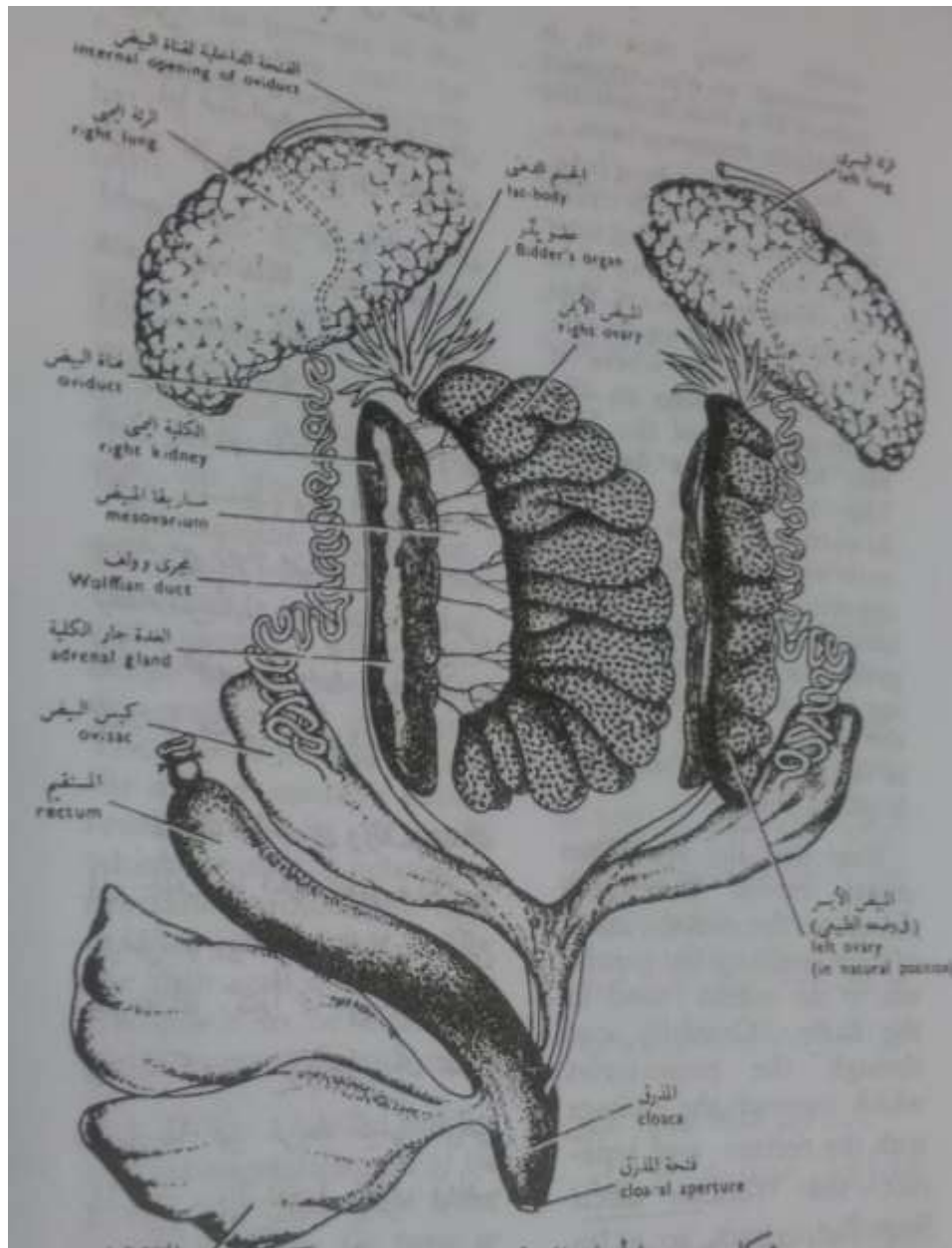
Vasa efferentia are 10-12 in number and after arising from testes run through the mesorchium and enter the kidneys of their side.

Urinogenital duct (Wolffian duct) emerges from the kidneys and then expanded to form vesicle seminal and finally opens into the cloaca. The cloaca is a small, median chamber that is used to pass faecal matter, urine and sperms to the exterior.

REPRODUCTIVE ORGANS OF FEMALE FROG :

In the female frog the primary reproductive organs are a pair of **ovaries** and the accessory reproductive organs are :

1. A pair of Oviducts,
2. Ovisac.



The Ovary:

Is a large organ which occupies a considerable space in the coelom, particularly during the breeding season. It is blackish in colour, granulated and lobulated, and contains a multitude of ova at different stages of maturity

and it is connected to the opposite kidney by a thin membrane called the mesovarium.

In the young frog each ovary is small, flat and lobulated .It is filled with coelomic fluid. During the breeding season the wall of the ovary becomes studded with a large number of ovarian follicles.

Oviducts:

Each oviduct is a long narrow and highly coiled tube. The anterior end of the oviduct forms a wide and fringed oviducal funnel. The oviducal funnel is located on the dorsal side of the lung. The margin and inner surface of the oviducal funnel is lined by ciliated epithelium.

The oviducal funnel leads into the oviduct. This oviduct is straight and thin-walled for a short distance. Thereafter it becomes highly coiled and thick-walled. This coiled oviduct runs posteriorly along the outer side of the kidney.

Ovisac:

The ovisac very thin walled and capacious. The ovisac opens of the posterior end in the dorsal wall of the cloaca by its individual aperture lying anteriorly to the openings of wolffian duct. The cloaca opens to the exterior by a cloacal aperture at the posterior end of the body.

Frog Reproductive System Functions

- **Ovaries** - Organs of the female reproductive system that produce the eggs.
- **Oviducts** - Tubes of a female frog's reproductive system that carry eggs from the ovaries to the cloaca.
- **Ova or Eggs** - Female sex cell or gametes
- **Testes** - Male sex organs that produce sex cells (sperm).
- **Sperm** - Male sex cell or gametes.
- **Seminal Vesicles** - Enlarged distal sections of the male frog's urinary ducts that collect sperm prior to entry into the cloaca.

Secondary sex characteristics

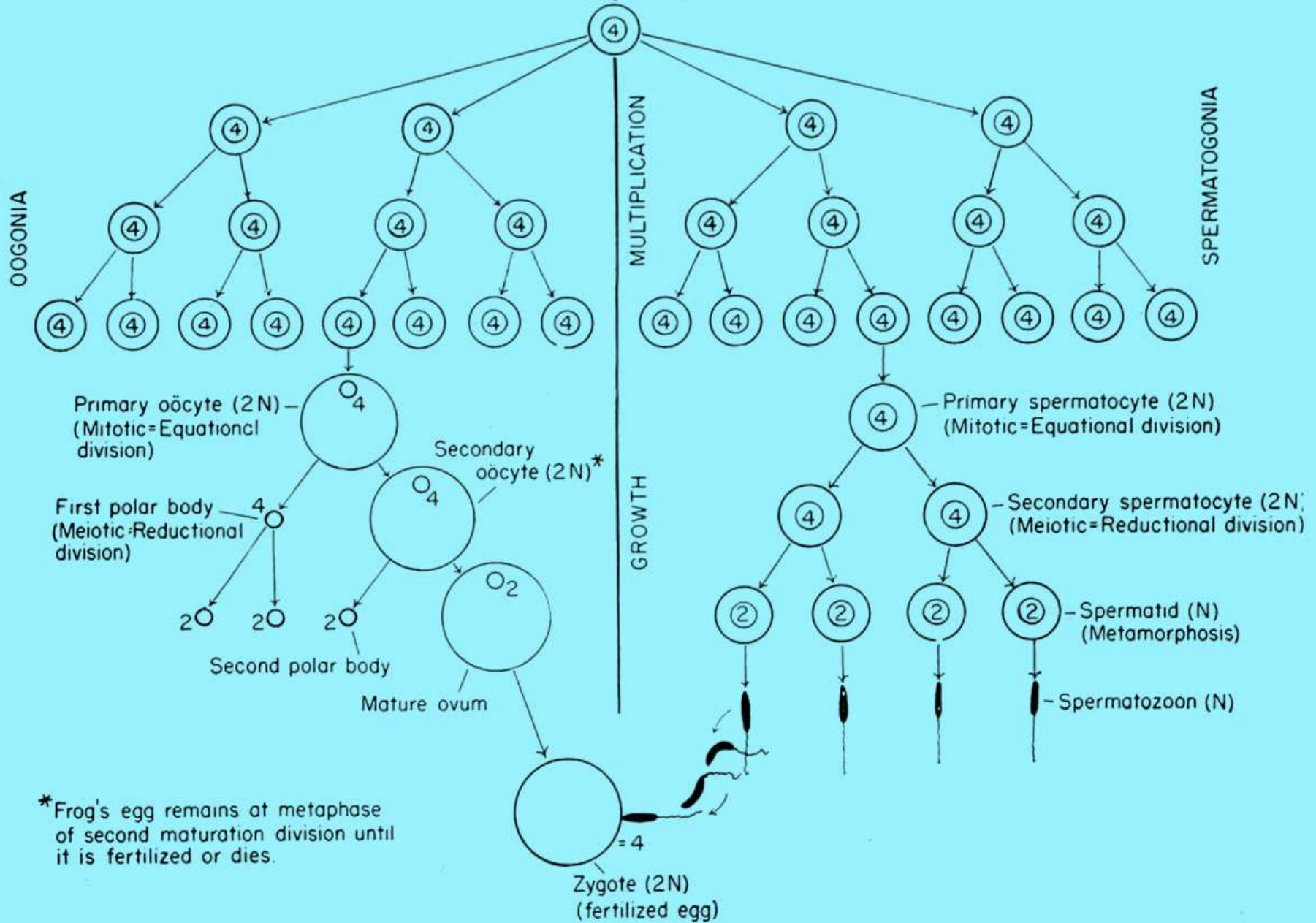
- Distinction the sexes by the colour of the subgular area ; being black in the male , whitish in the female .
- Females are usually larger than males, especially the time of reproduction.



OÖGENESIS

SPERMATOGENESIS

Primordial germ cell - 2N



Courtship:



1 . Air is driven back and forth from mouth to lungs to vibrate vocal cords.

2 . Females respond only to males of the same species.



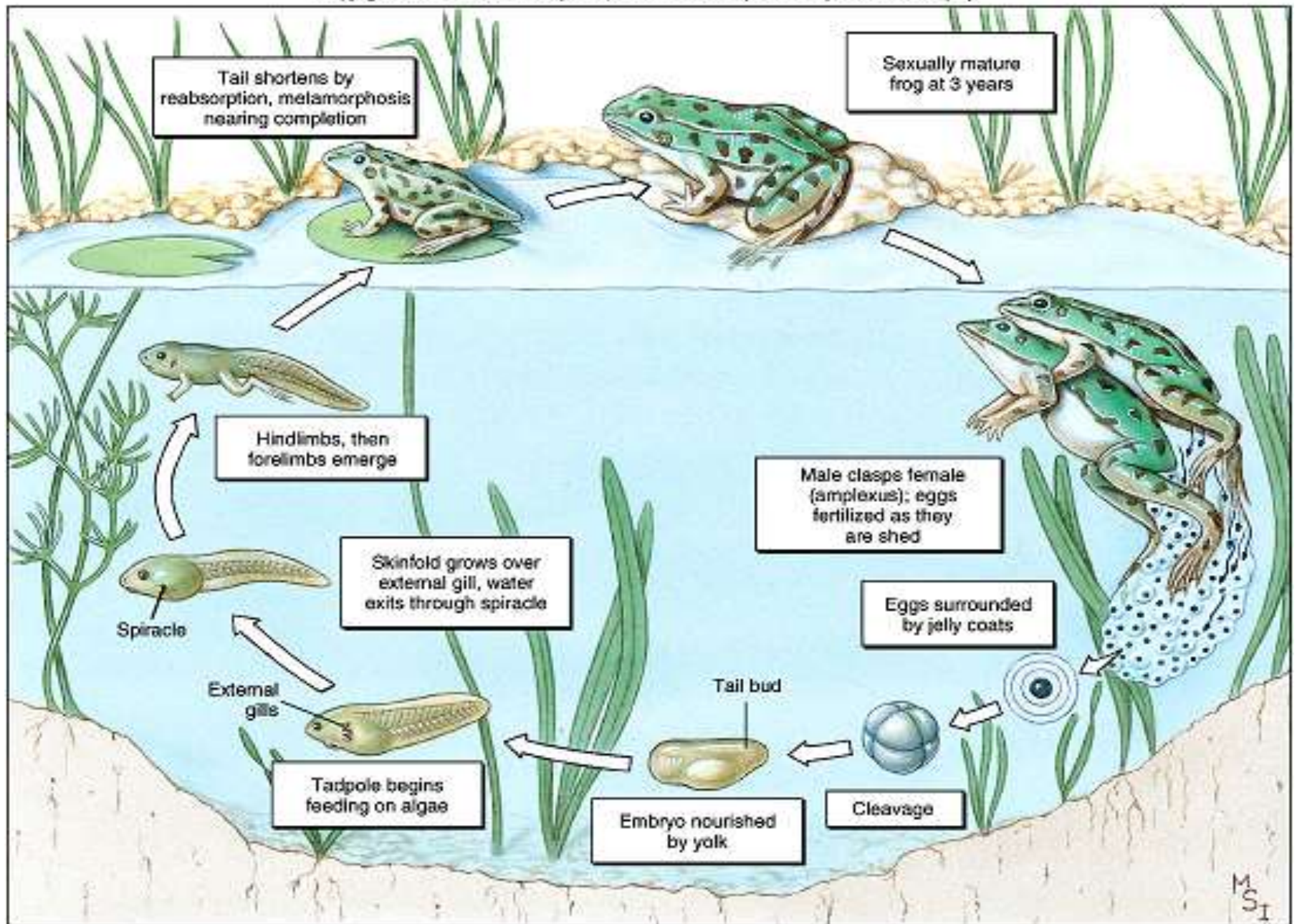


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Fertilization



When female is ready , the male climbs onto her back. He grasps her firmly. This embrace is called an amplexus. The female releases her eggs and the male deposits his sperm on top of them. Direct external fertilization is achieved.

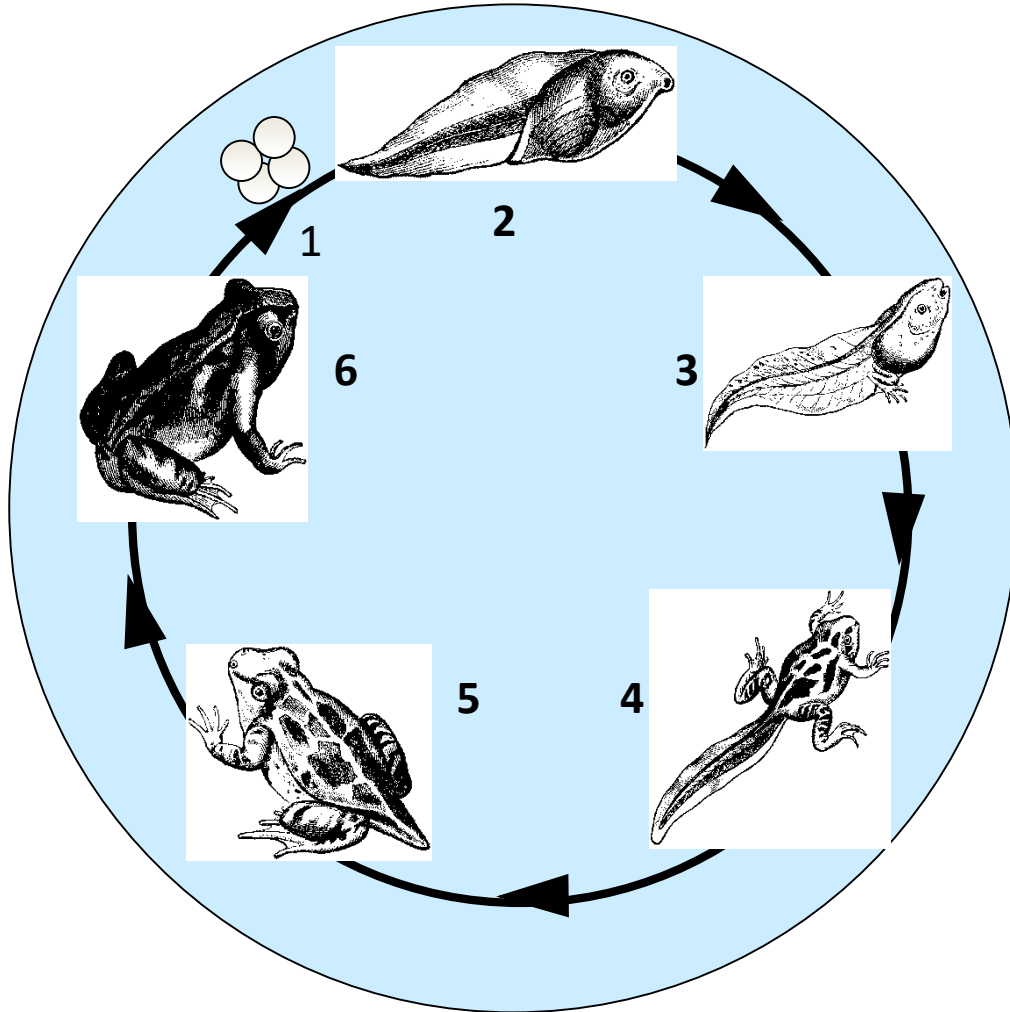
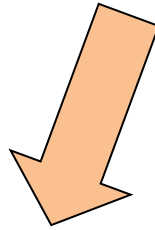


Egg

Frogs first begin life in the water. Some female frogs may lay as many as six thousand eggs. Each egg is in a ball of jelly. In 6-21 days the egg will hatch and the tadpole will wiggle out of the jelly ball.



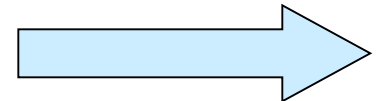
Stage 2



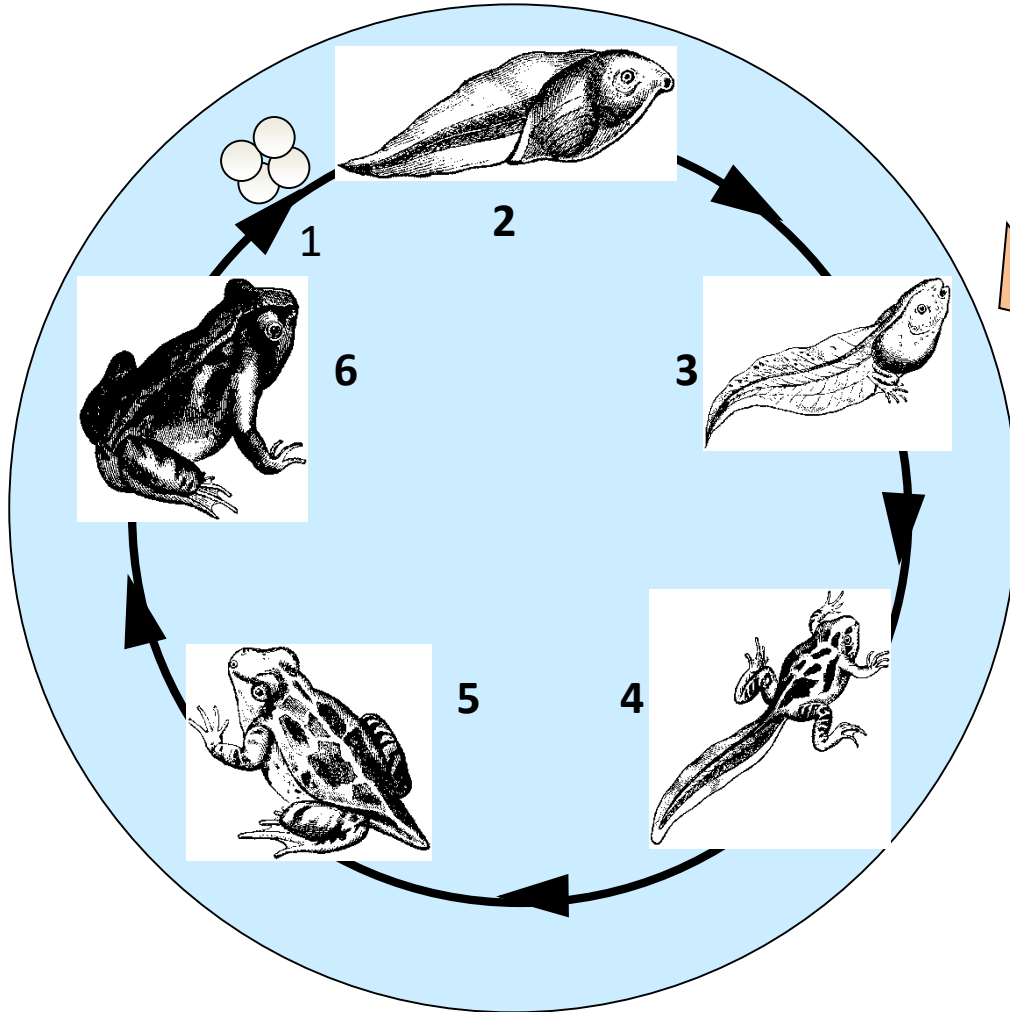
The Tadpole has a long tail and it lives in the water. Tadpoles breathe through gills on the outside of their bodies for about five weeks.



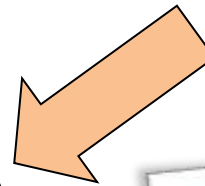
Stage 3



Stage 3



A tadpole has gills and swims in the water. Back legs begin to develop.

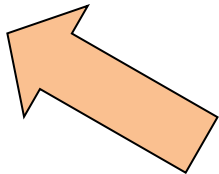
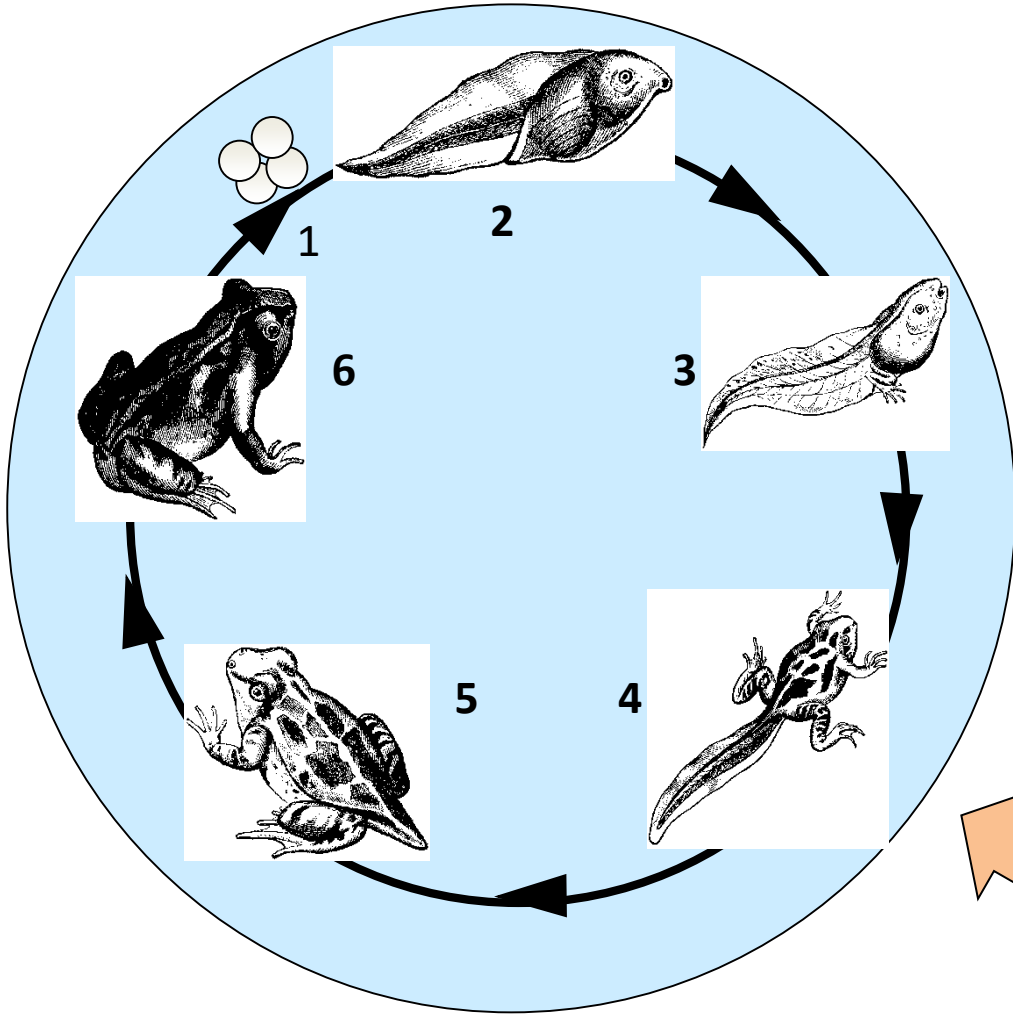


Stage 4



Stage 4

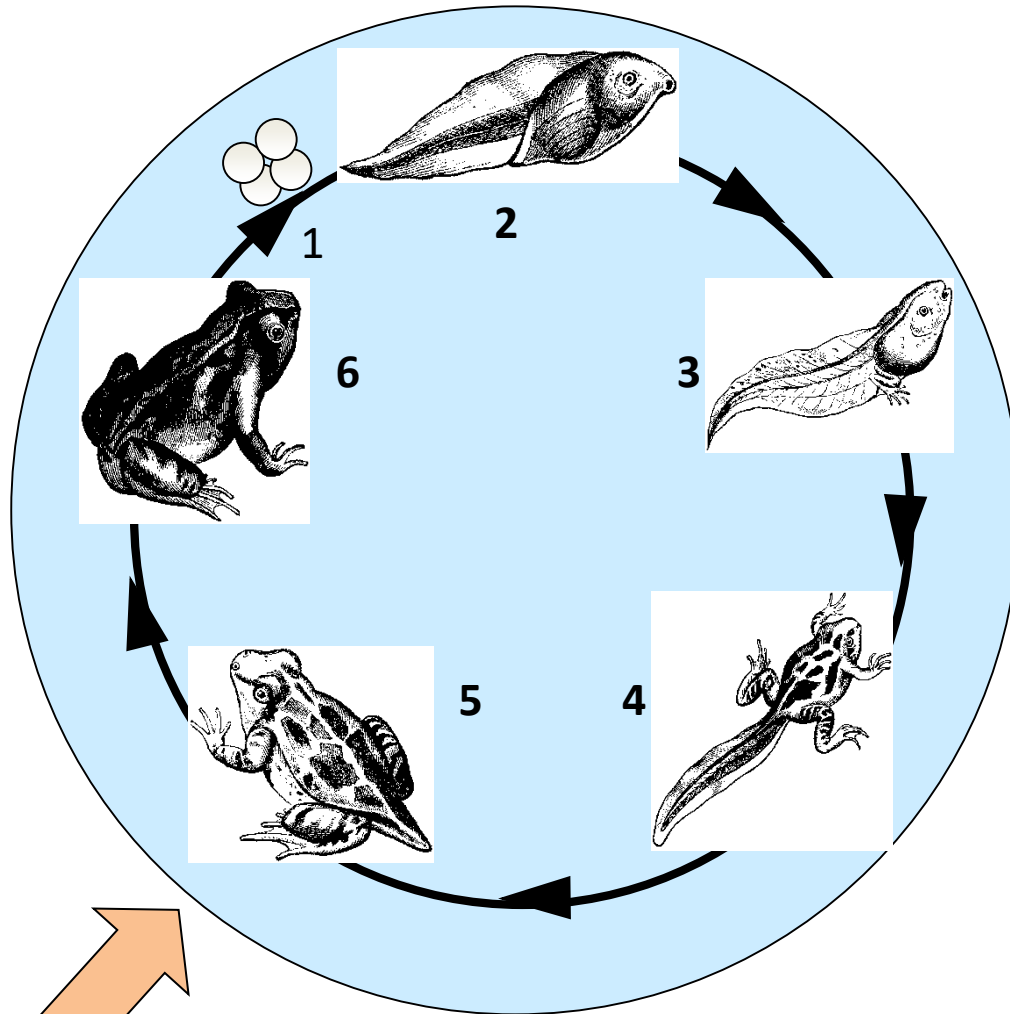
After a period of time the tadpole has fully developed legs and lungs



Stage 5



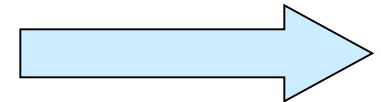
Stage 5



The tail being to disappear and the frog is able to spend more time on land.

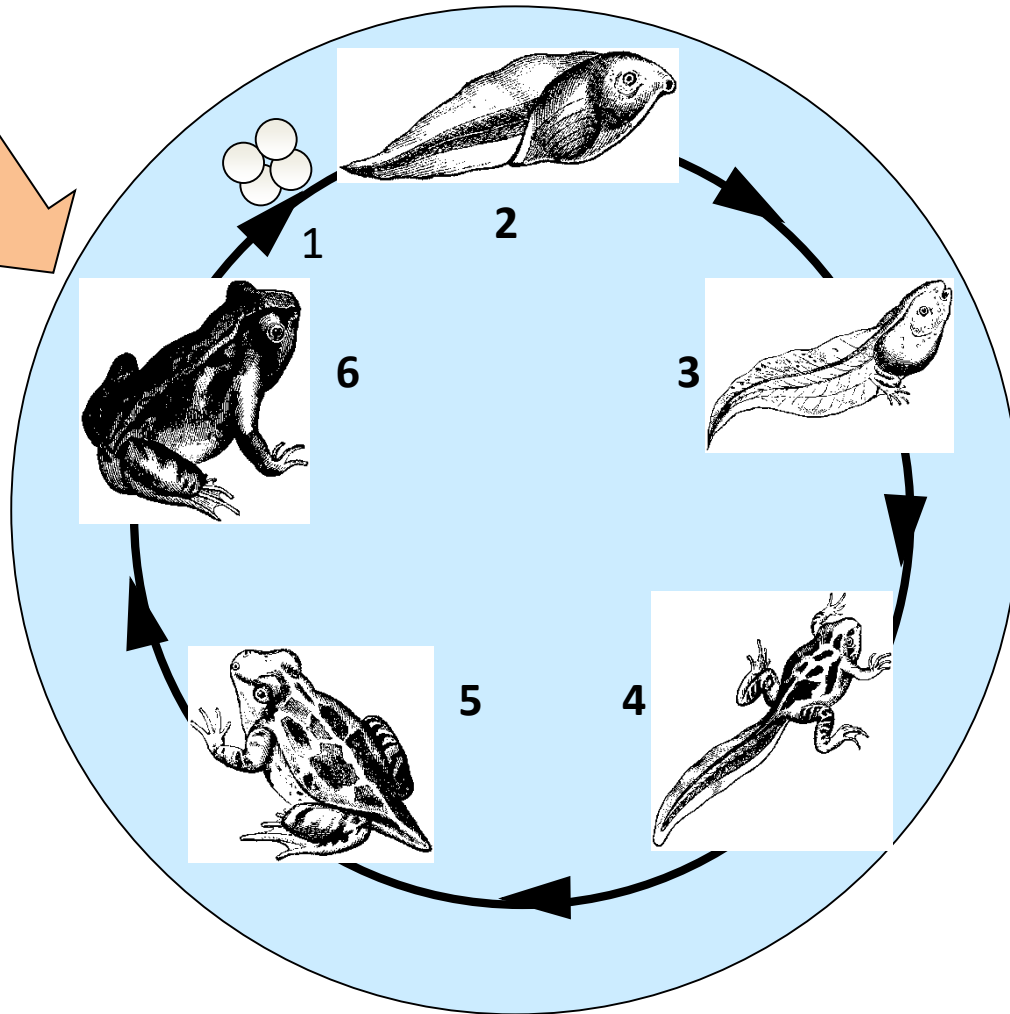


Stage 6



Stage 6

The frog is fully developed and can live on land or in water.



Hormonal regulation

In vertebrates including amphibians, external environmental cues are responsible for the production of primary hormones in the hypothalamus, pituitary, and gonads. the production of gonadotropin-releasing hormone (GnRH) in the brain. The influence of GnRH stimulates the pituitary to produce gonadotrophins . Gonadotrophins stimulate the testes to produce testosterone and the follicles to produce progesterone.

Testosterone promotes the production of spermatozoa and reproductive behavior in males, and progesterone promotes the maturation of oocytes and ovulation. In female amphibians, these hormones promote gonadal maturation, spawning behavior, and spawning. In male amphibians, primary hormones initiate the hydration of sertoli cells, which induces spermiation (or sperm release) into the urine, and stimulate both calling and amplexus.

Parental Care



Parental care means care of the eggs till they reach the reproductive age. Amphibians were the first vertebrates to have evolved different kinds of parental care to protect their young ones as given in the following description.



It lays eggs on the branches or leaves of a tree which will be hanging over a pond. These larvae after hatching from eggs will fall into the pond water and undergo metamorphosis.



The fertilized eggs are transferred into its vocal sacs the development takes place. Then the completely developed young individual will jump out from the mouth of the male frog.





It has a special pouch in its skin. It opens out through an opening near the cloaca. Fertilized eggs are transferred into this pouch. The eggs are stored in this pouch where they 'undergo development and tadpoles are liberated out.



This male frog lives in a shallow pit of the moist soil, It will come out of the pit now and then for feeding and to make the eggs moist. When the eggs are ready to hatch the male frog moves to a nearby pond and the larvae are released

Environment and frogs

The main factors that affect reproductive condition in amphibians are nutrition, temperature, humidity and light cycles.

Nutrition:



Amphibians should be fed an adequate amount of highly nutritional food. This food should have a nutritional profile particularly rich in vitamin A, other vitamins, highly unsaturated fatty acids, energy, calcium and phosphorus.



Temperature:

A seasonal cycling of temperature is essential for the maturation of oocytes in the ovaries. In different species either high or low temperatures may affect the maturation of testes.



Rain and humidity



It is necessary to provide water for the completion of the process of external fertilization. Strong water currents cause the dispersion of sperm and ova from each of the frogs that produce large amounts of them.

light cycle

For most species of amphibians the effects of light cycles are not known. Most studies have shown that the effect of temperature is paramount to the effect of lighting on amphibian reproduction. However, with some temperate amphibians lighting cycles have profound effects on the reproductive cycles. For example, frog (*Rana* sp.) need long photoperiods for full ovarian maturation.



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Thank you!

