

T. D.C. Part - I

ZOOLOGY (H)

PAPER - II

DR. VIPIN KUMAR
Assistant Prof.
(Guest Faculty)
DEPT. OF ZOOLOGY
L. S. College, MUZ.

TOPIC: Parental Care in Amphibia

3. PARENTAL CARE IN AMPHIBIA

Struggle for existence and perpetuation of race are rules of nature. Perpetuation of race in the face of various adverse factors is possible by over production of eggs and/or parental care, i.e., caring of eggs by one or more parents. Parental care is an important phenomenon in the trend of evolution and is met with in different vertebrate groups. It is an instinct which has contributed much to the success of vertebrates. It was first manifested in a brooding instinct or tendency for one or more parents to remain with the eggs. Among amphibia it seems to have independently developed and various degrees of parental care can be observed in them. The various ways by which parental care is manifested among amphibians are as follows :

1. Deposition of eggs in suitable place and bodies;
2. Construction of nests;
3. Carrying of the eggs by parents;
4. Development of brood pouch;
5. Development in uterus.

1. Deposition of eggs in suitable place and brooding.

Eggs are generally laid in such a place where they can develop properly. For this the eggs are deposited in a hole on muddy bank of river or pond as in *Rhacophorus schlegli*. The eggs are then covered by foamy mucus, a dermal secretion, to prevent dessication. In *Hylodes* the eggs are deposited on the under surface of leaves overhanging rivers and ponds. For security the eggs may be attached to aquatic weeds by glues as in *Triton*. In hynobid salamanders the males remain with the eggs for varying periods to fertilize them and exhibit an active interest in the eggs. The cryptobranchids guard the eggs until they hatch. Most amphibia which lay their eggs in the water abandon them after fertilization, but among those which deposit large-yolked eggs, the female frequently remains with them. The primitive plethodontid *Gyrinophilus* lay their eggs under stones in streams. In the terrestrial plethodontids the female takes up the eggs over body to provide moisture and her dermal secretions prevent growth of mold over eggs.

2. Construction of Nests

Many amphibians have been observed to construct nests of various types for protecting the eggs. *Rhacophorus maculatus* digs a hole just above the water level and fills it froth and foam by the wriggling movements of hind limbs both by the male and female. The eggs are laid in the frothy mass where they are prevented from dessication.

Hyla faber digs a basin shaped hole in shallow water and constructs a wall with surplus mud around the rim of the basin. A south american tree frog, *Phyllomedusa*, builds a nest by folding the margin of leaves. Cloacal secretion is used for gluing the leaf margins. Shoots of trees are used for making nests by *Triton* in which the eggs are deposited for further development. The male hell bender (*Cryptobranchus*) builds nest on the river bottom and guards the nests until the eggs are hatched. In *Salamandrella* the eggs are deposited in a gelatinous bag which is fixed to some aquatic object below the level of water.

3. Carrying of the Eggs by Parents

Some amphibians are found carrying the eggs on their body. Thus, the females of *Ichthyophis*, *Amphiuma* and *Siphonops* lay the eggs in damp places. The eggs are stringed together and the females coil round these egg masses guarding them until hatching. In *Alytes*

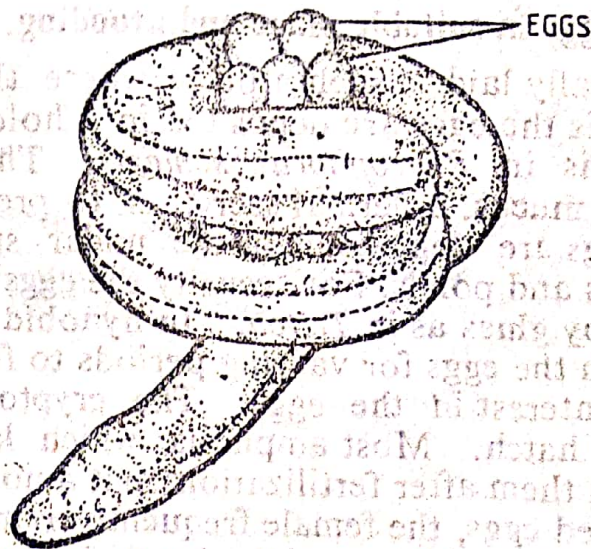


Fig. 3.1. *Ichthyophis*

the eggs are laid in two strings and become attached to the waist and hind limbs of males. The male toad then withdraws to some moist place along with the coiled egg mass. When the eggs are about to hatch, the male carries them to some pond for hatching. The larvae come out and metamorphose into adults. In *Hyla goeldii*, a Brazilian species, the females carry the eggs on their back in incipient brood pouches. In *Desmognathus*,

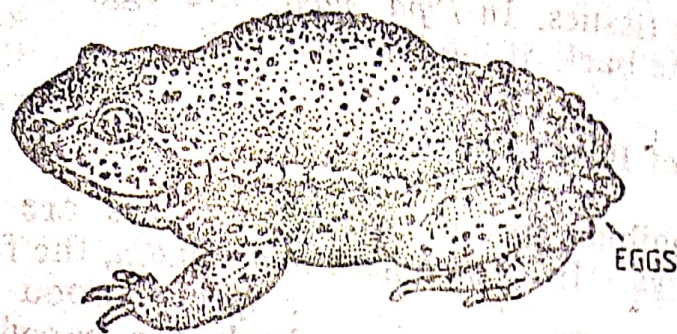


Fig. 3.2. *Alytes*

the females carry the eggs clustered around her head and lives in underground hole. In *Pipa dorsigera*, the back of the female is

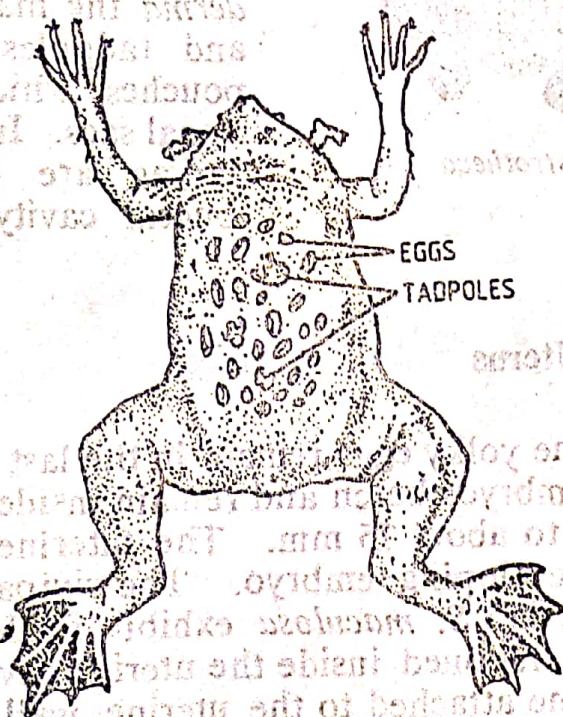


Fig. 3.3. *Pipa*

flattened and beset with dermal pockets for carrying the eggs. During breeding season, the male places the fertilized eggs on the spongy back of the female which thickens around the deposited eggs forming pits into which the eggs sink. An operculum covers the pit. The partitions between the pits become richly vascularised

and physiological exchange of materials occur between the embryonic and maternal tissues. In *Pipa pipa*, the eggs are deposited in simple pits on the back of the female.

4. Development of Brood Pouch

In some amphibian species special pouches are developed for protecting the eggs. In *Gastrotheca marsupialia*, the female develops a special brood pouch on her back for carrying the eggs. The pouch is closed on all sides except for a small slit like opening in the posterior side. The female *Nototrema* carries her eggs in a dorsal-horse-shoe shaped pouch which develops during the breeding season.

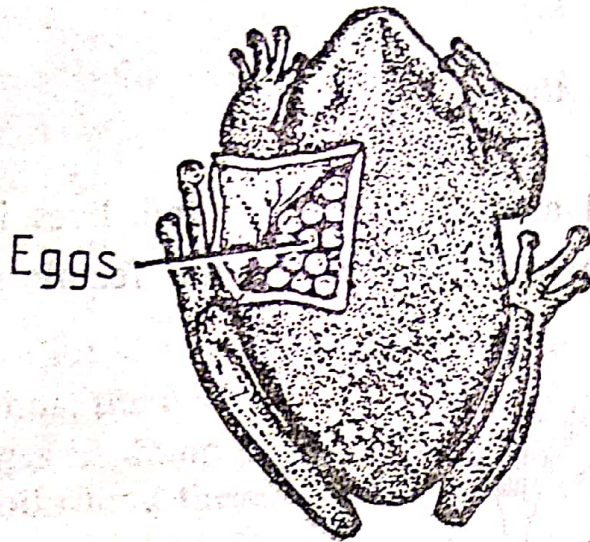


Fig. 3.4. *Gastrotheca*

In some species of *Rhinoderma* the males carry the eggs and tadpoles in special gular pouches which develop from vocal sacs. In *Arthroleptis* the larvae are kept inside the buccal cavity of the male at

the time of danger.

5. Development in Uterus

In *Geotrypetes* the yolky eggs remain in the last part of the oviducts. The small embryos hatch and remain inside the oviducts till they grow in length to about 75 mm. The 'uterine milk' provides nutrition to the developing embryo. The viviparous amphibians like *Salamandra atra* and *S. maculosa* exhibit further modification. Here the eggs are retained inside the uterine cavity. The larvae hatch out and become attached to the uterine wall by means of a membrane which allows metabolic exchange of materials. The broad vascular tail also serves this function.

Conclusion—The above account indicates the various degrees of parental care exhibited by different amphibians. This instinct first manifests itself in simple brooding which affords protection to the eggs. The bond between parent and eggs gradually becomes stronger. However, the brooding habit in some cases may have resulted merely from exhaustion of the female after egg laying. The brooding instinct exhibited by some males may be merely the tendency of the males to remain near their calling stations. But complex modifications in structure and behaviour are observed in amphibians in respect of

this particular instinct. The play of the instinct may be influenced by hormonal actions or due to reflex action brought about during the breeding season. In fine, parental care has contributed much to success of amphibians in perpetuating the race against many odds in the new terrestrial environment.

