



THE FEMALE ANURAN REPRODUCTIVE SYSTEM
IN RELATION TO REPRODUCTIVE MODE

by

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SUMMARY

Anurans display considerable morphological diversity in the female reproductive system, and a great variety of reproductive modes. In this study I defined the relationships between interspecific morphological variation and reproductive modes among 108 species.

Associations between reproductive mode and morphology must be related to the nature of the spawn, therefore I constructed a classification of modes based on egg diameter and the degree of embryonic dependence on stored yolk, to facilitate comparison with morphology:

- Mode I - eggs with little yolk, larvae aquatic and feeding
- Mode II - eggs containing moderate yolk reserve, only late larval stages feeding
- Mode III - eggs containing large yolk reserve which nourishes embryo or larva throughout development
- Mode IV - viviparity (not considered here, because the eggs contain little yolk, therefore reproductive morphology is not influenced by the same parameters as in species of Modes I - III).

In defining egg characteristics for each mode, I observed the following features:

- 1) unpigmented eggs in species which oviposit away from sunlight, and a significant trend towards loss of pigmentation from Mode I to III;

- 2) egg diameter (a) is positively correlated with snout-vent length in species of Modes II and III but not I, and (b) increases significantly from Mode I to III;
- 3) ovarian complement (a) is positively correlated with snout-vent length within a mode, and (b) decreases significantly from Mode I to III;
- 4) a negative correlation between egg diameter and ovarian complement;
- 5) for a given snout-vent length, ovarian complement volume remains similar regardless of mode.

I investigated the nature of morphological variation and the ontogeny of the reproductive system. Those features which exhibited significant interspecific variation, together with correlations with reproductive mode, were as follows:

- 1) the number of ovarian lobes is positively correlated with snout-vent length and decreases from Mode I to III. These correlations reflect changes in surface area of ovarian epithelium (larger in larger species, smaller for a smaller number of larger eggs), which is achieved by changes in the number of lobes;
- 2) ovarian asymmetry, which occurs in *Rheobatrachus silus*, was not observed in other species, and therefore appears to be unrelated to reproductive mode as defined here;
- 3) the number of convolutions of the *pars convoluta* of the oviduct is proportional to the length of that region, and is positively correlated with snout-vent length in Modes I and III but not in Mode II. It is negatively correlated with egg diameter, and significantly smaller in Modes II and III than in Mode I. These correlations probably reflect changes in surface area of secretory oviduct wall, achieved by altering oviduct length, in species with different

egg diameters and/or ovarian complements, which therefore require different quantities of oviduct secretions;

- 4) oviduct width (an indicator of lumen diameter) is positively correlated with egg diameter, and is significantly larger in Modes II and III than in Mode I, thus enabling the large eggs of Modes II and III species to traverse the oviduct;
- 5) in foam-nesting species the posterior-most convolutions are greatly enlarged and therefore probably secrete mucus for foam production;
- 6) the ovisacs remain separate, or unite posteriorly, or are completely united. Separate ovisacs are present only in species with small eggs, and there is a significant trend towards fusion from Mode I to III; fusion may reduce the risk of large eggs impacting during oviposition.

There is no apparent correlation of any pattern of reproductive morphology with taxonomic status. Similar morphological modifications have evolved in unrelated species which share the same reproductive mode, presumably in response to similar physiological and environmental pressures.