

WFS 493/560

Test #1 Review

Reproductive Strategies (Dr. Sandy Echternacht)

1. Know the 3 abiotic cues that work singularly or in combination to stimulate the breeding season.
2. Be able to describe in detail the typical biphasic life cycle of amphibians.
3. Be able to describe the differences between direct development, viviparity, and ovoviviparity.
4. Be able to compare and contrast the differences between hydriogenesis, gynogenesis, and parthenogenesis (Dr. Echternacht's lecture and assigned reading from Zug's book).
5. Know the 5 types of parental care discussed by Dr. Echternacht and be able to provide a taxa (e.g., species or genus) that uses a particular parental care type.

Amphibian Characteristics, Taxonomy and Evolution

1. Know the general definition of an amphibian.
2. Know the kingdom, phylum, subphylum, class, subclass, orders, and suborders of amphibians.
3. Be able to provide 5 characteristics that are common to most amphibians.
4. Know the 2 types of skin glands of amphibians.
5. Know the difference between the columella and opercular auditory channels.
6. Know the percent species composition of the extant amphibian orders.
7. Know 5 unique characteristics of Gymnophiona and where they are distributed.
8. Know the differences between stegokrotaphic and zygokrotaphic skulls.
9. Given a list of characteristics, be able to match the appropriate caecilian family with the correct list of characteristics.
10. Know the common and taxonomic names of each caecilian family.
11. Know which family of caecilians is believed to be the most primitive.
12. Be able to provide 5 unique characteristics of Caudata and know where they are primarily distributed.
13. Know the common and taxonomic names of each caudate family.
14. Know the 3 hypotheses for lungless evolution in the Plethodontids.
15. Know that the Plethodontids have diagnostic nasolabial grooves (and what happens to the grooves in males of many species during the breeding season).
16. Know that the Hynobiids have external fertilization and that their teeth are in patches.
17. Know that the Ambystomatids primarily breed in winter. Exceptions can be those living in xeric regions (e.g., *Ambystoma tigrinum mavortium*) and the marbled salamander (*A. opacum*; breeds in the fall).
18. Know which families of salamanders are obligate paedomorphs.
19. Know where the sirens and amphiumas are distributed in the United States.
20. Know where the torrent and giant salamanders are distributed in the United States.
21. Be able to provide an explanation why members of Rhyacotritonidae have reduced lungs.
22. Know which family of salamanders is believed to be the most primitive.
23. Know which family of salamanders contains the largest salamanders in the world.
24. Be able to provide 5 unique characteristics of Anura and know where they are primarily distributed.
25. Know the common and taxonomic names of each anuran family.
26. Know that male leptodactylid frogs frequently guard the eggs, and that all the members of Leptodactylidae develop via direct development except for *Eleutherodactylus jasperi*.
27. Know that the hylids are known for their large toe discs that help them climb.
28. Know how ranid species kick their legs when swimming compared to leiopelmatids, and which kicking strategy is considered more primitive.
29. Know what the Bidder's organ is and which anuran family it is a characteristic of.
30. Know which anuran family *Breviceps* is a member of and what is the function of the males secretions during amplexus.
31. Know which anuran family contains the "flying frogs" and how these frogs achieve flight.

32. Know which 2 families of anurans are believed to have converged evolutionarily with respect to skin toxins and aposematic coloration.
33. Know which anuran family is characterized by transparent skin.
34. Know which anuran family is characterized by a leaf-like appearance.
35. Know which anuran family contains the gastric-brood rearing frogs, which are now believed to be extinct.
36. Know which anuran family contains the African clawed frog (*Xenopus laevis*), which are commonly used in lab experiments and have been introduced throughout the United States.
37. Know which anuran family contains the hairy frog (*Trichobatrachus robustus*), and some of the hypotheses for why males may develop hair-like dermal protuberances during breeding.
38. Know which family contains the genus *Alytes*, which are known for males carrying fertilized eggs on the back of their legs as a parental care strategy.
39. Know which family of anurans is known to inhabit xeric regions and breed explosively during intense summer rains.
40. Know which family contains the smallest tetrapod in the Southern Hemisphere.
41. Be able to describe the unken reflex of fire-bellied toads and know its function.
42. Know which anuran family in the suborder Neobatrachia has species that perform inguinal amplexus.
43. Know that the leiopelmatids and the pipids are the only anuran families without a protusible tongue.
44. Know that members of Rhinophrynidae and Hemisotidae have prehensile tongues.
45. Know that females in the families Discoglossidae and Pelodytidae have been reported vocalizing to males.
46. Know which anuran family is known for internal fertilization.
47. Know where tailed frogs are found in the United States.
48. Know which anuran family has members where the tadpoles develop in the vocal sac of males.
49. Know which anuran family was recently discovered in India when digging a well.
50. Know which families are members of the suborders: Mesobatrachia and Archaeobatrachia.
51. Know which family of anurans is believed to be the most primitive.
52. Know which family has the highest and lowest species richness in each amphibian order.
53. Know the geologic period that amphibians likely began to appear. Also, know the 2 geologic periods that had substantial speciation (probably from adaptive radiation), and what geologic event likely triggered this accelerated speciation.
54. Be able to compare and contrast the 2 hypotheses for the origin of tetrapods (i.e., lobe-finned [Osteolepiformes] vs lungfishes [Ceratodontiformes and Lepidosireniformes]).
55. Be able to describe the fin-fold and body-spine theories for limb development.
56. Be able to compare and contrast theories on the monophyletic and polyphyletic origin of tetrapods.
57. Know basic characteristics of temnospondylous amphibians, Nectrideans and Microsaurs.
58. Know the 3 first fossil records of each order (*Triadobatrachus massinoti*, *Karuaus sharovi*, *Apodops pricei*), their geographic origin, and the period they were fossilized.

Amphibian Courtship and Breeding

1. Understand intimately the 5 cues amphibians may use for orienteering to breeding sites and during dispersal, and which cues are likely most important for short vs. long distance movements.
2. Know what physical factors of an anuran can influence the frequency of a call.
3. Know whether low or high frequency calls travel the farthest distance, and which are used most often in forests.
4. Be able to describe the mechanics of a typical anuran call.
5. Be able to discuss the difference in sound power on average between anuran and bird calls, and how anuran sound power relates to your standard Walkman or the front row at a rock concert.
6. Be able to describe the differences between the 3 types of vocal sacs, and know which may be external or internal.
7. Know the 4 types of anuran calls.
8. Be able to describe the differences among the 4 types of advertisement calls.
9. Know which part of the call “co-qui” attracts female *E. coqui*.

10. Know how one can stimulate the release call from a male anuran.
11. Understand intimately the 5 strategies of advertisement calls.
12. Know whether females prefer longer or faster calls.
13. Be able to provide some examples of predators that may cue in on calling males.
14. Understand how temperature, vegetation, soil, rivers and food resources can influence calling activity. Also, know the approximate maximum number of days a healthy male can call consecutively.
15. Understand how calling conspecifics can influence calling rate.
16. Understand the energetic costs of calling compared to other life-cycle activities.
17. Understand the relationship between carbohydrate and lipid oxidation, season, and calling behavior.
18. Know the average chorus tenure of a typically healthy calling male (i.e., what % of the breeding season will an individual male call?).
19. Be able to describe secondary sexual characteristics of caecilians, caudates and anurans.
20. Know which families of salamanders have external fertilization thus are believed to engage in minimal courtship.
21. Understand the comparative energetic costs of terrestrial and aquatic courtship for salamanders.
22. Be able to describe the typical courtship sequence of Ambystomatid salamanders.
23. Know 2 tactile cues that anurans use to recognize conspecifics.
24. Know the 6 types of amplexus.
25. Be able to compare and contrast aquatic vs. terrestrial oviposition in anurans.
26. In species that defend fertilized eggs, know whether the male or female usually defends the eggs in anurans and caudates.
27. Be able to describe internal fertilization in caecilians, caudates and anurans.
28. Be able to describe the structure and composition of a spermatophore.
29. Be able to compare and contrast the energetic costs of reproduction in male and females tungara frogs.
30. Know the average age of first reproduction for the majority of anurans and caudates.

Post-metamorphic Movements (Dr. Betsie Rothermel)

1. Be able to compare and contrast the differences between homing, migration and dispersal.
2. Know the genetic and demographic importance of occasional dispersal of individuals among populations.
3. Be able to compare the relative difference in vagility among *Ambystoma*, *Rana* and *Bufo* as reviewed by Semlitsch and Bodie (2003).
4. Understand how capture rates differed between old fields and forest for metamorphs emerging from mesocosm pools at forest edges (Rothermel and Semlitsch 2002).
5. Understand how capture rate of metamorphs was related to distance from the forest edge (Rothermel 2004).
6. According to Rothermel and Semlitsch (2006), know when most juvenile salamander mortality occurs and how mortality rates differ among old fields, forest edges and forest interior sites.
7. Know how juvenile toad capture rate and survival differed between forest and clearcut sites in the LEAP study (Todd and Rothermel 2006).
8. Know the buffer width recommendations of Bodie and Semlitsch (2003).
9. Know how body size at metamorphosis influenced postmetamorphic survival of spotted salamanders (Rothermel and Semlitsch 2006).
10. Understand how chemicals influenced time of metamorphosis and body size at metamorphosis (Boone et al. 2001).

Required Readings:

See website. Yes, there will be questions (approximately 10% of test will come from the readings).