Biology 452
Lab Practical 2, Spring 2009

Station 1:

A. Salmon
B. Minnow
C. Sucker
D. Pike

1. What is the Latin Order represented by more than one specimen? (Cypriniformes)
2. In what environment does specimen A spawn? (Freshwater)
3. What is the letter of the specimen that was introduced to Washington? (D)
4. What is the Latin Family name of specimen D? (Esocidae)

Station 2:

A. Clingfish
B. Rockfish
C. Sculpin
D. Toadfish

5. Give the common name(s) of the specimen(s) that are known to be catadromous. (Rockfish)
6. What is the Latin family name of specimen D? (Batrachoididae)
7. Give the letter(s) of the specimen(s) with pelvic fins in the jugular position. (D)
8. Give the letter(s) of the specimen(s) whose diet does NOT include invertebrates? (B)

Station 3:

A. Hagfish
B. Gunnel
C. Ratfish
D. Lamprey

9. What is the common name of the specimen that is NOT strictly marine? (Lamprey)
10. Give the letter(s) of the specimen(s) in the Superclass Agnatha. (A, D)
11. How many orders are represented here? (4)
12. What is the Latin family name of specimen C? (Chimaeridae)

Station 4:

A. Perch
B. Herring
C. Anchovy
D. Sunfish
E. Right Eyed Flounder

13. What Latin order is represented by both B and C? (Clupeiformes)
14. Give the letter(s) of the specimen(s) that eat Invertebrates AND Fish. (A, D, E)
15. How many dorsal fins does specimen D have? (1)
16. What is the Latin family name of specimen E? (Pleuronectidae)

Station 5:

A. Lamprey
B. Hagfish
C. Gar
D. Sturgeon
E. Hammerhead

17. Give the letter(s) of the specimen(s) with a bony skeleton. (C)
18. Give the letter(s) of the specimen(s) in the subclass Neopterygii. (C)
19. Give the letter(s) of the specimen(s) who, as an adult, have a diet that includes invertebrates. (B, D, E)
20. What is the shape of the caudal fin of specimen C? (Hemi-homocercal)
21. What is the Latin Class of specimen E? (Chondrichthyes)

Station 6:

A. Bowfin
B. Sturgeon
C. Anchovy
D. Bass

22. Name the Latin Family of specimen A. (Amiidae)
23. Give the letter(s) of the specimen(s) with a diet that includes fish. (A, B, D)
24. Give the letter(s) of the specimen(s) native to Washington. (B, C)
25. Name the Latin Order of specimen B. (Acipenseriformes)

Station 7:

A. Cod
B. Tuna
C. Wolf Eel
D. Prickleback

26. How many orders are represented here? (2)
27. What is the diet of specimen C? Be specific. (Hard shelled invertebrates / durophagy)
28. Give the letter(s) of the specimen(s) found only in a marine habitat. (B, C, D)
29. What is the Latin Family of specimen C? (Anarhichadidae)
30. Give the letter(s) of the specimen(s) with a keeled tail. (B)

Station 8:

A. Skate
B. Toadfish
C. Sculpin
D. Torpedo Ray
E. Stickleback

31. Give the letter(s) of the specimen(s) that have an electric organ to stun prey. (D)
32. Give the letter(s) of the specimen(s) in the order Gasterosteiformes. (E)
33. Give the letter(s) of the specimen(s) that have photophores? (B)
34. What is the Latin family name of specimen D? (Syngnathidae)

Station 9:

A. Dogfish
B. Catfish
C. Minnow
D. Sucker

35. What is the sex of specimen A? (Female)
36. Give the letter(s) of the specimen(s) that have an adipose fin. (B)
37. What is the shape of the tail of specimen C? (Forked)
38. Give the letter(s) of the specimen(s) whose diet includes invertebrates (A, B, C)

Station 10: Key Question (2 Points)

39/40. Key out the following specimen. Be sure to include ALL steps and the final family. 1A 2B 5B 8A 9B 11A 12A 13A

1A	One eye on each side of head; body rounded or laterally compressed	2
1B	Both eyes on right side of the head, usually; pelvic fins symmetrically placed; body flat in cross section	**Family A**
2A	Caudal fin heterocercal or hemihomocercal	3
2B	Caudal fin homocercal	5
3A	Caudal fin heterocercal, longitudinal bony scutes present, barbels present	**Family B**
3B	Caudal fin hemihomocercal, bony scutes absent, barbels absent	4
4A	Jaws are elongated, narrow; single, short dorsal fin; ganoid scales	**Family C**
4B	Jaws not elongated or narrow; no ganoid scales; single, long dorsal fin	**Family D**
5A	Adipose fin present	6
5B	Adipose fin absent	8
6A	No barbels around mouth; scales present	7
6B	Barbels present around mouth; scales absent	**Family E**
7A	Axillary process present near the base of each pelvic fin	**Family F**
7B	No axillary process near the base of each pelvic fin	**Family G**
8A	Single dorsal fin; no spines in dorsal fin	9
8B	Two or more dorsal fins; 1st dorsal fin spiny	14
9A	Branchiostegal membranes attached to the isthmus	10
9B	Branchiostegal membranes free of the isthmus	11
10A	Lower lip thick with fleshy papillae; subterminal mouth	**Family H**
10B	Lower lip thin & without papillae; mouth usually terminal	**Family I**
11A	Body not highly compressed; ventral midline without sawtooth keel; caudal fin deeply indented, truncate or rounded	12
11B	Body quite compressed; scales on ventral midline strongly overlap to form sawtooth keel; caudal fin deeply forked	**Family J**
12A	Snout not elongated; no dark vertical bar under eye; caudal fin not deeply indented	13
12B	Elongated snout shaped like a duck's bill; conspicuous dark vertical bar under eye; caudal fin deeply indented	**Family K**
13A	Origin of dorsal fin anterior to or directly over anal fin; pectoral fin insertion is ventral	**Family L**
13B	Anal fin anterior to origin of dorsal fin; pectoral fin inserts along lateral midline	**Family M**
14A	No barbel on lower jaw; pelvic fins thoracic do not end in a filament	15
14B	Single barbel on lower jaw (sometimes absent); pelvic fins end in a filament	**Family N**
15A	All spiny rays within dorsal fin connected by membranes; pelvic fins not spiny; no bony plates on sides of body	16
15B	Large, separate dorsal spines present; pelvic fins modified into long spines; bony plates present on sides	**Family O**
16A	Typically, scales present; eyes on sides of head; head not depressed; sharp spines in 1st dorsal fin	17
16B	Typically, scales lacking; eyes close together near top of head; depressed head; flexible spiny rays in first dorsal fin	**Family P**
17A	Dorsal fins may have a deep notch between spiny & rayed portions; no serrations on margin of preopercle	18
17B	2 well separated spiny & rayed dorsal fins; serrations on posterior margin of preopercle	19
18A	Anal fin with > 20 soft rays; dorsal fin base with scaly sheath separated from body scales by a groove	**Family Q**
18B	Anal fin with < 20 soft rays; dorsal fin base without sheath	**Family R**
19A	2 spines on anal fin; sides not silvery & lack dark longitudinal lines	**Family S**
19B	3 spines on anal fin; sides silver with many dark longitudinal lines	**Family T**

Station 11:

A. Tiger Salamander (larva)
B. Common Mudpuppy
C. Pacific Giant Salamander (larval)
D. Greater Siren
E. tailed frog tadpoles

41. List the letter(s) of the specimen(s) that is/are tadpoles. **E**
42. List the letter(s) of the specimen(s) A-D that is/are NOT native to Washington. **B, D**
43. What is the habitat of C? **Aquatic, cold streams**
44. What is the family name of B? **Proteidae**

Station 12:

A. Western Toad
B. Pacific Chorus Frog
C. Northern Red-Legged Frog
D. Columbia Spotted Frog

45. What is the family name of A? **Bufonidae**
46. List the letter(s) of the specimen(s) that has/have dorsolateral folds. **C, D**
47. What single order do specimens A-D belong to? **Anura**
48. What is the complete common name of C? **Northern Red-Legged Frog**

Station 13:

A: Northwestern Tailed Frog (Male)
B: Bullfrog
C: Northwestern Tailed frog (Female)
D: Pacific Chorus Frog
E: Northern Leopard Frog

49. List the letter(s) of the specimen(s) that has/have intercalary cartilage. **D**
50. Write the letter of the specimen with a diet different from all the rest. **B**
51. List the letter(s) of the specimen(s) that belong to the family Leiopelmatidae. **A, C**
52. List the letter of the specimen that has been introduced to Washington. **B**

Station 14:

A: Common Ensatina
B: Olympic Torrent Salamander
C: Arboreal Salamander
D: Long-Toed Salamander
E: Northwestern Salamander

53. How many families are represented by these specimens? **3**
54. Write the letter(s) of the specimen(s) that is NOT found in Washington. **C**
55. What is the complete common name of B? **Olympic Torrent Salamander**
56. List the letter of the specimen with large parotid glands. **E**

Station 15:

A. 3-toed Amphiuma
B. Mudpuppy
C. Long-toed Salamander
D. Hellbender

57. List the letter of the specimen that is native to Washington. **C**
58. Give the family name of specimen D. **Cryptobranchidae**
59. List the letter(s) of the specimen(s) that eat vertebrates. **A, B, D**
60. List the letter(s) of the specimen(s) that may live in forest habitat. **C**

Station 16:

A. Northern Leopard Frog
B. Northwestern Salamander
C. Roughskin Newt
D. Pacific Giant Salamander
E. Great Basin Spadefoot

61. List all of the habitats specimen B can be found in. **Aquatic, Forest**
62. What is the complete common name of specimen C? **Roughskin Newt**
63. List the letter(s) of the member(s) of Ranidae. **A**
64. How many families are represented here? **4**

Station 17:

A. Common Ensatina
B. Northern Red-legged Frog
C. Western Red-Backed Salamander
D. Columbia Spotted Frog
E. Barred Tiger Salamander

65. List the letter(s) of the specimen(s) that may live in talus. **A, C**
66. List the letter(s) of the specimen(s) that may live in grassland habitat. **D, E**
67. Give the family name of specimen E. **Ambystomatidae**
58. What is the complete common name of specimen A? **Common Ensatina**

Station 18: (2 pts)

A. Ambystomatid (Spotted Salamander)

69 & 70 (Key question): **1B, 2B, 3B, 4B, 5A, 6B, 7B, 8B, 9A, 10B, 12B, 13B, FAM. H**

1A	Mouth without jaws, one median nostril, no paired fins	Superclass X
1B	Jaws present, nostrils paired, paired appendages usually present	2
2A	Paired pectoral & pelvic fins present; paired internal gills	Superclass Y
2B	Paired pectoral & pelvic limbs usually present; gills, if present, external	3
3A	Skin may be smooth or scaly, but it is dry; no poison glands in skin	"Superclass" Z
3B	Skin smooth, moist with mucous; poison glands often present in skin	4
4A	Annular rings around body conceal miniature scales; always legless	Order M
4B	No annular rings around body; front limbs always present	5
5A	Tail present; hind legs, if present, nearly equal forelegs in length	6
5B	Tail absent in adults; hind legs longer and stronger than forelegs	15
6A	Only front legs present (reduced)	Family A
6B	Both front & hind limbs present	7
7A	Limbs minute; body elongate, eel-like; 1 pair of gill slits	Family B
7B	Limbs more robust; body form not eel-like	8
8A	Large, broad, flat head; folds of skin along limbs & sides of body	Family C
8B	Head not greatly flattened; no skin folds on sides & limbs	9
9A	External gills not present	10
9B	2-3 pairs of external gills	14
10A	Costal grooves indistinct or absent; skin rough or smooth	11
10B	Costal grooves distinct; skin slimy & smooth	12
11A	Vomerine teeth in 2 longitudinal rows diverging posteriorly	Family D
11B	Vomerine teeth in slightly curved, transverse row broken at midline	Family E
12A	Nasolabial groove present; 2 large clusters of parasphenoid teeth	Family F
12B	No nasolabial groove; no large clusters of parasphenoid teeth	13
13A	Eye large, horizontal diameter usually greater than distance from anterior corner of eye to tip of snout	Family G
13B	Eye smaller, horizontal diameter less than distance from anterior corner of eye to tip of snout	Family H
14A	Gills large, plume-like; 4 toes on hind feet; large tail fin	Family I
14B	Gills small, "curly"; small or absent tail fin	Family J
15A	Outer (5th) digit of hind foot broadest; male with tail-like process; female with shorter anal tube	Family K
15B	Outer digit of hind foot not broadest; no tail-like process or anal tube	16
16A	Fold of skin behind eyes, often completely across head; head narrow & pointed	Family L
16B	No fold of skin behind eyes; or, if present, associated with semitransparent eardrums; head & snout round	17
17A	Body stocky, limbs short	18
17B	Body slender; limbs long	19
18A	Parotid glands absent or indistinct; 1 inner, metatarsal tubercle, black, sharp	Family M
18B	Parotid glands present, usually distinct; 2 metatarsal tubercles, less sharp	Family N
19A	Eardrum thin, semitransparent; circular fold of skin forms large disc on venter; prominent	Family O
19B	Eardrum opaque; no circular fold of skin on venter	20
20A	Intercalary bone/cartilage present; tips of toes may have broad adhesive pads; no dorsolateral folds	Family P
20B	No intercalary bone/cartilage; no adhesive toe pads; dorsolateral folds in most	Family Q

Station 19:

A. Yellow Mud Turtle
B. Ornate Box Turtle Shell
C. Painted Turtle
D. Desert Tortoise

71) What is the Latin family name of the specimen with the double-hinged plastron. Kinosternidae
72) What is the complete common name of specimen C? Painted Turtle
73) List the letter(s) of the fully terrestrial animal(s). B and D
74) How many families are represented at this station? 3

Station 20:

A. Female Side-blotched Lizard
B. Male Western Fence Lizard
C. Longnosed Leopard Lizard
D. Female Sagebrush Lizard
E. Gila Monster

75) List the letter(s) of the animal(s) whose diet includes vertebrates. C and E
76) What is the complete common name of specimen D? Sagebrush Lizard
77) List the letter(s) of the specimen(s) (A, B, C, D) that is/are male? B
78) List the letter(s) of the animal(s) that is/are arboreal &/or semi-arboreal. B and D

Station 21:

A. Western Hognose Snake
B. California Mountain Kingsnake
C. Long-nosed Snake
D. Western Rattlesnake

79) List the letter(s) of the animal(s) whose diet includes invertebrates. A and C
80) What is the common name of specimen B? California Mountain Kingsnake
81) Name the type of fang in specimen A. Opistoglyphous
82) List the letter(s) of the specimen(s) that live(s) in Washington. B and D

Station 22:

X. Pointing to femoral pores
Y. Pointing to parietal eye
Z. Turtle carapace

83) Name the anatomical feature indicated at X. Femoral Pores
84) Name the anatomical feature indicated at Y. Parietal or Pineal Eye
85) Name the anatomical feature Z. Carapace, Keel, Vertebral Scute

Station 23:

A. Green Turtle
B. American Alligator
C. Hawksbill Turtle
D. Common Snapping Turtle Shell
E. Gopher Snake

86) What is the diet of specimen C? Invertebrates
87) Name the Latin order of specimen A. Testudines
88) What is the complete common name of specimen D? Common Snapping Turtle
89) What do specimens B and E have in common: order, habitat, diet &/or distribution? Diet (vertebrates)

Station 24:

A. Western Skink
B. Western Whiptail
C. Northern Alligator Lizard
D. Longnosed Leopard Lizard

90) What is the Latin family name of specimen C? Anguidae
91) What is the complete common name of specimen A? Western Skink
92) How many families are represented at this station? 4

Station 25:

A. Ringneck Snake
B. Striped Whipsnake
C. Racer
D. Common Garter Snake
E. Rubber Boa

93) List the letter(s) of the animal(s) who spend significant time in the water. D
94) What is the common name the specimen that does not eat invertebrates? Rubber Boa
95) Give the letter(s) of the animal(s) with keeled scales. D

Station 26:

A. Northern Alligator Lizard (a small specimen)
B. Northwestern Salamander
C. Rough Skinned Newt
D. Western Skink
E. Racer
F. Common Gartersnake

96) List the letter(s) of the specimen(s) that belong to the order Squamata. A, D, E, & F
97) List the letter(s) of the specimen(s) that have some granular scales. A
98) How many families are represented here? 6

Station 27:

Iguana

99 & 100 Key Question (2 pts) Key out the specimen using the key shown below:
Show all of your steps on lines 99 & 100, as needed, including the family identification. **1A, 4A, 5B, 6B, 7B, 8B, 9A, 10A, Fam. I**

1A	Two pairs of legs	4
1B	Legs absent	2
2A	Eyelids absent	Fam. A
2B	Eyelids present	3
3A	Ear opening present	Fam. B
3B	No ear opening	Fam. C
4A	Eyelids present	5
4B	Eyelids absent; eye covered with transparent scale	13
5A	Fold of skin along sides of body contains granular scales	Fam. D
5B	No fold of skin along sides with granular scales	6
6A	Belly scales quadrangular & larger than dorsal scales; belly scales run in longitudinal series	Fam. E
6B	Belly scales smaller, not quadrangular or not in longitudinal series	7
7A	Dorsal scales smooth, shiny & flat with overlapping rounded borders; ie. cycloid	Fam. F
7B	Dorsal scales granular-like or keeled, not smooth, shiny & flat	8
8A	Nostril slit-like; bead-like dorsal scales separated from each other by skin & tiny granules	Fam. G
8B	Nostrils round; scales not bead-like	9
9A	Parietal eye present	10
9B	Parietal eye absent	Fam. H
10A	Enlarged, erect row of scales down spine	Fam. I
10B	Enlarged row of scales down spine absent	11
11A	Body often covered with very spiny (pointed) scales, or at least some spiny scales are present	Fam. J
11B	Body covered with smooth or granular scales	12
12A	Large heads with tail much longer than body length	Fam. K
12B	Narrower heads with tail length ranging from shorter than body length to just a bit longer than body	Fam. L
13A	External ear canals present in some, but not all	14
13B	No external ear canals	15
14A	Head covered with large flat plates	Fam. M
14B	Head covered with small granular scales	Fam. N
15A	Belly scales transversely elongated & extending across width of ventral region	16
15B	Belly scales not transversely elongated	Fam. O

16A	Sensory pit between eye & nostril on each side of head	Fam. P
16B	No sensory pit between eye & nostril	17
17A	Pair of permanently erect fangs on the anterior part of upper jaw	Fam. Q
17B	No permanently erect fangs on upper jaw	18
18A	Two or more pairs of chin shields between R & L labial scales	Fam. R
18B	No paired, enlarged chin shields	Fam. S

Sawfish rostrum

BONUS A: What is the Latin order in which this specimen belongs? **Rajiformes**

A. Puffer
B. Tubesnout (Gasterosteiformes)
C. Flying fish
D. Lungfish (Sarcopterygian)
E. Protopterus (not even a Neopterygian)

BONUS B: List the letter(s) of the specimen(s) that are members of the Order Perciformes. **A, C**

A. Female seahorse
B. Female seahorse
C. Male seahorse
D. Type II male midshipman
E. Female midshipman
F. Type I male midshipman

BONUS C: List the letter(s) of the specimen(s) that are males. **C, D, F**

A. Snake skull
B. Gar skull
C. Iguana skull
D. Frog skull
E. Turtle skull

BONUS D: Place these specimens in order from most primitive to most derived. **B, D, E, C, A**