Biology 452, Lab Practical 2 (Fish-Reptiles)
Summer 2009

Station 1

A. Cod
B. Pike
C. Sucker
D. Sturgeon

1. List the letter(s) of the specimen(s) that may be anadromous. **A, D**
2. List the letter(s) of the specimen(s) that was/were introduced to Washington State. **B**
3. How many Orders are represented in this grouping? **4**
4. List the letter(s) of the specimen(s) that may feed on invertebrates. **A, B, C, D**

Station 2

A. Skate
B. Ratfish
C. Torpedo Ray
D. Lamprey

5. List the letter(s) of the specimen(s) in the Subclass Elasmobranchii. **A, C**
6. List the letter(s) of the specimen(s) in the Superclass Gnathostomata. **A, B, C**
7. What is the Common Name of Specimen B? **Ratfish**
8. List the letter(s) of the specimen(s) that may be filter feeders when immature. **D**

Station 3

A. Bowfin
B. Tuna
C. Sturgeon
D. Salmon

9. List the letter(s) of the specimen(s) that has/have a heterocercal tail. **C**
10. What is the shape of the caudal tail of Specimen B? **Lunate**
11. List the letter(s) of the specimen(s) that is/are NOT native to Washington State. **A**
12. What is the name of the process marked on Specimen D? **Axillary**

Station 4

A. Sunfish Anal Fin
B. Sunfish Pelvic Fin

13. What is the name of structure marked A? **Anal Fin**
14. What is the name of the structure marked B? **Pelvic Fin**
15. Is the dorsal fin continuous or contiguous? **Continuous**
16. What is the Common Name of this Fish? **Sunfish**

Station 5

A. Bowfin Skeleton Head	E. Placoid scales	M - Operculum	Q - Frontal	U - Dentary
B. Bowfin Skeleton Body	F. Cycloid Scales	N - Post-orbital	R - Maxilla	V - maxilla
C. Cod Skull	G. Ganoid Scales	O - Branchiostegal rays	S - Occipital	
D. Rockfish skull	H. Ctenoid scales	P - Operculum	T - Branchiostegal	

17. List the letter (M-V) on the specimens (A-D) that mark branchiostegal rays. **O, T**
18. List the letter (M-V) on the specimens (A-D) that marks the Operculum. **M, P**
19. List the letter(s) of the scale (E-H) that is cycloid. **F**
20. What type of tail is present in Specimen B? **Hemi-homocercal**

Station 6
21/22. Key out the following specimen. Be sure to include ALL STEPS (Question 21) and the FINAL FAMILY (Question 22).
SPECIMEN: Stingray

1B, 3B, 5B, 11A, Family J

1A	Mouth without jaws, 1 median nostril, no paired fins, pore-like gill openings	2
1B	Jaws present, nostrils paired, paired appendages usually present, gill openings not pore-like	3
2A	Eyes small & skin covered, 8 barbels around mouth, only caudal fin present	Family A
2B	Eyes not covered with skin, no barbels, mouth is a large round sucking disk, caudal & dorsal fins present	Family B
3A	1 pair of gill openings	4
3B	5-7 pairs of elongated gill slits, placoid scales on skin, claspers present on males	5
4A	Fleshy operculum without bones covers gills, scales absent, caudal fin tapers to fine point	Family C
4B	Bony operculum covers gills, scales variable, caudal fin variable	Taxon X
5A	Body cylindrical, not flattened dorsal-ventrally; eyes on sides of head	6
5B	Body flattened dorsal-ventrally; eyes on top of head	11
6A	Anal fin absent	Family D
6B	Anal fin present	7
7A	Head flattened, shovel or hammer-shaped	Family E
7B	Head not flattened, not shovel or hammer-shaped	8
8A	Tail with pronounced lateral keels on caudal peduncle	9
8B	Tail without pronounced lateral keels on caudal peduncle	10
9A	Gill slits very long, long gill rakers, many minute teeth	Family F
9B	Gill slits & gill rakers normal; teeth large, pointed or triangular	Family G
10A	First dorsal fin over or posterior to origin of pelvic fins	Family H
10B	First dorsal fin anterior to origin of pelvic fins	Family I
11A	Dorsal fins absent, caudal fin absent, stout spine on slender tail	Family J
11B	2 dorsal fins present, both relatively small	12
12A	Skin extremely smooth, caudal fin moderately developed	Family K
12B	Skin rough with scattered spines, caudal fin absent or reduced	Family L

Station 7

A. Dogfish Shark
B. Dogfish Shark Female Skeleton
C. Hammerhead Shark
D. Hagfish

23. What is the name of the structure marked on Specimen A? **Spiracle**
24. What is the sex of Specimen B? **Female**
25. List the letter(s) of the specimen(s) not found in Washington or its coastal waters. **C**
26. What is the name of the structure marked on Specimen D? **Barbels**

Station 8

A. Toadfish
B. Pipefish
C. Gar
D. Sculpin

27. List the letter(s) of the specimen(s) that live exclusively in Marine habitats? **A, B**
28. What is the Common Name of Specimen C? **Gar**
29. List the letter(s) of the specimen(s) that feed on plankton. **B**
30. What is the Order of Specimen A? **Batrachoidiformes**

Station 9

A. Gunnel
B. Wolf Eel
C. Sculpin
D. Clingfish

31. How many Orders are represented in this grouping? **2**
32. What is the body form of Specimen D? **Depressed or Subcircular, hemispherical**
33. List the letter(s) of the specimen(s) that may live in marine habitat. **A ,B, C, D**
34. What is the Common Name of Specimen A? **Gunnel**

Station 10

35/36. Key out the following specimen. Be sure to include ALL STEPS (Question 35) and the FINAL FAMILY (Question 36).
SPECIMEN: Mud Minnow

1A, 2B, 5B, 8A, 9B, 11A, 12A, 13A, Family L

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	**Fam. A**
2A	Caudal fin heterocercal or hemihomocercal	3
2B	Caudal fin homocercal	5
3A	Caudal fin heterocercal, longitudinal bony scutes present, barbels present	**Fam. B**
3B	Caudal fin hemihomocercal, bony scutes absent, barbels absent	4
4A	Jaws are elongated, narrow; single, short dorsal fin; ganoid scales	**Fam. C**
4B	Jaws not elongated or narrow; no ganoid scales; single, long dorsal fin	**Fam. 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	**Fam. E**
7A	Axillary process present near the base of each pelvic fin	**Fam. F**
7B	No axillary process near the base of each pelvic fin	**Fam. 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	**Fam. H**
10B	Lower lip thin & without papillae; mouth usually terminal	**Fam. I**
11A	Body not highly compressed; ventral midline without sawtooth keel; caudal fin deeply indented, truncate or round	12
11B	Body quite compressed; scales on ventral midline strongly overlap to form sawtooth keel; caudal fin deeply forked	**Fam. 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	**Fam. K**
13A	Anal fin at origin of dorsal fin or posterior to dorsal fin; pectoral fin insertion is ventral	**Fam. L**
13B	Anal fin anterior to origin of dorsal fin; pectoral fin inserts along lateral midline	**Fam. 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	**Fam. 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	**Fam. 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 1st dorsal fin	**Fam. 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	**Fam. Q**
18B	Anal fin with < 20 soft rays; dorsal fin base without sheath	**Fam. R**
19A	2 spines on anal fin; sides not silvery & lack dark longitudinal lines	**Fam. S**
19B	3 spines on anal fin; sides silver with many dark longitudinal lines	**Fam. T**

Station 11

A. Stickleback
B. Herring
C. Minnow
D. Anchovy
E. Sucker

37. What is the Common Name of Specimen A? **Stickleback**
38. What is the name of the body part marked on Specimen B? **Caudal Peduncle**
39. List the letter(s) of the specimen(s) that are members of the Order Cypriniformes. **C, E**
40. List the letter(s) of the specimen(s) that has/have homocercal tails. **A, B, C, D**

Station 12

A. Sunfish
B. Perch
C. Right-eyed Flounder
D. Prickleback
E. Sucker

41. What is the Common Name of Specimen A? **Sunfish**
42. What is the position of the pelvic fin in Specimen B? **Thoracic**
43. What is the name of the Order of Specimen C? **Pleuronectiformes**
44. List the letter(s) of the specimen(s) that are catadromous. **C**
45. List the letter(s) of the specimen(s) that may be herbivorous. **D, E**

Station 13

A. Little Toadfish
B. "Big" Minnow
C. Little Sculpin
D. Big Mouth Bass
E. Baby Salmon
F. Anchovy

46. How many Orders are represented in this grouping? **6**
47. What is the Common name of specimen A? Midshipman
48. List the letter(s) of the specimen(s) that have a "free" isthmus. **B, D, E, F**
49. List the letter(s) of the specimen(s) that is/are filter-feeders. **F**
50. List the letter(s) of the specimen(s) that are introduced to Washington State. **D**

Station A:

A. Side-blotched lizard
B. Sagebrush lizard
C. Rubber Boa
D. Racer
E. Western Fence Lizard

51. Of these specimens which are semi or completely arboreal? (List the letter(s)) **B, C, E**
52. List the letter of specimens whose diet includes vertebrates. **C, D**
53. What is the complete common name of E? **Western Fence Lizard**
54. List the Latin family name of specimen D. **Colubridae**

Station B:

A. Hawksbill Turtle (with "X" on a prefrontal scale)
B. Pacific Chorus Frog
C. Painted Turtle
D. Western Whiptail
E. Greater Siren

55. List the letter(s) of any/all specimen(s) not found in Washington. **A, D, E**
56. What is the name of the feature labeled "X" in specimen A? **Pre-frontal scale(s)**
57. List the letter(s) of the specimen(s) whose diet includes vertebrates. **D, E**
58. What is the common name of specimen C? **Painted Turtle**

Station C:

A. Northwestern Salamander
B. Barred Tiger Salamander
C. Pacific Giant Salamander
D. Olympic Torrent Salamander
E. Roughskin Newt

59. How many families are represented at this station? **3**
60. List the complete common name of D. **Olympic Torrent Salamander**
61. List the letter(s) of the specimen(s) that are aquatic AND may also be terrestrial. **A, B, E and C is okay too**
62. List the letter(s) of the specimen(s) whose diet consists solely of invertebrates. **A, D**

Station D:

A. Painted Turtle
B. Yellow Mud Turtle
C. Ornate Box Turtle
D. Northwest Short-horned Lizard
E. Long-nosed Leopard Lizard

63. What type of invertebrates is specimen D specialized to eat? **Ants**
64. Give the complete common name of specimen E. **Long-nosed Leopard Lizard**
65. How many families are represented at this station? **4**
66. Give the letter(s) of the specimen(s) that are NOT found in Washington state. **B, C, E**

Station E:

A. Great Basin Spadefoot
B. Western Toad
C. Northern Leopard Frog
D. Columbia Spotted Frog
E. Red-legged Frog

67. List the letter(s) of the specimen(s) that has/have a “spade” on their hind feet. **A**
68. Give the Latin family name for specimen A. **Scaphiopodidae**
69. List the letter(s) of the specimen(s) with dorsolateral folds. **C, D, E**
70. What diet(s) is/are represented at this station? **Invertebrates**

Station D2:

A. Western Skink
B. American Alligator
C. Common Snapping Turtle
D. Green Sea turtle

71. What Family does specimen A belong to? **Scincidae**
72. What is the Latin order name of specimen B? **Crocodylia**
73. List the letter(s) of the specimen(s) that is/are marine. **D**
74. List the letter(s) of the specimen(s) whose diet(s) is/are primarily vertebrates. **B, C**

Station E2:

A. Western Hognose Snake
B. Common Garter Snake
C. Gopher Snake
D. Western Rattlesnake
E. Eastern Coral Snake

75. What is the complete common name of specimen A? **Western Hognose Snake**
76. List the letter(s) of the specimen(s) that may be found in both terrestrial & aquatic habitats. **B**
77. How many families are represented at this station? **5**
78. List the letter(s) of the specimen(s) that has/have solenoglyphous fangs. **D**

Station F:

A. Western Coral Snake
B. California Mountain Kingsnake
C. Striped Whipsnake
D. Long-nosed Snake

79. How many orders are represented at this station? **1**
80. Is the anal plate of specimen D divided or entire? **Entire**
81. What is the complete common name of specimen C? **Striped Whipsnake**
82. List the letter(s) of the specimen(s) whose diet(s) include invertebrates. **C, D**

Station G: Iguana

83. Write out the complete sequence of steps to identify this specimen to the level of order or family using the key.
84. What Family or Order in the key does this specimen belong to? (Give the letter)

1B, 3B, 5B, 6B, 7B, 8B, 9B, 10A, FAMILY I

1A	Limbs absent	2
1B	Limbs present	3
2A	Eyelids present; external ear canals present, in some	Fam. A
2B	Eyes covered by transparent scales; no eyelids; no external ear canals	Fam. X
3A	Eyes covered by a transparent scale, no eyelids	4
3B	Eyes with moveable lids	5
4A	Scales of ventral surface of body quadrangular/rectangular; tips of toes unmodified	Fam. B
4B	Scales of ventral surface of body not quadrangular/rectangular; tips of toes spatulate, with enlarged scale	Fam. C
5A	Band of lateral granular scales runs from neck to hind limb; granular band folded inward to form lateral body fold	Fam. D
5B	No band of granular scales along sides separating larger scales, no lateral body fold	6
6A	Dorsal scales overlapping, smooth, cycloid	Fam. E
6B	Dorsal scales - granular, keeled, or pointed, never smooth & cycloid	7
7A	Scales on ventral surface of body are large, quadrangular/rectangular, arranged in 8 longitudinal rows	Fam. F
7B	Scales on ventral surface of body smaller, not in longitudinal rows	8
8A	Large dorsal scales granular or bead-like; ventral scales quadrangular/rectangular, in transverse rows	Fam. G
8B	4th toe twice as long as 5th, or nearly so; ventral scales various	9
9A	Tail constricted basally; smooth transverse lamellae on ventral sides of toes; skin; no parietal eye	Fam. H
9B	Tail without basal constriction; longitudinal keels on lamellae on ventral sides of toes; has parietal eye	10
10A	Enlarged, erect row of scales down spine; very long, very slender tail	Fam. I
10B	Enlarged row of scales down spine absent; tail not as long or as slender	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	Fam. K

Station H:

A. Common Ensatina
B. Western Redback Salamander
C. Arboreal Salamander
D. Long-toed Salamander

85. How many families are represented at this station? **2**
86. List the letter(s) of the specimen(s) that is/are NOT found in Washington state. **C**
87. What is the complete common name of specimen D? **Long-toed Salamander**
88. What is the Order in which all of these specimens belong? **Caudata**

Station I:

A. Western Tailed Frog
B. Pacific Chorus Frog
C. Columbia Spotted Frog
D. Northern Leopard Frog
E. Red-legged Frog

89. List the letter(s) of the specimen(s) that belong to the family Ranidae. **C, D, E**
90. List the letter(s) of the specimen(s) that has/have adhesive toe pads. **B**
91. What is the complete common name of specimen A? **Western Tailed Frog**
92. What is the Order in which all of these specimens belong? **Anura**

Station J:

A. Pacific Giant Salamander
B. Olympic Torrent Salamander
C. Common Mudpuppy
D. Hellbender
E. Common Ensatina

93. What is the Latin family name of C? **Proteiidae**
94. List the letter(s) of the specimen(s) that you could find in Washington state. **A, B, E**
95. List the letter(s) of the specimen(s) whose limbs would touch or overlap if adpressed. **A, E**
96. List the letter(s) of the specimen(s) that does/do **not** include vertebrates in their diet(s). **B, E**

Station K:

A. Tiger Salamander Larva
B. Bullfrog tadpole
C. Tailed frog tadpole
D. Northwestern salamander larva
E. Giant Salamander Larva

97. List the letter(s) of these larval specimen(s) that is/are found in cold, fast-flowing streams. **C, E**
98. List 1 trait that is unique to species C in the adult stage. **Lack of eardrum, tail, large outer/5th toe, reduced webbing hind feet.**

Station L: Spotted Salamander (Ambystomatidae)

99. List the correct steps from the key to identify this specimen
100. What Superclass, order, or family is this specimen? (From the key—give the letter not the latin name.)

1B, 2B, 3B, 4B, 5A, 6B, 7B, 8B, 9A, 10B, 12B, 13B, FAMILY 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	Family F
12B	No nasolabial groove	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

BONUS Station 1

E. Baby garter snake (*Thamnophis ordinoides*, Natricidae)
F. Baby racer (Colubridae)
G. copperhead (Viperidae)
H. Baby garter snake (*Thamnophis sirtalis*, Natricidae)
I. Sea snake (Elapidae)

BONUS A. List the letter(s) of the specimen(s) (E-I), to the right, that belong to the family Colubridae. **F**

Boa/Python vertebrae

BONUS B. Give the common name of the type of vertebrate that might have vertebrae like these. **SNAKE!!**

BONUS Station 2

J. Seahorse male - brood pouch
K. Midshipman male - swollen abdomen from enlarged swim bladder for singing
L. Mud turtle (different species) female - short tail & short claws
M. Gopher snake female - no visible hemipenis
N. Torrent salamander male - enlarged cloaca
O. Fence lizard (different species) male - enlarged femoral pores
P. Chorus frog male - enlarged vocal sacs

BONUS C. List the letter(s) of the specimen(s) (J-P) that is/are females. **L, M**

BONUS Station 3

Q. Shark jaws
R. Teid Lizard skeleton (with a durophagous diet)
S. Goliath Frog skull
T. Iguana skull
U. Carp jaws (partial) (with a durophagous diet)

BONUS D. List the letter(s) of the specimen(s) (Q-U) that has/have pleurodont attachment of their teeth. **S, T**