MONTANA *Wildlife*

January, 1970, Montana Fish and Game Department Official Publication
Information-Education Division

FEATURING AMPHIBIANS

NUMBER 1 OF ANIMALS
OF MONTANA SERIES

AMPHIBIANS of MONTANA

By
Jeffery H. Black

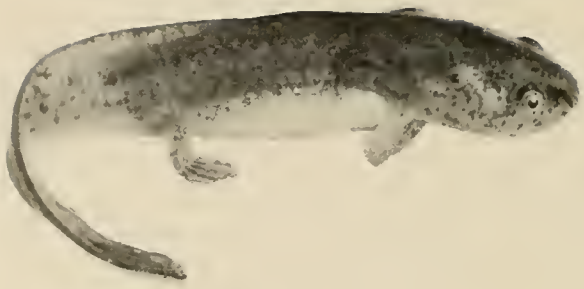
Edited By
Vernon Craig

Cover photo—Tiger Salamanders, by Vernon Craig

ABOUT THE AUTHOR

Jeffery Black is field oriented in his approach to the study of amphibians and all zoology. Over 40,000 miles were traveled in Montana while collecting information and specimens for this and other publications.

Jeffery Black is now completing his Doctorate at the University of Oklahoma. He received his Bachelor of Science from Oregon State University and worked two years on his Master of Science degree at the University of Montana, Missoula.



CONTENTS

ACKNOWLEDGMENTS

I am grateful to the many people who have assisted in collecting specimens. Roger Conant, F. R. Cook, P. C. Dumas, C. C. Carpenter, C. V. Davis, R. B. Brunson and the late Arthur N. Bragg have offered many suggestions on range maps and on sections of this publication. I also wish to thank E. D. Brodie, Roger Conant, and Isabelle Hunt Conant for the use of their photographs. Financial support of the Department of Zoology, University of Montana, and the Department of Zoology, University of Oklahoma, is gratefully acknowledged.

Amphibians

In the progressive chain of evolution, amphibians stand between the fishes and reptiles, being the first group among animals with backbones to live out of water. The word "amphibian" means dual life, and these shy, secretive creatures do exist in two very different ways during their life spans. During the first part of their lives, they are called larvae, and during this stage they must remain in the water and breathe with gills. The larvae eventually undergo changes in body structure, nearly always the gills disappear, and they are ready for the second, terrestrial stage of life.

Frogs, toads, salamanders and the wormlike caecilians make up the amphibians. Amphibians have backbones and a moist, glandular skin. There are no external scales. Two pairs of limbs are usually present. The front legs have four fingers and the hind legs usually have five toes. Two nostrils are connected with the mouth cavity. Body temperatures are not constant but vary with the temperatures of the surrounding environment. Respiration is by gills, lungs, skin, or the mouth lining. Usually a combination of these structures is used. The limbs, lungs and nostrils connecting to the mouth cavity have adapted the amphibians to life on land, but most must return to water to lay their eggs.

Amphibians differ from reptiles in several ways. Amphibians have a smooth skin, while reptiles characteristically have scales. Amphibians do not have claws like many of the reptiles. Amphibians have jelly coated eggs that are usually layed in water and hatch into gilled larvae.

Little herpetological work has been done in Montana as a whole, and most work done has been concentrated in the mountainous western part of the state. This publication includes nineteen amphibians as possibly occurring in Montana and these are representatives of the Pacific Coast, Great Plains and Canadian herpetofaunas. The occurrence of some species is considered questionable. The common names used are those suggested by the Committee on Herpetological Common Names of the American Society of Ichthyologists and Herpetologists in 1956.

Most of the information for this publication comes from collecting in Montana from September, 1965, to June, 1967. Range maps are primarily based on these collection records. Persons who discover new species, new locality records, or collect specimens of rare Montana amphibians are requested to report this information to myself at the University of Oklahoma or to the Montana Fish and Game Department. We will be happy to identify any amphibians that can not be identified by use of this publication.

THE TAILED FROGS

Montana is one of the few places in the world where there are frogs with tails. The tailed frog **(Ascaphus truei)** is the most primitive species of American frogs. It is a small frog which inhabits cold, swift, mountain streams and is one of the most water-dependent frogs in this country. It is found only in the northwestern United States and southwestern Canada. The only other relative of the tailed frog is a genus of mountain stream-inhabiting frogs in New Zealand.

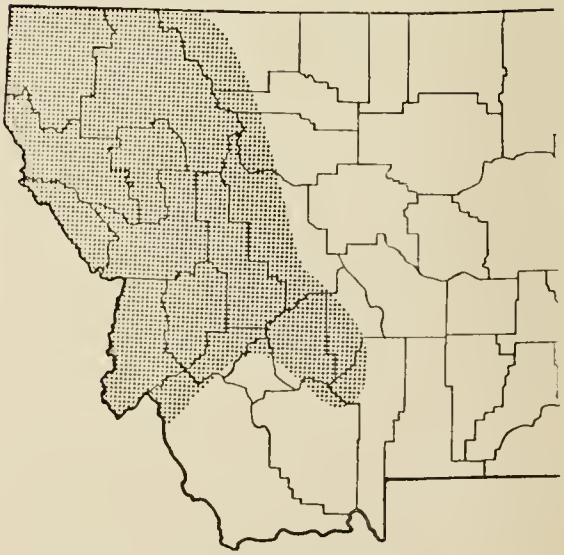
Tailed frogs get their names from the males of the species which have a tail-like extension of the cloaca that is used in mating. This is not a real "tail," even though it certainly looks like one. Two tiny tail-wagging muscles with the awesome names of pyriformis and caudalipuboischiotibiales show the descent of the tailed frog from its tailed ancestors. This "tail" is an organ for copulation and is necesary because of the habitat of the tailed frog. External fertilization would make the species vulnerable to extinction in the fast moving water where it makes its home. With external fertilization in the swift water, the sperm, as soon as it is shed, would be carried downstream before it could fertilize all the eggs of the female. Thus, nature has provided the male tailed frog with a tail so that he may fertilize the eggs of the female internally and the species is able to reproduce successfully. This is the only species of frog in which fertilization of the eggs is internal.

The tailed frog is one of the few species of frogs in the world in which the male lacks a voice with which to call its mate. Distinctions additional to the lack of voice and the mountain-stream habitat is the fact that the ear of the tailed frog is not like that of most frogs. The tailed frog lacks not only a tympanum (ear drum) but also the Eustacian tube and a stapes. Unlike all other frogs, it has short ribs attached to some of the vertebrae. The vertebrae of the tailed frogs are of the type found in the very early amphibians and reptiles. Its lungs are very much reduced. Its tongue can not be stuck out. Most amphibians have a horizontal pupil in the eye, but the tailed frogs always have vertical pupils.

A female tailed frog. Note the external characteristics and how well the frog blends with surrounding rocks. Photo by Jeff Black.

Distribution:

The tailed frogs in Montana are restricted to suitable streams within the western third of the state. Their range includes the Rocky Mountain front, many mountain ranges and intermontane valleys or basins. They are found only in cold, swift, mountain streams which usually have numerous waterfalls. Deep snow



Shaded portion of map shows range of the tailed frog in Montana.

is usually present during the winter and the streams remain cold with stable flows throughout the year.

Description:

Adult tailed frogs are only about two inches long and usually olive, brown, or gray on the back and lighter underneath. Adults have a warty appearance. The only markings on some adults consist of a black band extending from the shoulder across the eye, over the nostril, and ending on the edge of the upper jaw. On some adults, a light patch extends across the head at the level of the front half of the eyes. A light spot may angle from behind each eye toward the middle of the back. The fingers are free of webbing while the toes are slightly webbed with the outermost hind toe broader than the rest.

Habitat:

Tailed frogs are usually active only during the night. During the day, throughout most of the year, adults are found under rocks in the stream beds, under overhanging stream banks, or under rocks in small springs that enter streams. Adults seldom leave the water except on extremely rainy days. Adults and tadpoles can survive only a short time out of water.

During the winter when water temperatures may be below freezing, the tailed frogs bury themselves in the sand under large hard-to-move rocks where they remain until spring. In the spring when the streams are swollen from the spring runoff, the tailed frogs are found in quiet side pockets of streams.

Breeding:

Males develop nuptial characteristics during the summer such as horny black outgrowths on the inner side of the first finger, palms of the front feet, forearms and even on the chest. The "tail" also becomes swollen and appears engorged with blood during the actual mating which takes place in the early fall.

Egg laying does not occur concurrently with mating, but the sperm is carried by the females through the winter to the egg laying season which occurs during the following year during June and July in Montana. As the eggs are laid, they are fertilized by sperm that has been stored in the uterus. Even though the tailed frogs are only two inches long, they lay some of the largest eggs of all our frogs. Each egg is roughly one-fourth inch in diameter. The eggs are unpigmented and take approximately one month to hatch.

Underside of a male tailed frog. Note the "tail"' which is really an extension of the cloaca and used in mating. Photo by Jeff Black.

Tadpoles or larvae of tailed frogs are highly modified for life in cold swift streams. The tadpoles can secure enough oxygen in swift water to get along without external gills and these never develop. Lungs which aid in regulating their vertical position in the water are reduced. Their mouths are modified into sucker-like organs which enable the tadpoles to attach to rocks and move upstream in humping movements against the current. Tadpole tailed frogs are easily recognized by their sucker-like mouths.

Rows of minute-black teeth are found in their sucker-like mouths. There are usually three tooth rows in the upper part of the mouth and around nine tooth rows in the lower part of the mouth. The number of teeth increase with the age of the tadpole. There is a variation of tooth form in the tadpoles. Some teeth appear to be used for scraping food from the rocks, others for grinding food, and others are comb-like and may be used for assistance in attachment to rocks and movement in the swift streams.

In Montana, three age classes of tadpoles may be found at any one time of the year. Tadpoles in the first year are slim and lack appendages. During the second year, tadpoles show early development of the hind legs and have heavy bodies. Tadpoles in the third year have well developed hind legs and the front legs are present. The tadpoles transform during the third year into juveniles.

The tailed frogs, **Ascaphus truei**, with their primitive status, specialized life history and peculiar habitat are unique and interesting animals in the living world.

SPADEFOOT TOADS

The spadefoot toads of the genus **Scaphiopus**, comprise an exclusive North American group. Spadefoot toads are in the family Pelobatidae. Their taxonomic and phylogenetic relationships and the associated nomenclature are still in much confusion. Spadefoots are squat, toadlike amphibians with a single, black sharp-edged tubercle or spade on the inner side of the hind foot. This spade is used in digging into loose or sandy soil. They have prominent eyes with a vertical pupil which becomes round at night when fully dilated. The skin of a spadefoot is smooth, thin and moist, much like the skin of frogs, but the spadefoot is found on dry land and in this respect resembles the true toads.

Spadefoots are sometimes called "froads" or "trogs" since they resemble both the frogs and toads. Spadefoots are active primarily at night and are seldom seen because of their burrowing activities.

Montana definitely has one spadefoot and possibly another. Members of the plains spadefoot are found throughout eastern Montana with a few isolated populations west of the Continental Divide. Another spadefoot, **Scaphiopus hammondi intermontanus**, may enter Montana along the Yellowstone River or through breaks in the Rocky Mountains of northeastern Idaho, but their occurrence needs to be verified.

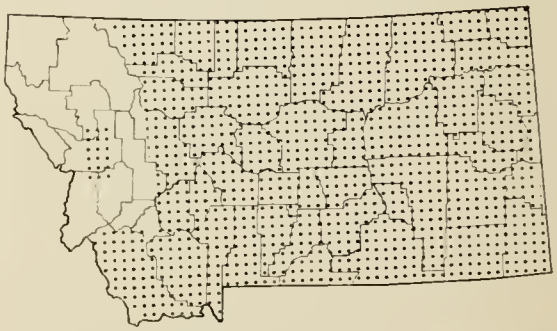
Adult Plains Spadefoot. Note the prominent eyes with vertical pupils and the squat, toadlike shape. The warty dorsum is evident. The arrow indicates the sharp spade on the hind foot. Photo by Jeff Black.

PLAINS SPADEFOOT

(Scaphiopus [Spea] bombifrons)

Distribution:

These animals are limited ecologically to drier regions and are therefore more common east of the Continental Divide throughout the plains region of Montana. A few plains spadefoots have been collected in western Montana, but they do not appear to be common and probably occur only in isolated populations. They have only been reported from Missoula County in western Montana. Plains spadefoots are seldom seen but are quite common throughout eastern Montana. They have been collected in Toole, Chouteau, Cascade, Lewis and Clark, Jefferson, Gallatin, Carbon, Big Horn, Garfield, Dawson, and Powder River Counties in eastern Montana.



Shaded portion of the map shows the range of the Plains Spadefoot in Montana.

Dorsal view of the adult Plains Spadefoot showing the prominent boss (protruding area) between the eyes. Note the warty appearance. Photo by Jeff Black.

Behavior:

The spadefoots are often called biological marvels. They spend most of their time underground and emerge only to breed or feed at night.

The spadefoots are dependent on water or moisture for their survival and the habit of digging with their black spades on the hind feet enables them to follow moisture downward and escape from drought by burrowing in the ground. They have been found as deep as 3 feet below the surface.

When handled, spadefoots often emit a sticky secretion with an odor. Some people find themselves allergic to this secretion and sneezing, coughing and rashes may result from handling a spadefoot. One should never rub the eyes or face after handling spadefoots.

Description:

The plains spadefoot is 1 1/2 - 2 1/4 inches in snout-vent length. A single, sharp, black spade on each hind foot, a prominent boss between the eyes, small teeth in the upper jaw and the presence of a vertical pupil in the eye will usually distinguish the plains spadefoot. This is a gray to brown animal, often with irregularly placed red spots and darker spotting or mottling on the back, commonly also with light streaks. Small tubercles on the dorsum may be reddish. The plains spadefoot in Montana is quite finely warted in comparison to this same species from Oklahoma, New Mexico, Texas and Kansas. The venter is whitish except in males which have dusky throats and dark pads on fingers.

Habitat:

The plains spadefoots are primarily found in the plains region of eastern Montana which is characterized by rolling shortgrass prairie dissected by several large rivers and small intermittent streams. This region is largely non-forested and a region of low rainfall. The plains spadefoots prefer loose, sandy or gravelly soil suitable for burrowing. In western Montana they are found at lower elevations and inhabit those drier regions with suitable soils.

Breeding:

There is typically no breeding season among spadefoots, but most breeding seems to occur during June and July in Montana. Their breeding activities are geared to rainfall. They seldom emerge for breeding except following heavy rains of one inch or more associated with thunderstorm activity and warm temperatures. Breeding occurs primarily in temporary pools which form during the rain.

Usually the first to arrive at the pools are males. The calls of the males are quite loud and to some sound like "Waah" or "Waac." They are not easily mistaken for any other calls. The sound of a spadefoot chorus will carry for over a mile. Males usually swim or float when calling. Most breeding activity occurs at night, but several groups of calling males were found at mid-day in northern Montana.

The eggs are laid in small masses attached to vegetation, often several inches below the water surface. Eggs hatch in 1 to 2 days.

The plains spadefoots have cannibalistic and non-cannibalistic tadpoles. Cannibalistic

Juvenile Plains Spadefoot. Note the remnant of a tail in this juvenile which has just recently metamorphosed. Photo by Jeff Black.

tadpoles are larger and have modified mouthparts. Non-cannibalistic tadpoles frequently form feeding aggregations.

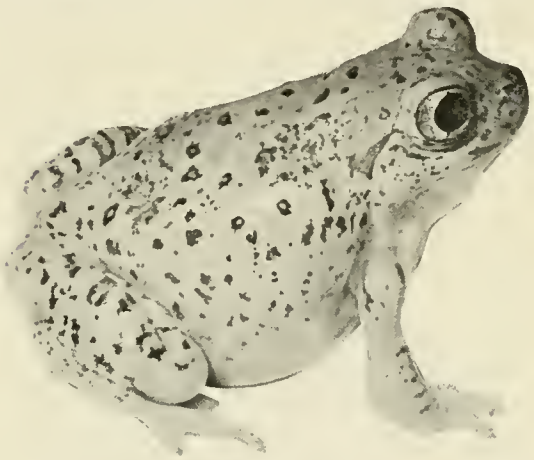
Tadpoles metamorphose in from three weeks to a month after hatching. Spadefoot tadpoles have a normal rate of development much faster than any other tadpoles known in Montana.

GREAT BASIN SPADEFOOT

(Scaphiopus [Spea] hammondi intermontanus)

Distribution:

There are several records of the Great Basin spadefoot from southern Montana but their occurrence needs to be verified. They may enter Montana along the Yellowstone River or through breaks in the Rocky Mountains of northeastern Idaho.



This is not the Great Basin Spadefoot, but the similar Hammond's Spadefoot. The Great Basin Spadefoot has a glandular boss between the eyes while the Hammond's Spadefoot shown does not have this boss. Photo by Isabelle Hunt Conant.

Description:

The Great Basin spadefoot differs from the plains spadefoot in having a glandular boss between the eyes. The plains spadefoot has a hard boss between the eyes that is underlain with bone. The dorsal surface of the Great Basin spadefoot is gray with dark markings. A vertical pupil is present and the spade on the hind foot is wedge shaped.

Habitat:

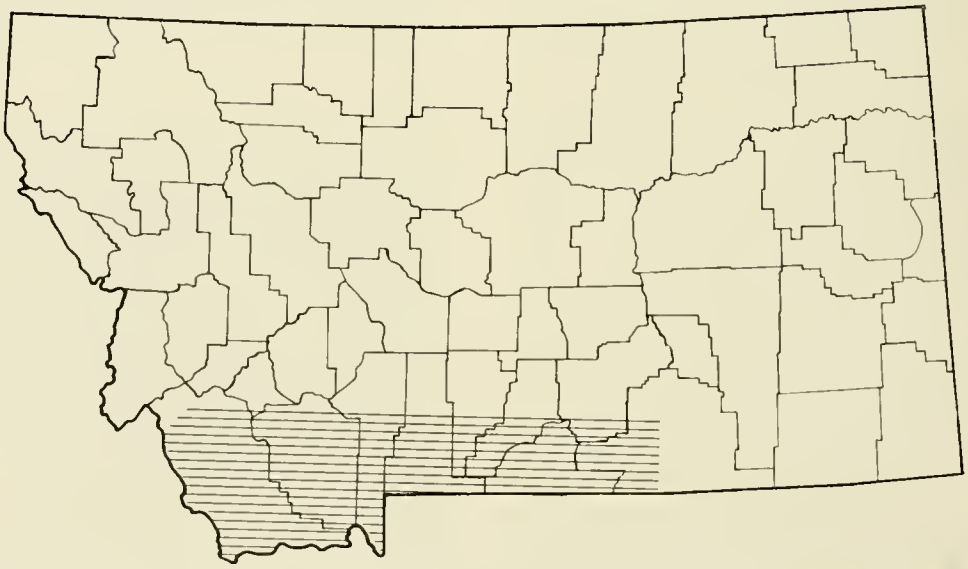
Nothing is known of the habitat of these spadefoots in Montana. In other localities they are found from sagebrush areas and the shortgrass prairie to higher elevations where spruce and fir occur.

Breeding:

There is no definite breeding season. Breeding can occur after heavy rains and adults use permanent and temporary water for breeding.

Behavior:

This spadefoot is active primarily at night and is very secretive. It spends most of its time underground.



Shaded portion of the map shows the probable range of the Great Basin Spadefoot in Montana.

TOADS

Western Toad. Photo by Jeff Black.

Precious jewels catching warts, and cows giving bloody milk are just a few of the superstitions associated with the warty toad in the folklore of America.

The cause and effect relationship between toads and warts is traditional. Probably every boy and girl has heard that if one takes a toad in his hands, that he will "catch the warts." This is not true and is probably the most famous and erroneous belief associated with toads. Even Tom Sawyer told Huckleberry Finn that warts on the hands are the price that one pays for handling toads, and the only way to get rid of warts was to repeat the magic words:

> "Barley corn, barley corn, Injun meal shorts,
> Spunk water, spunk water, swaller these warts."

At one time it was a common belief in the country that if one killed a toad, his cows would give bloody milk. Another superstition taught that the toad possessed a "precious jewel" in its head. This jewel could be worn as a talisman to ward off evil, but it is not known which part of the toad's head was used.

All Montana toads are able to secrete a substance which may cause irritation if it gets around the eyes and mouth. This secretion from glands in the skin, offers protection for toads from predators, and will also be given off if handled roughly by humans. The fact that dogs and cats often become sick from mouthing toads, leaves no doubt that the secretion is quite toxic. The toxic secretion seems to have no effect on garter snakes or the hog-nosed snake which depend on young toads as a source of food.

The warty toads are readily recognized by most people in Montana. Toads are plump, have dry warty skins and are less streamlined than frogs. Toads give short clumsy hops, while frogs are agile jumpers.

Toads must return to water to breed, and their eggs must be laid in water if they are to develop. Breeding usually occurs in the spring, depending upon rain and/or temperature. The eggs are laid in strings of transparent jelly-like material containing a large number of small black eggs. The eggs hatch into tadpoles or pollywogs. As the tadpole grows, tiny legs develop, gills are replaced by lungs, and the tail is gradually absorbed into

the tadpoles' bodies and used for nourishment. Later the tadpoles undergo certain changes which enable them to leave the water, now able to survive on land.

Toads depend almost entirely upon their tongues for catching food. The tongue is attached at the front end, but free at its back end. When an insect is spotted, it flicks out its tongue, which is covered by a sticky substance, and the insect is captured.

There have been sufficient studies of the food habits of toads, to indicate they are economically important. An authority has estimated that in three months a toad, under normal circumstances, will consume approximately ten-thousand insects. The value of Montana toads is in the service they perform in pest control through their feeding habits. The values are enhanced in eastern Montana, not only by their feeding habits, but their presence in numbers tends to keep the ground mulched through their burrowing activities.

A KEY TO THE TOADS OF MONTANA

Body with no covering of scales or bony, leathery armor; without tail; pupil of eye horizontal when contracted; skin warty and rather dry; parotoid glands present ..... **True Toad**

1A. Parotoid glands and interorbital crests present **2**

1B. Parotoid glands present; interorbital crests not present ..... **Bufo boreas**

2A. Interorbital crests parallel and connected at rear margins; with or without a central groove; postorbital crests incomplete or lacking; ventral surface with numerous black spots ..... **Bufo hemiophrys**

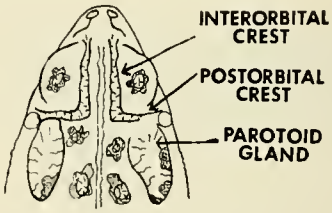
2B. Interorbital crests distinct and separated at posterior margins; postorbital crests complete **3**

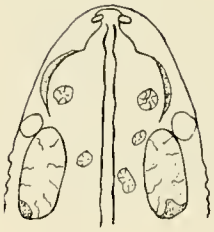
3A. Interorbital crests that diverge and are usually well separated at posterior margins and extend diagonally forward to form a V with a bony elevation between and behind the nostrils, venter unspotted ..... **Bufo cognatus**

3B. Interorbital crests nearly parallel; parotoids in contact with postorbital crests; venter unspotted or with a single chest spot ..... **Bufo woodhousei**

The true toad family, Bufonidae, is world wide in distribution. Montana contains four species of the family. Telling these four species apart is very difficult and one must check the cranial crests between the eyes, the parotoid glands, the prominence of warts, and coloration and patterns.

A key is included in this paper to aid in the identification of unknown toads. The key is made of couplets, which are numbered on the left. Each couplet is a pair of alternatives, one of which will describe the unknown toad. Choose the half of the couplet, starting with 1A, which describes your specimen. At the end of the couplet is a name or number. If the couplet ends in a number, refer to the couplet bearing that number and continue until the half couplet ends in a name; that is the name of the unknown specimen. Drawings are included and show some of the characteristics mentioned in the key. The numbers beneath the drawings are the same as those of the half-couplet which they illustrate. Try it, it's not complicated.




1B


1A, 2A


1A, 2B, 3B


1A, 2B, 3A

The above illustrations show identifying characters and are to be used with the accompanying key.

WESTERN TOAD
(Bufo boreas boreas)

Distribution:

The western toad is found in all of western Montana and ranges east to the flat and rolling prairie. It is found in all counties west of the Continental Divide and as far east as Chouteau, Judith Basin, Wheatland, Golden Valley, Stillwater and Carbon counties. It may also occur on the isolated low mountain groups such as the Little Rockies, Highwoods. Bearpaws, Judiths and Big Snowys. It will not be found in the flat and rolling plains which surround the isolated mountain groups. This toad exhibits remarkable versatility in its choice of habitat.

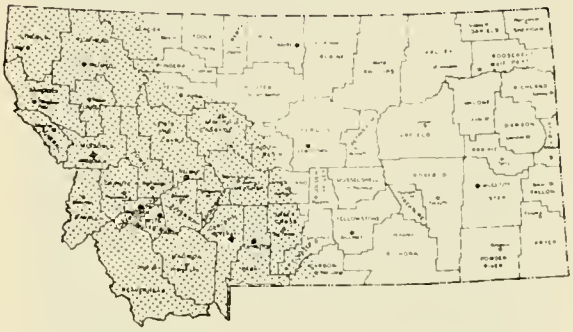
Description:

The average snout-vent length for adults is 2-5 inches. The complete lack of supraorbital and postorbital crests will usually identify this toad. The general dorsal color is light gray or greenish to a dull black. Numerous black pitted warts cover the dorsal surface. These warts are usually light brown with small black pits and may be set in a black spot. The warts are larger than those found on other species in Montana. The vertebral stripe is white and usually continuous from behind the nares to the anus, but may be broken. Parotoid glands are oval, distinct and smooth. The interparotoid distance is greater than the width of the parotoid glands. Each eyelid usually contains one large wart. Sole tubercles are light brown and have no cutting edge. A well-developed fold of skin is on the tarsus from the inner sole tubercle to the heel. There is usually a large wart on the tibia. The venter is usually whitish with varying amounts of dark spotting. Variation in the typical western toad is found at high elevations in Glacier National Park. The size is smaller and the interparotoid distance is usually the same as or less than the width of the parotoid glands. The dorsal warts are large and each is set in a dark blotch. The vertebral stripe is not continuous, but broken by black blotches or warts. Females of the western toad are usually larger and heavier than males. Males also have nuptial pads on the thumb and inner fingers during the breeding season. Males do not have the dark throat that is found in other toads of Montana.

Breeding:

In Montana most breeding occurs from March to June, depending upon the temperatures. These toads exercise little discrimination in selection of their breeding sites. Any body of water without a strong current fulfills the qualifications. Breeding has been observed in pools of water along the Bitterroot River, springs, glacial ponds and marshy areas. Females may lay as many as 16,500 eggs.

Western Toad—Note the large warts on the back surface and the large wart on the tibia. Interorbital and postorbital crests are not present in this species. Photo by Jeff Black.



Shaded area on the map shows general distribution of the Western Toad in Montana.

Behavior:

The preferred habitat of the western toad seems to be moist areas near water. They are especially numerous around bodies of water such as lakes, glacial ponds, mountain streams, springs and along rivers. Adults have also been found in moist meadows and thickets up to 9,500 feet of elevation. The western toad is common around human habitations in western Montana where it is found in gardens, yards, and even window boxes.

Behavior:

When disturbed the adults of the western toad try to escape, but their short hops are very slow. When not disturbed, individuals usually walk. This toad is active at night and is occasionally found during the day. During the daytime, it seeks shelter under logs, boards, rocks and even under old car bodies. In breeding ponds, males are usually found with their front feet on the bank, logs or rocks along the edge of the pond. During the breeding season, or when handled, males usually utter a series of soft chirping sounds. The females do not chirp.

DAKOTA TOAD
(Bufo hemiophrys)

Distribution:

Distribution includes northern Montana in parts of Glacier, Toole, Liberty, Hill, Blaine, Phillips and Valley counties; throughout Daniels and Sheridan counties and with a southern Montana limit in Roosevelt county where it enters North Dakota. The range of the Dakota toad in Montana lies within the area formerly covered with the Laurentide Ice Sheet.

Description:

The average snout-vent length is 2-3 inches for adults. The dorsal color is brown to white with many brown warts. Most of the warts are set in black spots. A cream or white vertebral stripe is prominent from the interorbital crests to the anus. The parotoid glands are long and not greatly elevated above the dorsal surface. Each eyelid contains a black bar or spot which may have one or more brown warts. The interorbital crests may form a solid "boss" on the head, but there is usually a well developed groove between the parallel interorbital crests. The interorbital crests are nearly always joined across their posterior edges. Postorbital crests are weakly developed or absent. The legs and feet contain black spots or bars over their total length. The tibia is covered with spiny warts. Both sole tubercles have a free cutting edge; the inner large, the outer small. The ventral surface is light brown to white with numerous black spots of various sizes. Males can usually be distinguished from females by their dark colored throats and nuptial pads on the thumbs and inner fingers during the breeding season.

Breeding:

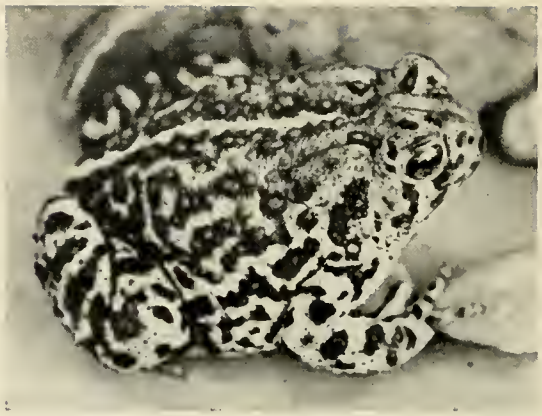
The Dakota toad probably starts breeding from late April to early June in Montana, with the peak time starting with the first good rain.

Habitat:

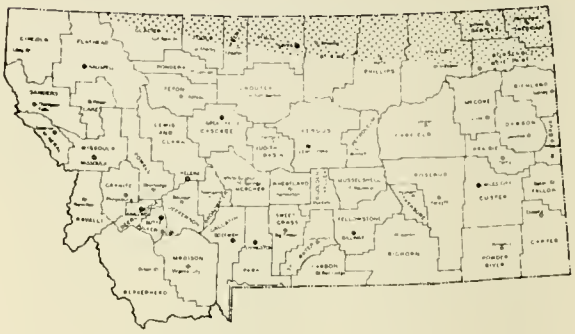
After the breeding period in Montana, adults will be encountered most frequently along pond margins throughout their season of activity. They seem to prefer ponds with relatively stable water level surrounded by sedges and bulrushes, among which they feed. Their distribution in Montana lies in the short grass prairie or undifferentiated grassland.

Behavior:

When frightened this toad may swim well out from shore or run through the sedges and bulrushes. The Dakota toad begins hibernation in late August or September by moving to slight rises in ground level where they burrow to spend the winter. It has been shown in Minnesota that these toads burrow during the winter just enough to keep ahead of the frost line in the soil and follow the frost line back up for spring emergence.



Dakota Toad — Note the lack of postorbital crests. Other general characteristics are typical of the species. Shaded portion of the map shows general distribution in Montana. Photo by Jeff Black.



GREAT PLAINS TOAD
(Bufo cognatus)

Distribution:

The Great Plains toad has an extensive distribution in the short grass prairie of eastern Montana. Its western Montana limit is in Glacier, Pondera, Teton, Cascade, Judith Basin, Wheatland, Sweet Grass, Stillwater and Carbon counties. The lack of collection records in northeastern Montana is bounded by a lack of records to the north in southeastern Saskatchewan and extreme northwestern North Dakota. This does not mean the species does not occur in this area, but merely shows where collectors have not been at the right time.

Description:

The average snout-vent length in adults is 2-4 inches. The dorsal color is gray to light brown. Well-defined dark blotches, usually in symmetrical pairs, are sharply outlined on the back. These are usually on either side of a faint vertebral stripe. The dark blotches contain many small warts and may be outlined with a narrow white line. All warts are small. The interorbital and postorbital crests are well developed. The interorbital crests are divergent and separated at their posterior margins and extend diagonally forward to form a V with a bony elevation between and behind the nares. Postorbital crests are complete and touch the parotoids. The parotoid glands are obvious, oval in shape and set wide apart. The sole tubercles each have a cutting edge. Toes are dark tipped. The venter is light and unspotted. Females usually exceed the males in size. Males have a vocal sac which forms a black apron on the throat which is partly concealed by a flap of light skin.

Breeding:

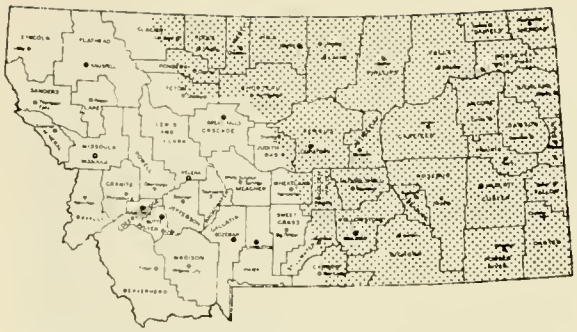
Breeding occurs only after rain during the months of April through August if the temperatures are not too low. This is a species which characteristically breeds only in clear, shallow pools. Breeding can occur in artificial cattle ponds, flooded shallow fields, shallow ditches or any temporary rain-formed pool on the short grass prairie. The Great Plains toad has been found to be quite restricted in its selection of breeding places. Eggs are deposited in two continuous strings wound around plants on the bottom of the pool. A female may produce about 20,000 eggs.

Habitat:

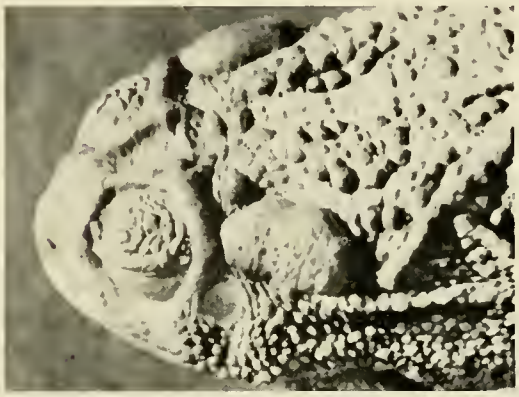
The Great Plains toad in Montana seems to prefer the higher portions of the short grass prairie. It is found in agricultural lands, along irrigation ditches, and in the floodplains of streams and rivers. This toad's habitat is usually the short grass prairie, but it also occurs in the eastern Montana pine forests and savannah, and the foothill grasslands and sagebrush.

Behavior:

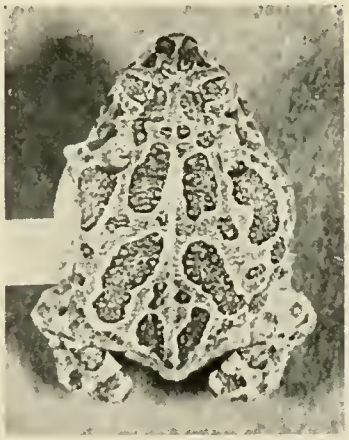
This species is normally active only at night. During the day it spends much of its time underground in a shallow burrow it digs with the sole tubercles on the hind feet. These burrows are only deep enough for the body of the toad to fit in the burrow with the dorsal surface flush with the surface of the ground. Males of the species too, utter a series of soft chirping sounds when handled. The females do not chirp.



Shaded area indicates range of the Great Plains Toad in Montana.



Head view of the Great Plains Toad. Note the divergent interorbital crests which form a V with the bony elevation between and behind the nostrils. Photo by Jeff Black.



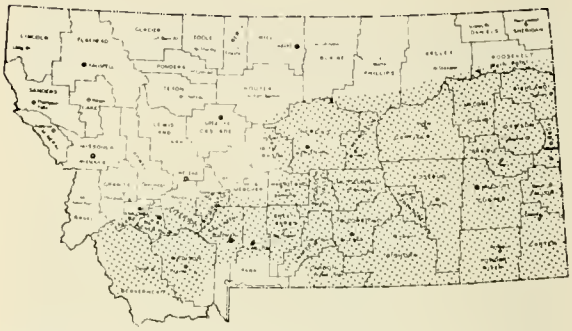
Back view of the Great Plains Toad. Note the well defined dark blotches in symmetrical pairs on the back. Photo by Jeff Black.

ROCKY MOUNTAIN TOAD
(Bufo woodhousei woodhousei)

Distribution:

The range of the Rocky Mountain toad in Montana lies east and south of the Continental Divide. Its northern boundary appears to be slightly north of the Missouri River where it enters Roosevelt, Valley, Phillips, Blaine and Chouteau counties. Its range then goes south and west to Gallatin County where its range may continue to the Idaho border. South of the Missouri River, it is found in all counties to the Wyoming border. It is probably the most versatile and wide ranging of Montana toads in its distribution.

Rocky Mountain Toad—The general characteristics are typical of the species. Shaded portion of the map shows general distribution in Montana. Photo by Jeff Black.



Description:

The average snout-vent length for adults is 2-3½ inches. The dorsal color is brown or olive green and some are light gray. Small light brown warts cover the dorsal surface. Warts are often set in small black spots which may be ringed with a narrow white line. These black spots usually contain only one or two warts, but they may be larger and contain many warts. The vertebral stripe is white and continuous from behind the interorbital crests to the anus. The parotoid glands are long, narrow and elevated. There is a black or white spot on each eyelid with one or two warts. The interorbital crests are prominent and parallel or nearly so. The postorbital crests are well developed and in contact with the parotoid glands. Sole tubercles are brown and the inner has a sharpened edge. Toes are dark brown tipped. The ventral surface is unspotted except for a single black chest spot, but this is often broken up into two, three or a cluster of smaller spots. The chest spot is not always present. Young toads are spotted dorsally in two colors on a grayish background. The larger spots are dark colored, while the smaller are tiny and red. Males can be distinguished from females by their dark throats and nuptial pads on the thumbs and inner fingers during the breeding season.

Head view of the Rocky Mountain Toad (left)—Note the nearly parallel interorbital crests and well developed postorbital crests that touch the parotids.

Head view of the Dakota Toad (right) shows the parallel interorbital crests connected at their rear margins. Photo by Jeff Black.

Breeding:

The Rocky Mountain toads start breeding after spring and summer rains, if the temperature is not too low. Breeding can occur from late April to August with breeding activities staggered throughout the summer. These toads breed in a great variety of places such as farm ponds, ditches, flooded fields, backwashes of streams and probably use isolated pools in dry creek beds for late breeding. A female may produce as many as 25,-644 eggs of one or two rows in a long string.

Habitat:

This species is the common toad in the floodplains of the Missouri and Yellowstone Rivers west to the Gallatin River. The vegetation habitat in eastern Montana includes short grass prairie, sagebrush, and stream bottoms, with most being found in the short grass prairie bordering the larger rivers and their tributaries. In the Gallatin Range near Bozeman, its habitat is unique for the species, where it is found in the forests at elevations of 7,000 feet. In habitat, the Rocky Mountain toad is the most versatile toad in the state.

Behavior:

Young of the Rocky Mountain toad are active during the day, but with increasing age tend to feed later at night. Adults were found to be common under streetlights where they find a source of insect food attracted to the light. These toads are also common occupants of many gardens in eastern Montana.

TREE FROGS AND CHORUS FROGS

People of eastern Montana are probably aware of members of this group. Every pond, swamp and temporary pool of eastern areas comes to life with the sounds of the tiny chorus frogs in the spring. People of western Montana may hear the sounds of Pacific tree-frogs, another member of this group, during the late spring.

The treefrogs and chorus frogs are members of the family Hylidae which is world wide in distribution. There are three genera of this family in the United States, but Montana contains only two, **Hyla** and **Pseudacris**. All frogs in this group have in common terminal discs or pads on the toes. These toe pads are pronounced in the treefrogs but very small in the chorus frogs. Webbing between the toes is clearly evident in the treefrogs, but not so pronounced in the chorus frogs. Males of both genera have dark throats. The presence of toe pads and small size should help identify these frogs in Montana.

PACIFIC TREEFROG
(Hyla regilla)

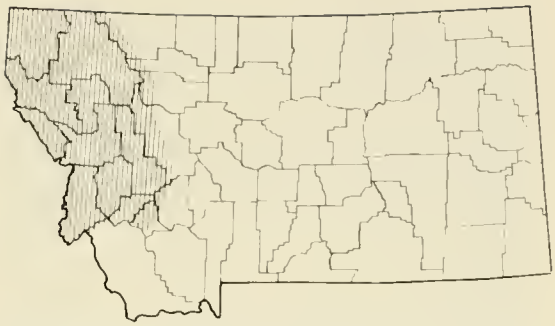
Distribution:

Pacific treefrogs are found primarily west of the Continental Divide. There are some records of their occurrence on the east side of the Continental Divide, but this species does not enter the short-grass prairie of eastern Montana. They range east to Glacier, Pondera, Teton, Lewis and Clark, and Jefferson counties, with a questionable record in Gallatin County. Their southern range limit appears to be in Beaverhead, Deer Lodge and Silver Bow counties.

Adult male Pacific Treefrog—Note the small size in comparison to the thumb upon which it is sitting. The conspicuous eye stripe from the nostril to the shoulder is evident. Also note the dark patches on the dorsal surface. Photo by Jeff Black.

Description:

These are frogs with prominent toe pads and large eyes. The large pads on the fingers and toes easily separate these frogs from others in Montana. Adults are usually 1¼ to 2 inches in snout-vent length. A conspicuous eye stripe extends from the nostril to the shoulder. Triangular, Y-shaped or barred dark marks are usually present on the head. The dorsal surface is usually spotted with dark patches which also occur on the legs. The ground color may be green, brown or gray. The hind toes are webbed. The venter is unspotted and whitish or pale yellow except in sexually mature males which have dusky throats. Females are larger than males.



Shaded portion of the map shows the range of the Pacific Treefrog in Montana.

A population containing many juvenile Pacific treefrogs with extra hind limbs was reported by Hebard and Brunson (Copeia, 1963) near Polson, Montana.

Habitat:

The common name of this species suggests that they are usually found in trees, but Pacific treefrogs are usually found on the ground. They use rotten logs, vegetation along streams, rock crevices, squirrel burrows and cracks in buildings as shelters. They are frequently found along ponds, springs, streams, ditches and lakes. They occur from high to low elevations in Montana.

Breeding:

Breeding takes place from May to July with eggs deposited in shallow water. Breeding occurs in lakes, ponds, ditches, pools and slow moving streams. The call of the male is a "kreek-ek" in rapid sequence.

Behavior:

Pacific treefrogs are largely nocturnal, but are frequently found active during the daytime in Montana. These frogs can change color from light to dark in a short time.

SPOTTED CHORUS FROG
(Pseudacris clarki)

Distribution:

Spotted chorus frogs were not known to occur in Montana until 1967. Adults of this species were collected near Fort Benton, Chouteau County, Montana. Only one collection site of **P. clarki** was found in eastern Montana. This appears to be an isolated population of spotted chorus frogs, probably introduced by man.

Description:

These are small frogs reaching 1½ inches in snout-vent length. The dorsum has green patches rimmed with black. There is almost always a triangle between the eyes. There are two dorsal patterns, the most common of which is spotted. The spots are normally scattered and not arranged in rows. Longitudinal stripes are occasionally present. Green markings and a triangle between the eyes will usually separate the spotted chorus frogs from the boreal chorus frogs. The venter is white except for a dark throat in sexually mature males. Toes are only slightly webbed.

Habitat:

The spotted chorus frogs are typically grassland species. They have been collected in Montana only during the breeding season in ponds near Fort Benton. Other populations of this frog may occur in the grasslands of eastern Montana.

Breeding:

Rainfall seems to be necessary for the initiation of breeding. Breeding sites are in temporary, typically grassy, shallow pools. The typical call of the breeding male is a rapidly repeated, short, single note.

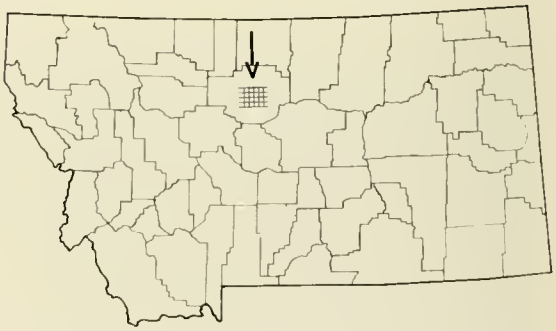
Eggs are produced in small masses on grass and other vegetation near the surface. Tadpoles hatch in two to three days.

Behavior:

This species is inactive during dry weather, and normally active only at night or in early evening.

Adult Spotted Chorus Frog. Note the spotted dorsal pattern and the triangle between the eyes. Also note the lack of webbing between the toes. Photo by Jeff Black.

Shaded portion of the map shows range of the Spotted Chorus Frog in Montana.



BOREAL CHORUS FROG
(Pseudacris triseriata maculata)

Distribution:

The range of the boreal chorus frogs in Montana lies east and south of the Continental Divide. They are wide ranging frogs in eastern Montana and have been collected in practically every county.

Description:

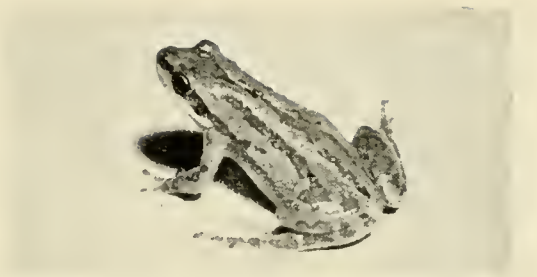
This is a frog with short legs and about ¾ to 1¼ inches in snout-vent length. The dorsal color is highly variable and may be brown, green, gray or olive. There are usually 3 dark stripes on the back which may break up into rows or spots. The venter is unmarked, except for a dark throat in sexually mature males. Toes are only slightly webbed.

Habitat:

Boreal chorus frogs are found near lakes, ponds, pools, and swampy areas in eastern Montana.

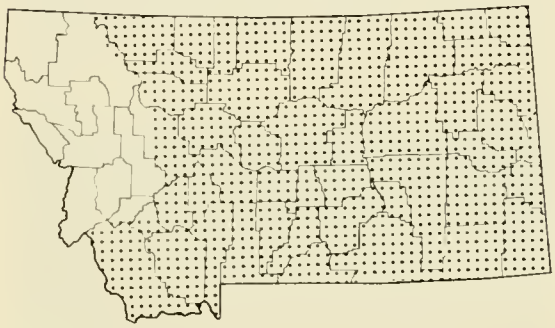
Breeding:

Most breeding in Montana occurs from May to June. The typical call of breeding males is a regularly repeated "prreep, prreep." Eggs are loose clusters attached to vegetation.



Boreal Chorus Frog—Note the dark stripes on the back. Photo by Isabelle Hunt Conant.

Shaded portion of the map shows range of the Boreal Chorus Frog in Montana.



Behavior:

These are terrestrial frogs and individuals are occasionally found active during the day in wet areas of eastern Montana.

TRUE FROGS

The family Ranidae in North America is represented only by the genus **Rana.** Montana has three and possibly a fourth species of this genus. This group of true frogs includes many of the most familiar amphibians. These frogs have relatively smooth skin, are long-legged, and have webbed hind feet. The pupils of the eyes are horizontal or oval. Eardrums are usually distinct.

The leopard frogs, spotted frogs and bullfrogs of the true frog group are present in Montana and will be discussed in some detail. The wood frogs, **Rana sylvatica**, have been reported from northern Montana but their occurrence needs to be verified. These frogs are brown above with a distinctive brown patch on their "shoulders" just behind the eyes and covering the tympanums or eardrums. The true frogs of Montana are rather distinctive and a key will not be needed for their identification.

BULLFROG
(Rana catesbeiana)

The bullfrogs **(Rana catesbeiana)** are the largest frogs in the United States and are by far the most famous of the frog leg species. They are also well known for their jumping ability in frog jumping contests and the "Frog Olympics" in California. They get their name from the deep calls of the males which to some people resemble the bellowing of a bull. Because of their eatable legs, the bullfrogs have been introduced and are established in virtually every part of the United States. They are protected by law in some states.

Distribution:

Bullfrogs were not reported from Montana until 1968 and were supposedly introduced into the Bitterroot Valley of western Montana about 1920. They appear to be presently restricted to ponds along the Bitterroot

River from south of Hamilton, Ravalli County, north to Florence, Ravalli County, though transplants to other areas are suspected. Eggs of bullfrogs have also been collected in a large pond, four miles south of Plains, Sanders County. These frogs are to be expected in any permanent water in Montana and are probably present in many parts of the state.

Description:

The bullfrogs are our largest frogs and may attain a maximum snout-to-vent length of about eight inches. They are plain or nearly plain green above, or with some gray or brown markings on a green background. The skin may be roughened with small tubercles. The venter is whitish and may have a yellowish wash, especially on the throats of adult males. Bullfrogs have short dorsal folds which begin on the head and bend downward just behind the ear. The ears are twice as large as the eyes in males and the first finger may be short and swollen in breeding males.

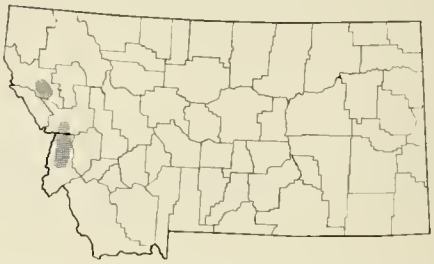
Tadpoles of the bullfrog are very large and may attain a total length of six or seven inches. The dorsal surface of the tadpole body is greenish-olive and is distinctive in having the whole dorsal and lateral surfaces including those of the tail and body dotted with small circular dark spots.

Breeding:

During the breeding season, adult males may establish breeding territories which they actively defend from other males by aggressive behavior. These territories probably increase the male bullfrogs' chances of successful mating. The voice of the male is well-developed and is deep pitched, hoarse, and bellowing.

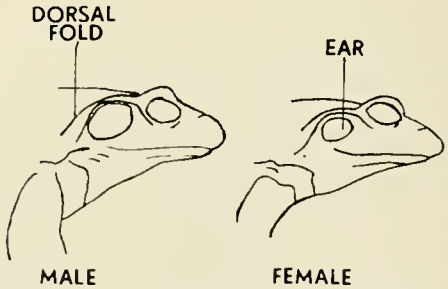
In Montana most breeding occurs from April to July, depending upon the temperatures. The eggs are typically laid in large floating rafts in quiet water and hatch in about four or five days according to temperature. The tadpole stage may last for three years and sexual maturity is reached at an age of four or five years. Bullfrogs have been known to live for 16 years.

Note the large size and numerous circular spots on this bullfrog tadpole. The numerous circular spots will distinguish this tadpole from those of other species. Photo by Jeff Black.



The shaded area on the map shows the probable range of the bullfrog in Montana, though they are likely to be found in other areas also.

This is an adult bullfrog. Note the short dorsal fold which begins on the head and bends downward just behind the ear. Photo by Jeff Black.



These drawings of male and female bullfrog heads show the difference in size of the ears according to sex of the frog. Note the dorsal fold which helps identify this species.

Habitat:

Bullfrogs prefer deeper water and within their range are common in larger streams, rivers, ponds, lakes and swamps. They are closely restricted to water. They are good swimmers and jumpers with adults covering 4 to 6 feet at a leap. One only has to try and catch a bullfrog to find that these abilities are not exaggerated. Adults and tadpoles hibernate during the winter, but tadpoles are often killed in Montana when the water freezes for some length of time.

Behavior:

The bullfrogs are well known for their apparent readiness to eat whatever they can get. They have been described as voracious, omnivorous and carnivorous. They are known to eat anything from small fish to birds and any other animals that are small enough to be captured and swallowed.

The bullfrogs appear to be having an effect on populations of leopard frogs **(Rana pipiens)** and spotted frogs **(Rana pretiosa)** in the Bitterroot Valley. Nearly all suitable ponds are now occupied solely by bullfrogs. Mild winters enable the bullfrogs to extend their range and occupy the habitat of the other frogs. Because of this competition in parts of the Valley, the leopard frogs seem to be disappearing, while the spotted frogs are still occupying permanent water at higher elevations.

LEOPARD FROG
(Rana pipiens)

Distribution:

Leopard frogs have been collected in practically every county in Montana. They appear to be absent only in parts of Glacier National Park and other high mountains of western Montana. Leopard frogs are found in many parts of western Montana, but are primarily limited to the lower valleys and not commonly above 5,000 feet of elevation where the spotted frogs are common. In eastern Montana they are the most plentiful frogs near any permanent water.

Description:

The average snout-vent length for adults is 2-5 inches. Their dorsal pattern is oval and rounded olive-green, brown, or black spots outlined with pale borders. The dorsal color can be greenish, brownish, or grayish, with rare individuals having a blue dorsal color. There is a well-defined light raised stripe (dorsolateral fold) extending backward from each eye. A white stripe is on the upper jaw. The venter is cream or yellowish. Legs are barred with bands. Males have vocal sacs between the shoulder and the tympanum and during the breeding season males have enlarged first fingers with pads on the inner side.

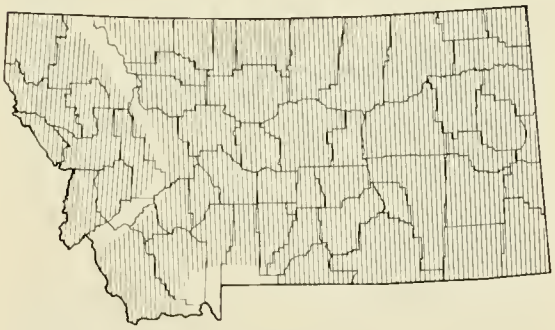
Habitat:

Leopard frogs are versatile in choice of habitats. They have been collected crossing highways at night, under wooden shelves along the Missouri River and under rocks. They are more commonly observed along the edges or in farm ponds, rivers, lakes, springs, creeks, and temporary pools. They will feed far from water in damp meadows.

Breeding:

In Montana most breeding occurs from late April to August. This is a highly adaptable species in choice of breeding sites. All types of water are used for breeding. Male leopard frogs have mating and release calls associated with the breeding season. The mating call is usually described as a "chuckle."

Adult Leopard Frog. Note the dorsal spots outlined with pale borders and the well defined dorsolateral fold. Photo by Jeff Black.



Shaded portion of the map shows range of the Leopard Frog in Montana.

Behavior:

Leopard frogs can jump 20-44 inches at a leap and often give a squawk or warning call as they jump into the water. Hibernation occurs in the winter beneath objects at the bottoms of pools and leopard frogs may hibernate in aggregations. These frogs are protected by law in some states.

SPOTTED FROG
(Rana pretiosa)

Distribution:

Spotted frogs are found in all of western Montana and range east to the short-grass prairie of the plains region. This species is closely restricted to water and is the only **Rana** found throughout Glacier National Park and the other high mountains of western Montana. The Highwood Mountains, an isolated range of peaks in central Montana, contain populations of spotted frogs in habitats ecologically similar to the normal spotted frog habitat in western Montana. Spotted frogs range as far east as Glacier, Teton, Pondera, Chouteau, Judith Basin, Wheatland, Sweet Grass, Stillwater, and Carbon counties.

Description:

The average snout-vent length in adults is 2-5 inches. The skin is often smooth, but usually covered with small rounded tubercles on the dorsal surface. The dorsal surface is light to dark brown with varying numbers of spots. Spots have indistinct borders and generally light centers. Eyes are directed upward and there is a light-colored jaw stripe. The venter may be spotted and adults usually have orange to red color on the ventral surface. The limbs have crossbars. Males are smaller than females and have enlarged first fingers.

Habitat:

The preferred habitat of spotted frogs seems to be permanent water. This is a highly aquatic species. These frogs are especially numerous around high mountain lakes, streams and ponds and other such bodies of water at lower elevations. They are occasionally found near or in rivers and some large temporary pools.

Spotted frogs and leopard frogs are occasionally found together in western Montana. Mixed populations have been found in Lincoln, Ravalli, Sanders and Flathead counties. Spotted frogs are usually found on the level swampy areas of the ponds, while leopard frogs occupy the steep grassy banks near deep water in the ponds.

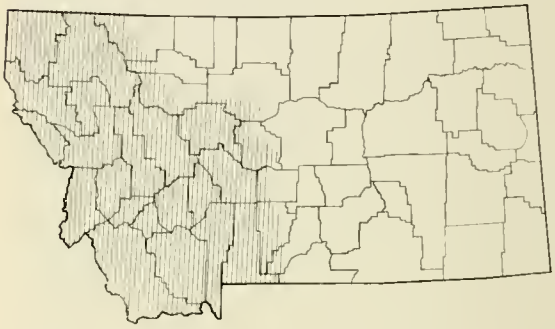
Breeding:

In Montana most breeding occurs from early April to May at lower elevations and in June at higher elevations. Males enter the breeding ponds in March at low elevations and have been collected in ice-covered water. Groups of 15 to 20 males congregate at these sites and await the arrival of the females.

During the breeding season males attempt to clasp each other and this results in a chorus of release calls which can be heard for some distance.

Adult Spotted Frog. Note the light colored jaw stripe and tubercles on the dorsal surface. Photo by Jeff Black.

Shaded portion of the map shows range of the Spotted Frog in Montana.



Eggs are usually laid in clumps and near the edges of pools or ponds and may be attached to vegetation. Eggs hatch in about four days.

Tadpoles metamorphose in July to August. Metamorphosing tadpoles were collected on 15 August 1966, on Lolo Pass at which time wandering garter snakes were eating the juveniles as they left the water. Garter snakes will also eat the tadpoles.

Large tadpoles of this species have been collected in January at high elevations when there was considerable snow. This may indicate that at high elevations tadpoles of this species overwinter and metamorphose the second year.

Behavior:

These frogs are easily captured as they usually dive to the bottom of water and half bury themselves in the mud. At higher elevations they are often found foraging some distance from water in the tall grassy meadows. When surprised away from water in these high mountain meadows, they frequently use mouse burrows under willows for escape.

WOOD FROG
(Rana sylvatica)

Wood Frog. Note the brown patch behind the eye and covering the eardrum. Photo by Isabelle Hunt Conant.

Distribution:

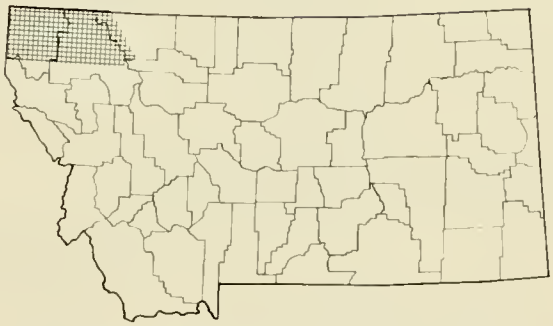
There are records of wood frogs from Havre in Hill County, Bowman Lake in Glacier National Park, and Billings in Yellowstone County. All these records require confirmation. They would be expected to occur in the forested areas of northwestern Montana.

Description:

These are frogs with a distinctive brown patch just behind the eyes and covering the eardrum. The wood frog is called the frog with the robber's mask. The brown patch is bordered below by a white jaw stripe. Adults are 1½ to 3¼ inches in snout-vent length. The dorsal color can vary from green to brown. There is a dark spot on each side of the chest near the base of the foreleg. Red, yellow or orange on the ventral surface is absent.

Habitat:

The wood frog is a frog of moist wooded areas and may be found considerable distances from water.



Shaded portion of the map shows range of the Wood Frog in Montana.

Breeding:

This frog is called an "explosive" breeder. Adults enter ponds and pools to breed as soon as ice begins to melt, remaining only a few days and then disappear from the breeding sites.

SALAMANDERS

Salamanders are creatures of moist situations, some entirely aquatic. They have no scales on their skins or claws on their toes. Larval salamanders have external gills for breathing and some species retain these into adulthood such as the axolotls of southern Montana. Most lose their gills and move onto land where they frequent moist areas.

Montana has five salamanders representing three salamander families. The family Ambystomidae is represented in Montana by the northern long-toed salamander, two forms of the tiger salamander, and the Pacific giant salamander. The salamanders in this family are called mole salamanders because of their underground habits and are distinguished from all other salamanders in having a continuous or broken row of teeth across the roofs of their mouths. The family Salamandridae is represented by the northern rough-skinned newt which barely enters Montana. These salamanders have 2 rows of teeth extending from between the nares to between the eyes and a skin that is roughened by numerous small warts. The lungless salamanders of the family Plethodontidae are represented in Montana by the Coeur D'Alene salamander. This is the largest family of salamanders and all have a groove that extends from the nostril to the edge of the upper lip, and all lack lungs. Respiration is through the mouth lining and skin.

Montana salamanders are rather distinctive in external characteristics and with the use of range maps should be easily identified without the use of a key.

COEUR D'ALENE SALAMANDER
(Plethodon vandykei idahoensis)

Distribution:

The Coeur D'Alene salamander was first reported from Montana in 1962. They have been collected at Big Hoodoo Mountain, Lincoln County, and Cascade Creek, 6.5 miles south of Paradise, Mineral County. These salamanders probably occur elsewhere in northwestern Montana.

Description:

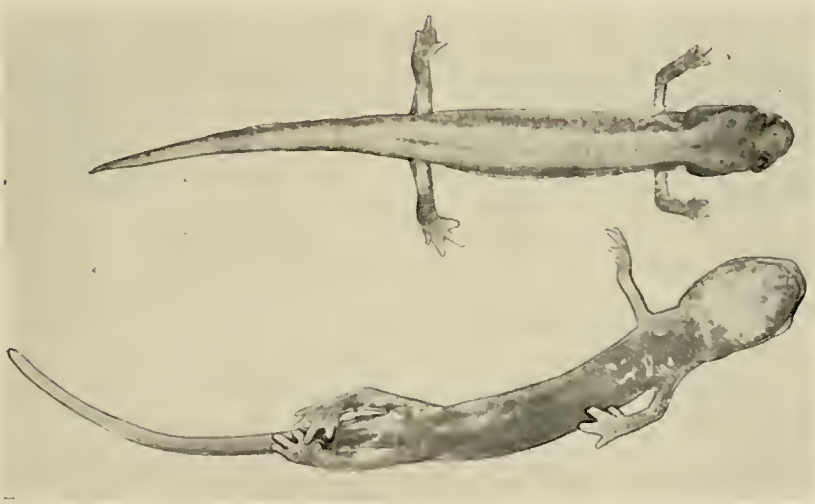
These salamanders reach 2 to 3 inches in total length. A yellowish to tan stripe extends from the snout to the tip of the tail. The venter is dark brown to black except for the throat area which is yellowish and stands out in sharp contrast to the darker belly color.

Habitat:

In Montana these salamanders have been found under small surface objects such as rocks and wood in splash and spray zones of waterfalls or near seepage areas. They occur only in very wet places, but not necessarily near running water.

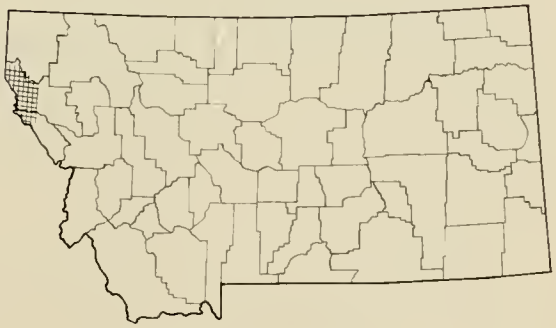
Breeding:

Little is known about the breeding of these salamanders. Eggs are said to be in grape-like masses attached to rocks.



Coeur D'Alene Salamanders. Top: Note the wide strip from the snout to the tip of the tail. Bottom: Note the light throat area. Photo by Jeff Black.

NORTHERN ROUGH-SKINNED NEWT
(Taricha granulosa granulosa)



Shaded portion of the map shows the probable range of the Northern Rough-Skinned Newt in Montana.

Distribution:

The northern rough-skinned newt has been recorded only once in Montana near Thompson Falls, Sanders County. Collecting trips to this area have not yielded any of these salamanders and its occurrence within Montana needs to be verified.

Description:

These newts have dark lower eyelids and skin which is thick and roughened by numer-

Northern Rough-Skinned Newt. Note the rough skin and solid dorsal color. Photo by Jeff Black.

ous small tubercles or warts. Breeding males have a smooth skin. The dorsal color is usually dark brown which is set off by an orange venter. Males are larger and have a longer and larger vent than females.

Habitat:

Adult newts are aquatic and usually found in ditches, pools, ponds and lakes. Permanent water is preferred. They are occasionally found wandering in the forest or beneath logs and other surface objects.

Breeding:

Breeding occurs in the spring when adults migrate to the breeding sites. Males arrive first and are followed by the females. Male courtship involves clasping the female, stroking the underside of the female and rubbing of the female's snout. The male releases the female and then deposits a gelatinous mass with a packet of sperm on the top. The female picks up this sperm packet with her vent. The sperm is stored in her cloaca and then later used to fertilize the eggs as they are deposited. Eggs are deposited in clusters attached to objects in the water. Eggs hatch in several weeks and larvae have plumelike gills. Metamorphosis occurs in late summer.

PACIFIC GIANT SALAMANDER
(Dicamptodon ensatus)

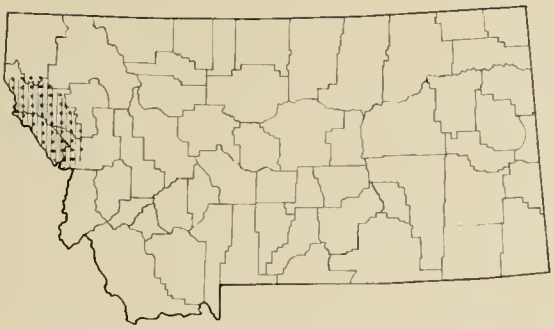
Distribution:

Pacific giant salamanders are extremely difficult to find in Montana and probably occur only near the Idaho border in northwestern Montana. There are few records of their occurrence within Montana.

Description:

These are the largest of the western salamanders and adults may attain a length of 12 inches. These stout bodied salamanders have a distinctive pattern with the dorsal ground color marbled with dark brown to black. The dorsal surface appears as a network of light and dark. The venter is light colored.

Pacific Giant Salamander—Note the dorsal surface which appears as a network of light and dark. Photo by E. D. Brodie, Jr.



Shaded portion of the map shows distribution of the Pacific Giant Salamander in Montana.

Habitat:

These are salamanders of cool wet places and can be active during both day and night. They are found under surface objects near streams or springs.

Breeding:

Little is known about the breeding habits of the Pacific giant salamanders. Adults lay eggs during the spring in underground springs, surface springs, or streams.

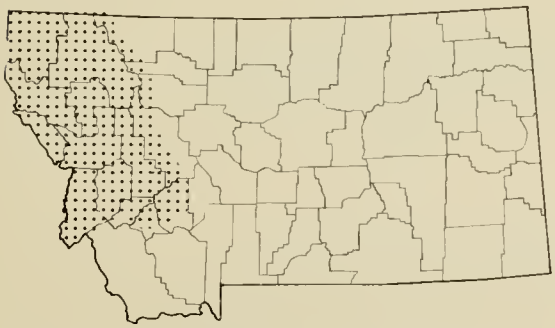
Behavior:

These are one of the few species of salamanders that can make sounds. They can give a rattling sound when irritated or a cry that resembles the bark of a dog. Even though they are large salamanders, they have been observed in bushes or trees several feet above the ground. They have been known to eat snakes, mice and also other amphibians.

NORTHERN LONG-TOED SALAMANDER
(*Ambystoma macrodactylum krausei*)

Distribution:

The northern long-toed salamanders are the common salamanders of western Montana. They have been collected in every county west of the Continental Divide and are common in Glacier National Park. They have also been collected east of the Continental Divide south of Helena, Lewis and Clark County, by Dr. C. V. Davis of Montana State University.



Shaded portion of the map shows distribution of the Northern Long-Toed Salamander in Montana.

Northern Long-Toed Salamander. Note the dorsal band that expands behind the eyes and the spots on the eyelids.

Inset picture is larva. Arrow points to stubby growth which will eventually develop into a leg. Photo by Vernon Craig.

Description:

Male salamanders from breeding populations ranged from 3½ to 4½ inches in total length and 1¾ to 2 inches in snout-vent length. Females were slightly larger than males and ranged from 4¼ to 5¼ inches in total length and 2⅛ to 2½ inches in snout-vent length. The ground color of these salamanders is brown to black. A dorsal band is present and is usually yellow to green and extends from near the tip of the tail to the mouth line. This band is expanded immediately behind the eyes. Each eyelid has a large well-defined spot of yellow. Patches of yellow also occur on the dorsal surfaces of the limbs. Sides of the head and body have numbers of white flecks which may extend onto the venter. The venter is usually brown to olive-green. Males have a longer vent opening than females and the vent region of males

is swollen and has vertical rows of papillae on the folds. Females have shorter vent openings and the vent folds are without papillae.

Habitat:

These are widespread salamanders in western Montana and are found in almost any moist habitat such as springs and along streams and lakes. They have been collected in moist areas under logs, rocks, boards, sticks, bark, cement, car fenders, sweatshirts, plastic seat covers, ledges of snow, and in rotten logs and house basements.

Breeding:

Breeding populations of northern long-toed salamanders were observed in Missoula County during 1967. The first two adults were found under a log near a pool north of Missoula which had formed from melting snow. These adults were found on April 4th and eggs were laid in the pool on April 6th. Another small pool near Turah was filled with dead leaves and grass and surrounded with rocks along the edges. Over 30 males were found under the rocks in the edge of the water on April 6th. All males would swim to the bottom of the pool when disturbed. Breeding continued at this pool for two weeks and eggs were always laid during the night. Single eggs or groups of 2 to 24 eggs were found attached to grass, rocks and leaves. Another breeding pool on the side of Mt. Jumbo near Missoula was found to contain over 20 adults under a board in the edge of the water on April 12th. Numerous eggs were attached to vegetation. In Wallace Lake, breeding adults were found inside an old sweatshirt in the water along the shore on April 22nd. The water temperature was 19°F. Another nearby lake on the same day had an inlet covered with ice and adult salamanders were swimming beneath the ice. These observations indicate that most breeding in Montana occurs from late March to May as soon as ice begins to melt.

Behavior:

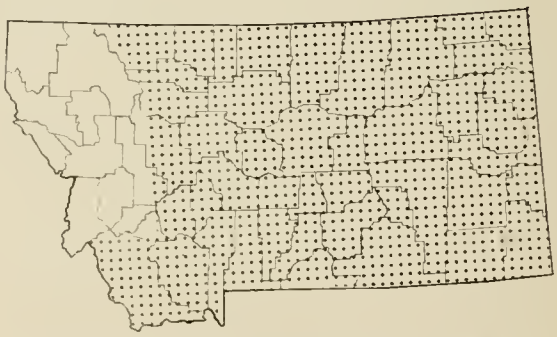
The dorsal stripe of salamanders is often made conspicuous by a curling behavior when they are disturbed under objects. This showing of the dorsal color may serve as a warning.

TIGER SALAMANDER
(Ambystoma tigrinum)

Tiger Salamanders. Photo by Vernon Craig.

Distribution:

There are two forms of the tiger salamander in Montana. The blotched tiger salamander, **A. t. melanostictum**, is common throughout Montana east of the Continental Divide. These are the common salamanders of eastern Montana. There are records of their occurrence in Lake County of western Montana, but these have not been verified. These salamanders are found on both sides of the Continental Divide in Glacier National Park.



Shaded portion of the map shows distribution of Tiger Salamanders in Montana.

The other form of the tiger salamander is the gray tiger salamander, **A. t. diaboli**. They have been collected along the Teton River near Fort Benton, Chouteau County, and within Bowdoin National Refuge, 8 miles east of Malta, Phillips County. These salamanders appear to occur in northern Montana east of the Continental Divide.

The blotched tiger salamanders and gray tiger salamanders have been collected together in eastern Montana. This raises the question as to whether these are distinct forms that occur together without interbreeding or whether these two forms do intergrade in Montana.

Description:

Tiger salamanders are chunky animals with a dark ground color and markings on this ground color. The gray tiger salamanders are light olive with scattered round dark spots. There may be a few dark spots on the throat and belly which are lighter in color. The blotched tiger salamanders have numerous light markings. These light markings have indefinite borders and the ground color can be reduced to a network which sets off the light colored areas. The light areas are usually a dull yellow. The venters are light on both forms. Adult blotched tiger salamanders are slightly smaller than the gray tiger salamanders and range from 7¼ to 9 inches in total length and 3½ to 4¼ inches in snout-vent length. The gray tiger salamanders range from 8¼ to 9¼ inches in total length and 3¾ to 4⅞ inches in snout-vent length.

Habitat:

Tiger salamanders have been collected in farm ponds, pools, lakes, reservoirs and potholes of water in dry Montana creek beds. Adults spend much time underground in burrows of small animals. Adults are occasionally found under objects near water or wandering at night.

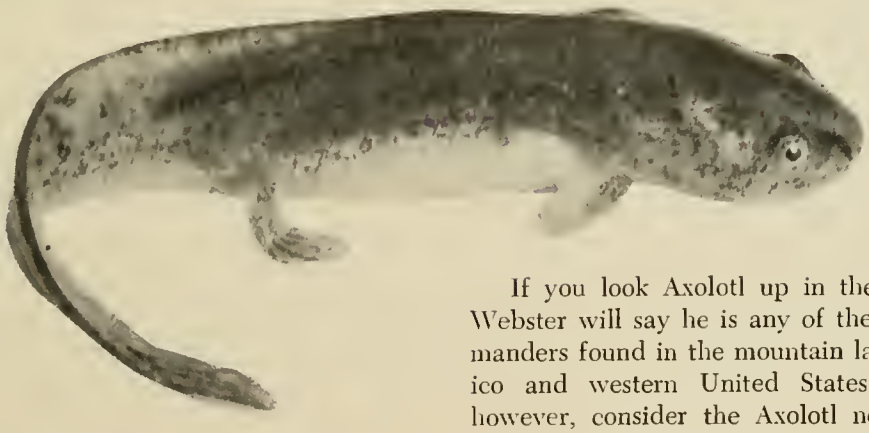
Breeding:

Breeding occurs in the spring when adults migrate to water after the ice begins to melt. Movement usually takes place at night. Males court the females by nosing along their bellies and sides and then crawling in front of them where they deposit sperm capsules. Eggs are attached to objects in water. Mature larvae are 3 to 5 inches in total length and may take 2 years to develop or may remain as permanent larvae (axolotles). Axolotles have been collected near Virginia City in Madison County, and Plentywood in Sheridan County. Axolotles from Madison County ranged from 6¾ to 9¾ inches in total length and 3¼ to 4¾ inches in snout-vent length.

Behavior:

A pond in a lodgepole pine thicket in southern Montana was found to contain many dead larvae or other remains of the blotched tiger salamander larvae. Healthy juveniles were found in cracks of large rocks surrounding the pond. Investigation showed many large leeches swimming in the water and a weakened larvae covered with leeches was caught swimming in the pond. It appeared that the leeches had caused the death of some of the tiger salamander larvae. Other salamander adults and larvae in Montana have also been found with attached leeches.

Larvae are often quite light in color in the highly turbid ponds and pools in eastern Montana.



THE AXOLOTL

If you look Axolotl up in the dictionary, Webster will say he is any of the larval salamanders found in the mountain lakes of Mexico and western United States. Biologists, however, consider the Axolotl not as just a run-of-the-mill salamander, but one which becomes sexually mature while it is still in a larval stage. Neotenic is the high-classed word for this condition.

In Montana we have tiger salamanders on both sides of the divide, and it is the progeny of these amphibians that become Axolotls. Normally, the early or larval stages of salamanders begin their lives in a pond or lake after hatching from eggs. During the early stages of development, they look somewhat like the adults. They have four stubby legs, a tail which is much flatter than that of adults, and two buggy eyes. At first the young ones have very little color pattern and are a light drab brown. Two big differences are that the young, or larvae, have a fin along the top of the tail and bushy gills protruding from above and behind the jaws. Since they breathe by gills, they must live entirely in the water at this time. In contrast, the adults have no outside gills but depend on lungs and free air for respiration. Before the larvae lose their gills they often get much larger than they will be as adults, in which case they shrink again during the final stages of change. A large larvae is nine or ten inches long, but generally much smaller at maturity. The subtle changes in development from larvae to adults is called metamorphosis.

Normally, this change-over (metamorphosis) takes only a year or so, but for some reason many refuse to lose their gills and fins although at the same time they become sexually mature. In mountain lakes, they reportedly may retain the outside gills for eight or nine years. In captivity, fully matured adults have been known to live thirteen years.

Just why Axolotls get stymied in their development is not known. Many theories have been advanced—the most popular contending that iodine deficient waters affect thyroid activity, thus disrupting normal growth of the salamanders.

Adult Blotched Tiger Salamander at right and larva at left. The larva, though as large as the adult, has retained its gills and would be correctly called an axolotl if sexually mature. Photo by Vernon Craig.

Amphibians of Waterton-Glacier Peace Park

Waterton - Glacier International Peace Park is composed of Glacier National Park in Montana and Waterton Lake National Park in Canada. The following is a list of those amphibians which are found in this Park. An asterisk denotes a species which has not yet been collected, but may occur in the Park.

SALAMANDERS

1. Northern long-toed salamander, **Ambystoma macrodactylum krausei**
2. Blotched tiger salamander, **Ambystoma tigrinum melanostictum**
3. Pacific giant salamander, **Dicamptodon ensatus***

FROGS AND TOADS

1. Boreal toad, **Bufo boreas boreas**
2. Tailed frog, **Ascaphus truei**
3. Pacific treefrog, **Hyla regilla**
4. Wood frog, **Rana sylvatica***
5. Spotted frog, **Rana pretiosa**
6. Leopard frog, **Rana pipiens**

Raising and Keeping Amphibians

Tadpoles and salamander larvae are best raised in an aquarium, gallon jar or some other suitable container. The most important points are not to overcrowd or overfeed tadpoles and to watch for contamination of water. Tadpoles eat boiled lettuce, finely chopped beef, bits of hard boiled eggs, and some fish food. Salamander larvae may need live natural food. Larger tiger salamander larvae will eat bits of meat and earthworms. As the time for metamorphosis approaches, a rocky shore should be available for emergence to land.

Adult or juvenile amphibians are best kept in an aquarium or any other large glass-sided container. The aquarium should be fitted with sand, gravel or soil and a container of water which is made level with the soil. Rocks, bark and wet moss are good shelter and provide hiding places for amphibians.

Frogs and toads will eat many things. Feed them all kinds of insects and they also will eat earthworms and mealworms. Tiny bits of beef and liver can be dangled in front of them for food. Salamanders will eat earthworms and mealworms. It is important to keep the number of captive animals small.

Collection and Preservation of Amphibians

Indiscriminate collection of Montana amphibians is not desirable, but collecting done under the direction of investigators or any of the educational institutions in Montana can be useful. At the time an amphibian is collected, there are several things that must be done. The collector should write down in a small notebook the animal or collection number, date of collection, geographic location to the nearest town where the amphibian was found and the collector's name.

Amphibians require moisture of some type and cool temperatures. They can be carried in a cloth or plastic bag as long as there is wet moss or grass in the bag with them and they are kept out of direct heat. Coffee cans with plastic lids are also handy.

Amphibians are most easily killed by dropping them directly into 10% formaldehyde. This same formaldehyde can be used for permanent storage. If amphibians are stored in ethyl alcohol, it is necessary to wash them in running water for about an hour if they have been killed in formaldehyde. They can then be stored in 70% ethyl alcohol.

A tag or label written with waterproof ink or soft lead pencil should be tied to each animal or put in the jar with the preserved animal and should include the collection number, date of collection, and the geographic location where the amphibian was collected.

REFERENCES

Many references are available for those readers who might wish to study more about frogs, toads and salamanders. Following are publications which are the most useful in Montana:

A Field Guide to Reptiles and Amphibians of Eastern North America, by Roger Conant, 1958. Peterson Field Guide Series, Houghton Mifflin Co., Boston, Mass., 366 p.

The Natural History of North American Amphibians and Reptiles, by James A. Oliver, 1955. D. Van Nostrand Co., Inc., Princeton, N. J., 359 p.

Amphibians of North America, by Robert C. Stebbins, 1951. Univ. of Calif. Press, Berkeley, Calif., 539 p.

Amphibians and Reptiles of Western North America, by Robert C. Stebbins, 1954. McGraw-Hill Book Co., Inc., New York, N. Y., 536 p.

A Field Guide to Western Reptiles and Amphibians, by Robert C. Stebbins, 1966. Peterson Field Guide Series, Houghton Mifflin Co., Boston, Mass., 279 p.

RETURN REQUESTED

Return to

INFORMATION-EDUCATION DIVISION
MONTANA FISH & GAME DEPARTMENT
Helena, Montana
ZIP 59601

Sec. 34.66, P. L. & R.
U. S. POSTAGE
PAID
Permit No. 50
Helena, Montana