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Randel, Walter A

THIS BOOK ON THE CULTURE OF
BULLFROGS, HAS BEEN PREPARED
FROM OFFICIAL GOVERNMENT STA-
TISTICS, RESEARCH AND THE AC-
TUAL BREEDING AND DEVELOPING
OF BULLFROGS.

—THE AUTHOR.

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FROG CULTURE FOR PROFIT.

To the skeptical regarding bullfrog culture.

Mr. Robert Seeds was growing alfalfa in Pennsylvania for some time before the Agricultural Professors would admit it could be grown there.

Frogs are Batrachians, a class of vertebrae animals occupying a position between fish and reptiles. Batrachian eggs or spawn are deposited and hatched in water into tadpoles, which are very different from the adults in appearance and living, as they are wholly adapted to water life, and while living in the water, breathing by gills in early life, they breathe with lungs, which replace the gills as age advances and the transformation takes place.

There are many types of frogs, all of which authorities agree are edible; however the bullfrog owing to size and other desirable qualifications, is the type cultivated, and is the frog of which we will treat:

The bullfrog is found in about every part of the United States and Canada east of the Rocky Mountains, and is the most aquatic of the frog family; however, he spends many hours in shady nooks

under big water-plant leaves or beside old stumps, awaiting a chance to catch the water-beetle, or in fact any living thing that may come his way, but is never found very far from a body of water.

The male bullfrog can be distinguished from the female by the size of the ear, which in the male is much larger than the eye; in the female about the same size as the eye. The male is usually the smaller in body size, and in color usually plain green; the female in color is more brown or brownish green, and perhaps a trifle spotted. The color changes, however, from time to time in the bullfrog, just as it does in other batrachian life, so the eye and ear comparison is the more accurate.

It is a very common error to consider all small frogs as immature bullfrogs, for a bullfrog is a bullfrog from the time it is hatched, and it grows to a size that no other specie could obtain should it live a century. Twelve to fifteen years is the length of bullfrog life.

The bullfrog is a peculiar animal in more ways than one. In his life there seems to be none of that solicitude for the welfare of the helpless young or for his mate or brother and he seems to live about

A Pond That Was The Beginning
of One Frog Farm

all his life alone coming in contact with others of his breed (by design) only in the spring during the mating season. Bullfrog spawn is deposited in the water and is fertilized by the male, after which the eggs undergo a process of cell multiplication, gradually developing into tadpoles, without any care or attention whatever from the parent frogs.

Bullfrogs are inclined to be cannibalistic, especially when underfed and culturists separate their frogs according to size, also arrange for feeding, thus overcoming this apparent drawback.

The value of bullfrogs as a food is now thoroughly recognized; the meat is white, delicate, (not unlike young chicken) wholesome and when fried in butter or prepared a la Maryland with cream-gravy is delicious. Frog meat saute is another pleasing dish, and served very generally in New Orleans and Southern city eating places. In the better restaurants of Chicago, St. Louis, Philadelphia and Boston, frog meata la Newburgh is listed on the bill of fare at rather fancy prices. There is a tradition that only the hind legs of a frog are to be eaten, but if the frog is large enough to pay for dressing, the trunk and shoulders are just as desirable as the legs.

For a long time, the French people alone availed themselves of this delicacy, though according to history, it was well known to the Romans. From France the use of this food passed into Germany, England and other parts of Europe, later into the United States where now frogs are more generally consumed than in any other country. Back in 1897 U. S. Fisheries Commission report shows the yearly cost of frog meat to be not less than \$145,000.00, and the annual increase since then is wonderful.

The unrestricted hunting of bullfrogs threatens their practical extinction in most places, especially where they are in an abundance, and shipping facilities are at hand. Already a marked decrease in the supply is manifest in New York, Chicago and other consuming centers; prices have gone up in accordance, and in order to derive some of the profits and supply the demand, hundreds of people are now preparing to engage in bullfrog culture, while others have frog farms of no mean proportions, showing immense financial returns on the time and money invested.

Bullfrog Spawn
More Vegetation is Necessary in this Aquarium.

Successful frog farms are to be found pretty generally in the Eastern half of the United States, and rather extensively in California, where perhaps there are more than in any one State. However, the frog usually cultivated in California is what is known as the "French" frog, but as this specie does not begin to attain the size, the bullfrog is being very extensively introduced, and is the more satisfactory.

The possibilities for any one to derive a very good income from the culture and marketing of bullfrogs are unusual and the surprising thing is that more have not taken it up—no doubt the reason is, that it has not been brought to notice. The industry shows infinitely more with less capital invested, care and time given than chickens, squab or in fact any small live-stock, whose flesh is marketed for food.

If you are serious regarding a start, go into the matter earnestly, using common horse-sense. As experience is the only satisfactory teacher where animal life is concerned, it is advisable to make a moderate beginning, which will enable one to feel his way and learn as he goes.

It is possible to make a beginning in a tank, or a small pool, in which have water about a foot deep with sand and pebbles so arranged that it will make shallow water at one end and deep water at the other; in this place a quantity of water vegetation.

If you wish to start with frogs, secure matured ones, and remember to remove them shortly after the eggs are deposited and fertilized, as the frog's actions in jumping and swimming about very often upset one's plans.

Should you wish to use egg spawn, the same can be had, and will incubate and hatch just as though the frogs themselves had deposited them, as daylight and the temperature of water have all to do with the incubation. After the eggs have started to incubate, and appear quite black to the naked eye, you are assured there is life and progress, but should the eggs turn white or partially so, life is no more. For some reason or other the eggs have been killed and you must start with a fresh lot.

Observations as follows were recorded from an experiment: Bullfrogs were taken from pond last week in April and placed in an aquarium; two days

after the frogs were changed, the female deposited an egg mass about five inches in diameter, containing in the neighborhood of 5,000 eggs (conclusive evidence that it matters little where frogs are so long as the environments are water, some growing vegetation and daylight).

The eggs become attached to the twigs in the water put there for the purpose. The male fertilizes the egg mass when passing over it, which was repeated several times, both frogs removed. The eggs are now so close together that the entire mass seems dark colored, but covered with a clear gelatinous substance, and being transparent, allows us to watch the process of development. The egg is round and when first deposited, part of the yolk can be seen. It is claimed that the dark portion of the egg at the top (later the whole egg becomes black) allows more absorption of the sun's heat than would a light color, thus encouraging development, which depends wholly on temperature.

Two Very Satisfactory Water Plants

Development of the egg begins an hour or so after fertilization, but to the naked eye, the change is very slight during the first three days. If eggs are examined with a magnifying glass there seems to be a groove at the top of each. This groove finally circles the egg and the second groove appears at right angles and rapidly encircles the egg, thus dividing it into four parts. Other external changes take place, which show the beginning of the tadpole formation.

By the fourth day the eggs seem to change very much; they have become long and the line down the middle marks the back of the future frog.

The fifth day again the advancement shows; the length of the egg is still greater and a projection, which we found later to form the tail of the tadpole, is very evident.

During the sixth day, the end which proved to be head, and the other end which will be the tail are unmistakable.

The seventh and eighth days, the head now shows plainly and the tadpoles move in the eggs while we watch.

The ninth and tenth days bring us to the hatching stage. Eggs are hatching all the while, and at the end of the tenth day, most of the tadpoles are hatched and are clinging by little feelers or suckers to the gelatinous mass or to some of the water vegetation in the tank.

On the morning of the twelfth day, all those that are going to hatch have done so, and now we have life in earnest—a living thing which is very interesting indeed to watch. Our tadpole seems to be the busiest thing imaginable, wagging its rudder-like tail vigorously; then quiet for a moment or two, as if resting, only to commence more actively than ever. The bullfrog tadpole grows rapidly and seems to want something to eat constantly. Some substance which he seems to get from the vegetation growing in the water appears very satisfying, but after the young tadpole was about a week old, we fed a quantity of prepared food.

This hatch has been large and we find it necessary to remove half of the tadpoles to another aquarium, as more space and water is necessary. Right here we discovered that vegetable growth, and plenty of

it, gave the tadpoles no end of comfort and satisfaction.

During the first few months the tadpole grows in size but no change in body formation takes place. Later two (2) very small hind legs are noticed which slowly grow to good length and by degrees are used to help propel in swimming. Later on, when the transformation stage comes, two (2) forward arms shoot through the openings, that up to now were used as gills. The gills are now closing and lungs are taking their place. At this stage the tadpole comes to the surface often to get air, and other actions are interesting to watch. At this time, tadpoles were all transferred to a pool with a mud bottom.

Should one wish to pass the egg-spawn stage in his start or education and begin with tadpoles from three (3) to five (5) months old, it would be covering a lot of ground, etc., etc.

Bullfrog tadpoles can be more easily secured from known sources and can be gotten during a greater number of months than can egg-spawn.

The months egg-spawn can be collected are all of April, May and June. The ideal month depends on climatic location. Whether North or South.

THREE THINGS NECESSARY FOR
THE SUCCESSFUL BREEDING AND DE-
VELCPING OF BULLFROGS:

(1) PROTECTION FROM NATURAL
ENEMIES.

(2) COMPLETE SEPARATION AC-
CORDING TO SIZE.

(3) PROPER VARIETY AND QUAN-
TITY OF FOOD.

SHOWING POSSIBILITIES IN SMALL QUARTERS

FOR THE FROG FARMER.

The success accomplished by Frog Farmers in many parts of the United States can be accomplished by any one who can get a small piece of swampy ground, or a small pond, and these can be found on almost any farm, or can be very easily made where there is a small stream of water anywhere near.

It is claimed that more money is made from an acre of swampy land or a pond that has been absolutely useless, when converted into a frogger, than twenty acres of good land planted in wheat or corn, and all done with little or no labor or expense.

Don't let us forget the possibilities in a small place, even a back yard, for we have some very successful frog breeders, who have begun in an artificial pond dug in a place near the house; some others who have started in a small cave, and one in particular who is still using the dug-out part of an old quarry.

We advise in beginning that it is best and cheapest to start with frogs at least three years old, for that is about as young as bullfrogs will breed. Once a plant is established and stocked with mature frogs,

one season is all that is necessary to make the revenue constant, and about all profit, as the care and feeding is of small account.

The froggery or frog farm should be divided into at least four parts, and as many more as the number demands. The first divisions are to be used for the hatching and developing; the others for tadpoles, and the balance for the different size frogs. All of the divisions must have a mud bottom with some large stones, and plenty of water vegetation, as the tadpole uses this as food, and frog for shade and hiding places. **FROGS MUST HAVE PLENTY OF SHADE**, and also make it possible for them to spend a great deal of time out of the water on a piece of land or log. It is also very important that the division where your frogs are to be, to have them well fenced at a height of not less than four feet (boards or a fine mesh wire net may be used); and if your division is in such a position that would make it possible for the frogs to burrow out, it will be necessary for you to dig out two or three feet of the mud, put down half inch wire net; and put your mud back, so if they do burrow, they can

Note Length of Frog Legs

only get as far as the net; this is an escape proof frog developing section. Where possible these instructions should be followed, as bullfrogs are strong, great leapers, and wonderful burrowers. Always have in mind the importance of keeping frogs of one size only together.

From twenty-five to fifty mature frogs are a great plenty to be used for breeding and a less number will usually suffice.

The laying out of a plant, of course, depends much upon of the land and the water supply. A pond of any shape, but containing equivalent to 50 x 25 will safely hold five hundred mature frogs, and 25,000 tadpoles have been developed in a pool 20 x 15 feet, water about 2 feet deep.

The water of the frogs' home may be, to some extent, stagnant, but it is very important that the water be pure, for frogs like other animal life, do best on pure water, while polluted, unclean pools soon bring about death.

The breeding time for bullfrogs is from March until June, depending on the location, whether north or south, and is most satisfactory during a warm rain

Bullfrog Tadpole About Six Months Old

spell. One male for each female is necessary, as they mate the same as warm blooded animals, remaining together for hours; very shortly after which the female deposits her spawn, and the male fertilizes the egg mass, after the manner of fish. The eggs are deposited by the female in shallow, very slow running, or still water; in one large mass with sort of a gelatinous covering. The number of eggs laid varies greatly and seems to depend on age, size of individual, etc. Race suicide is not practised by the frog, and the breeder profits greatly by the size of the usual family. The female spawns from four to eight thousand eggs; the sun-rays and the temperature of the water bring about the egg development. Sixty-five to seventy degrees Fahrenheit being considered ideal temperatures for incubation, and from ten to thirty days to hatch. This variation in time is brought about by climatic conditions.

There are many enemies of the egg mass, as fish, turtles, ducks, water snakes, musk rats, etc., are known to devour great quantities.

After hatching the tadpole's first food is the gelatinous envelope which protected the egg from which

he hatched; shortly afterwards he will devour almost anything given him, but depends largely on some substance, which he seems to get off of the water vegetation. It was thought for a long time that the tadpole lived on a vegetable diet, but it is now known, that while he can live on vegetation exclusively, they thrive and make much better progress when some other food is fed; combination and prepared foods are extensively used.

The bullfrog tadpole grows to a very large size, and often measures from five to seven inches. He also has very many enemies, and it is necessary that the pools be kept free of fish, turtles, water snakes, etc., also bullfrogs, as the bullfrog seems to relish his own tadpole, as well as any other food. The tadpole develops into a frog the spring following the year he was hatched. At the transformation stage, when the bulltadpole becomes a bullfrog, the opening on each side of the upper body (the gills) are closed by the forward arms coming through, and at this time lungs take their place.

Frogs fed right do remarkably well. They will not take meat or other dead food from the ground,

and it has to be offered in some attractive manner—that is, shaken or made to move in some way to suggest life.

Frogs begin to burrow in September in the northeast section of this country and later bury themselves in the mud where they stay dormant, protected from frost, etc., all winter until spring. However, in the extreme south, and west of the Rocky Mountains frogs do not hibernate.

MARKETS FOR FROGS AND FROG MEAT.

The demand for frog meat in cities is enormous and exceeds the supply many times over. Any first class hotel, restaurant or fish dealer are always in the market for bullfrog meat.

Every dealer in live fish, frogs, etc., is ready to contract for large numbers and will take frogs from three inches up in size. Bullfrogs are measured from tip of nose to base of body between the hind legs. The supplying of breeding frogs to those stocking a place is an exceptionally good outlet.

There is no good reason why you should go a great distance from your place looking for a market; you have as good outlets as anyone right at your door. The better family trade, hotels, restaurants and fish markets for the meat; schools, laboratories, frog breeders and many others for the live specimens.

100 One Year Old Bullfrogs were Fed and Developed
in this Coop, with Water Tank in One End.

METHODS OF BULLFROG CATCHING.

The easiest way to catch bullfrogs in a pond of water or in any of their natural haunts, is at night, with the aid and use of a lantern fitted with a reflector and the use of a scoop net. On seeing the light the frogs seem curious and will bob up and appear from unexpected places, at which time throw your net over him, rather than under, for if you dive under as one would in scooping crabs or fish, you will be surprised how many you will miss, as the frog naturally jumps and if he gets a footing, which it has been found he often does when net is brought up from under water, his jump will get him safely away and you will not be liable to get him that night.

To catch the bullfrog in daylight, the most successful method has been found to attach a bit of red material or meat on the end of a fish line which, in turn is attached to a long fishpole; dangle this over the frog's head or rather near it and Mr. Bullfrog will soon be convinced that it's alive, his body will make a quick move and his tongue will shoot out, down will go your bait and you will have the

frog. If you wish to keep the specimen alive, do not use a fish hook—it is not necessary, as the bait is swallowed.

Many live frogs can be kept in an enclosure for a long time if a little water is kept in one end, so frogs can get at it, and if fed twice or three times a week.

PACKING FOR SHIPMENT.

When frogs are taken from the water, they should be washed and packed in the shipping crate, together with some moss or water holding vegetation. Pack in case large enough to allow of the frogs moving; cover securely with burlap or similar material, which generously moisten with water—that is, if shipping in the warm months; if in the winter, ship dry, packed in sawdust, or something similar, as provision must be made to protect the frogs from frost. Do not use wire to cover your crate for the frogs will jump against it and cut and bruise themselves badly.

Frog meat shipments arrive satisfactorily when wrapped in cheap cheese cloth and packed in ice.

FOOD AND THE FEEDING OF THE BULLFROG.

The food and the feeding of the bullfrog tadpole is a very simple matter, as the tadpole eats most anything. For the very young, rice flour has proven most satisfactory. Later, say, from two (2) weeks old, they will consume small bits of meat and seem to get some sort of nourishment off the stems and leaves of the vegetation that grows in water.

Food for the developed bullfrog requires a little more thought, as they will eat, naturally, only living things.

For a moderate number the food problem is not difficult, as a sufficient amount of live food is naturally about, but for a large number of frogs some means to attract insect life must be used. This is not the problem it may seem at first, as experience has taught that molasses, honey or moist sugar spread on boards and placed adjacent to the divided sections or ponds, prove excellent inducements to bring the live food for our frogs.

Meat and liver serve as very satisfactory food when live food is shy or when you are keeping frog

stock in the cellar or elsewhere over the winter. All sorts of schemes have to be resorted to, to get the bullfrog to take this kind of food, as frogs seem to insist on the food moving before he will consider it and many have starved to death in quarters where there has been a quantity of meat lying about. Bits of meat have to be shaken before them to imitate life to get the frog to take it naturally. When the meat is forcibly put into the frog's mouth, however, he will swallow it almost immediately. The writer has kept many and many a frog in excellent shape and condition in just this manner.

Perhaps the very best method is to propagate your own live frog food. Crawfish, fiddler crabs or even the common earth worm serve as a good food for bullfrogs. Why not secure a few and propagate in quantities? The fact is the bullfrog will eat anything alive that he can get in his mouth; therefore anything alive that you can secure cheaply and conveniently is your frog food.

It is most amusing to watch a large bullfrog eat. He will sit on his hind legs, very much like a squirrel and use his two arms to manipulate and adjust the

object to fit in his mouth so it can be swallowed. His digestive organs must be unusually good, for about everything taken seems to be swallowed whole.

Of course when it is necessary to feed frogs artificially, it takes time, but when you attend to this but twice or three times a week, the time is of small account.

It has been by no means proven that frogs can be overfed; on the contrary they are very good feeders, but a moderate amount of food is safer than gorging.

There are no better Roach, Water Bug or Mouse catchers in the world than the bullfrog. Let him loose in a cellar or any place that might be inhabited with the bugs, etc., and the frog will clean it up in a very few nights.

ANSWERS TO QUESTIONS MOST FREQUENTLY ASKED.

Bullfrogs are considered at a marketable age, for any purpose, except breeding at six (6) months old—that is six (6) months from the time of transformation from tadpole.

Reports and deductions would suggest the South, East or West and California as having a little advantage over some other locations for bullfrog culture, as the frogs do not hibernate at all in the extreme South and it has been found the Eastern bullfrog is dormant a very short while, if at all, when taken to the Pacific Coast. Under these little advantages a slight development is made in size at earlier age than where the bullfrog goes into Winter quarters for months.

Generally speaking, one part of the country is as good as another as we have to get as near natural conditions as possible to be a successful frog farmer and naturally, right now, the bullfrog is very plentiful in Maine and they are very thick in the waters of Mississippi and Louisiana (note the spread of geography) and before they were hunted so ruthlessly, bullfrogs were to be found in quantities in about every State East of the Rocky Mountains.

Proof enough, isn't it, that all climates are suitable or the bullfrog arranges his life to suit the climate.

As to cost of starting a frog farm, it all depends on your own ideas or ambitions. One can begin with as few as a dozen breeders and about 100 running feet of a small mesh wire, for fencing, etc.

Should bullfrogs come into your possession before you have your place ready, it is an easy matter to keep the live stock alright in a small enclosure for months, if a small quantity of water is placed where they can get at it and food given them twice a week.

Many, many times the frogs arriving at a new place with new surroundings, etc., will not eat naturally. This may be from fright, homesickness or "what not"; however it very often happens, and in this event, take each frog, open its mouth, into which place a chunk of meat about the size of thumb and usually as soon as the frog tastes, the meat is swallowed. You understand, live things are the natural frog food and a small fish, a worm that will move some or anything up to a rat, if the frog is big enough to get it in his mouth, is relished.

Bullfrogs will live and do alright in slightly brackish water.

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SEX CONTROL IS POSSIBLE WITH FROGS.

Experiments made by PROFESSOR OSCAR RIDDLE of the Biology Dept. of the University of Chicago, Ill., have proven to his satisfaction that sex control is a very simple and easy matter with frogs. An experiment under his own direction and observation resulted in 100 per cent. male when the eggs or spawn were kept in cold storage till they were ripe before allowing to start incubating and another experiment where the hatch was forced early after the spawn was deposited by parent frog, the hatch was almost entirely female.

He claims that the secret of sex control of even higher life (the frog is one of the lower order of life) lies in the determination of the time at which the embryonic egg is to be started incubating.

Frogs are more and more used for all sorts of experiments and the bullfrog is the most desirable for such purposes.

We are often asked for names of people who are bullfrog farming.

Enclose a 2-cent stamp with your request and names and addresses will be sent you.

CHEMISTRY MATURES LIFE FROM THE EGG

Frog Produced by Science Grew
to Adult Stage, Dr. Loeb
Tells Doctors.

SECRET OF SPERMATOZOON

Rockefeller Institute Worker Learned
It and How to Imitate Its Effect
In Egg Fertilization.

Prof. Jacques Loeb of the Rockefeller Institute, speaking before the Manhattan Medical Society at the Wurzbürger Hofbrau last night, described some of his recent experiments in artificial reproduction by fertilization of specimens of animal life that developed to maturity. Prof. Loeb excited great interest by relating that a female frog, produced from an artificially fertilized egg, was found on dissection after accidental death to be equipped for parenthood. This frog had reached adult life.

The physicians, over whom Dr. Benjamin T. Tilton presided, followed closely Dr. Loeb's description of his experiments. Prof. Gary N. Calkins of Columbia University led the discussion which followed. Prof. Loeb asserted that as a result of his experiments he had not only learned how to imitate the effect of the spermatozoon in nature, but to learn the nature of the spermatozoon itself and its method of action. He said:

"The egg in nature is only able to develop after the spermatozoon has entered into it. The spermatozoon calls the egg not into life—for it had life already—but into a new being. The question before biology has been, 'How?'"

"Previously biologists answered this question in the same way that a few years ago was answered questions concerning contagious diseases, by hypotheses, by guesses. Biologists compared the egg to a clock, and said the spermatozoon wound it. Liebig put his metaphor into terms of chemistry and called the spermatozoon a ferment which set up vibrations in the egg.

Professor Loeb explained that the eggs of frogs were started on the road to development by merely puncturing them. This, he said, convinced him that the breaking of the outside of the egg was the important factor, accomplished in nature by chemical action of the spermatozoon, in his earlier experiments by chemical dissolution of its natural protection. Experiments both with naturally fertilized and artificially fertilized eggs, he said, showed that the first effect of the formation of the halo was to increase oxidization six times. This oxidization, he said, was the force which stirred the cell to development.

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