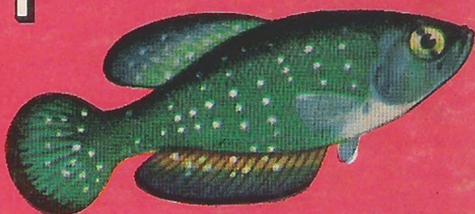


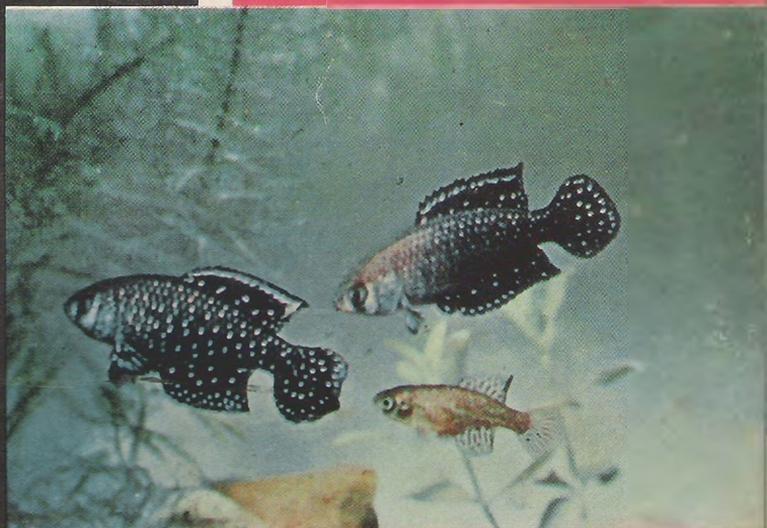
ARGENTINE PEARL FISH



**A Complete
Study of
the Argentine
Pearl Fish,
*Cynolebias bellotti***

by Dr. Enrique Bosch (Argentina)

Translated by William Vorderwinkler



ARGENTINE

PEARL

FISH

Cynolebias bellottii Steindachner 1881

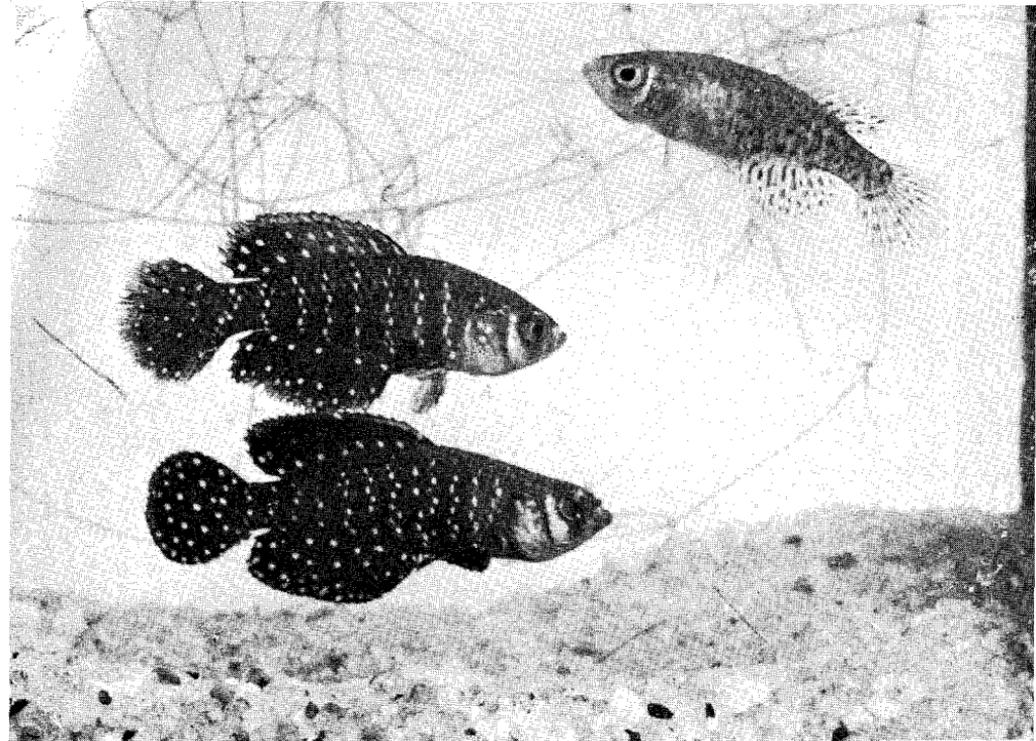
By Enrique Boschi, translated from the Spanish

by William Vorderwinkler

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A trio of *Cynolebias bellottii*, two males to the left. Photo by Sam Dunton, New York Zoological Soc.

The Argentine Pearl Fish

ETYMOLOGY

Cynolebias: *Lebias*: with dog-like teeth; *bellottii*: in honor of Dr. Bellotti, who obtained the species.

TAXONOMY

Class: Teleostomi

Order: *Cyprinodontiformes*

Sub-Order: *Cyprinodontidei*

Family: *Cyprinodontidae*

Genus: *Cynolebias* Steindachner

Species: *Cynolebias bellottii* Steindachner

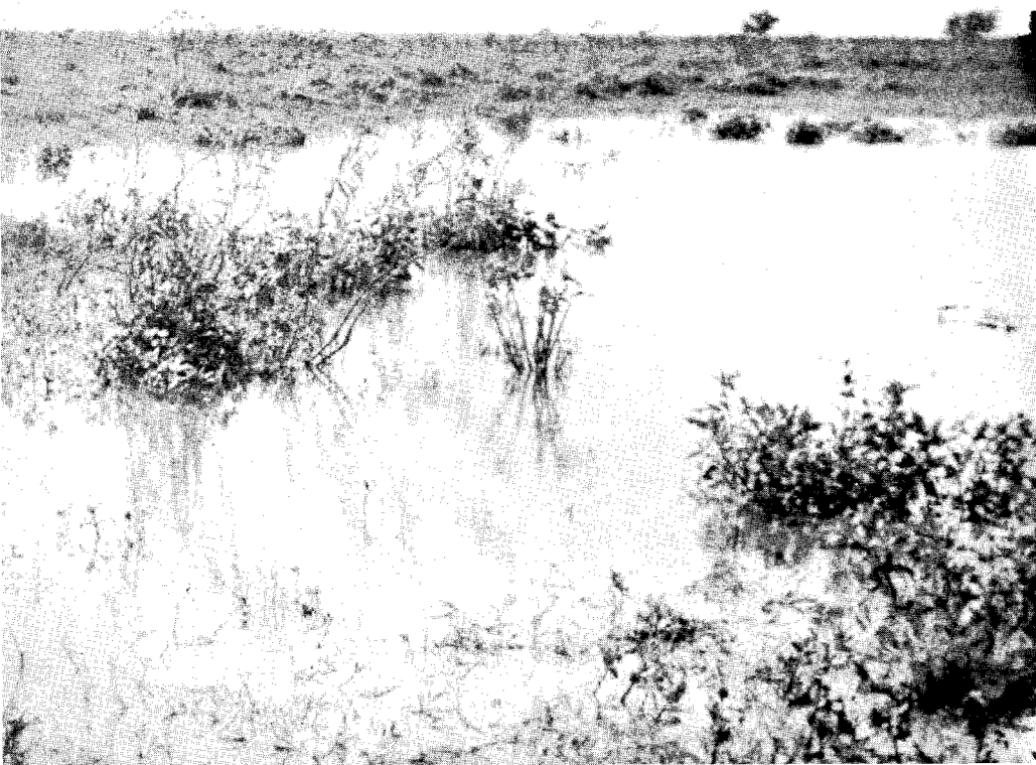
DISTRIBUTION

Pools and small rivulets of the Buenos Aires Province, as far as Mar del Plata, south of Entre Rios and Santa Fe. Also occurs in the southern part of Uruguay. Mr. Axel Bachmann found this species in the Province of Salta and in Paraguay.

ECOLOGY

The fish prefer to live in pools and swamps which are shallow and have a muddy bottom and turbid waters discolored by clay and rich in plankton organisms. These pools generally dry up in the summer; they are also found in little

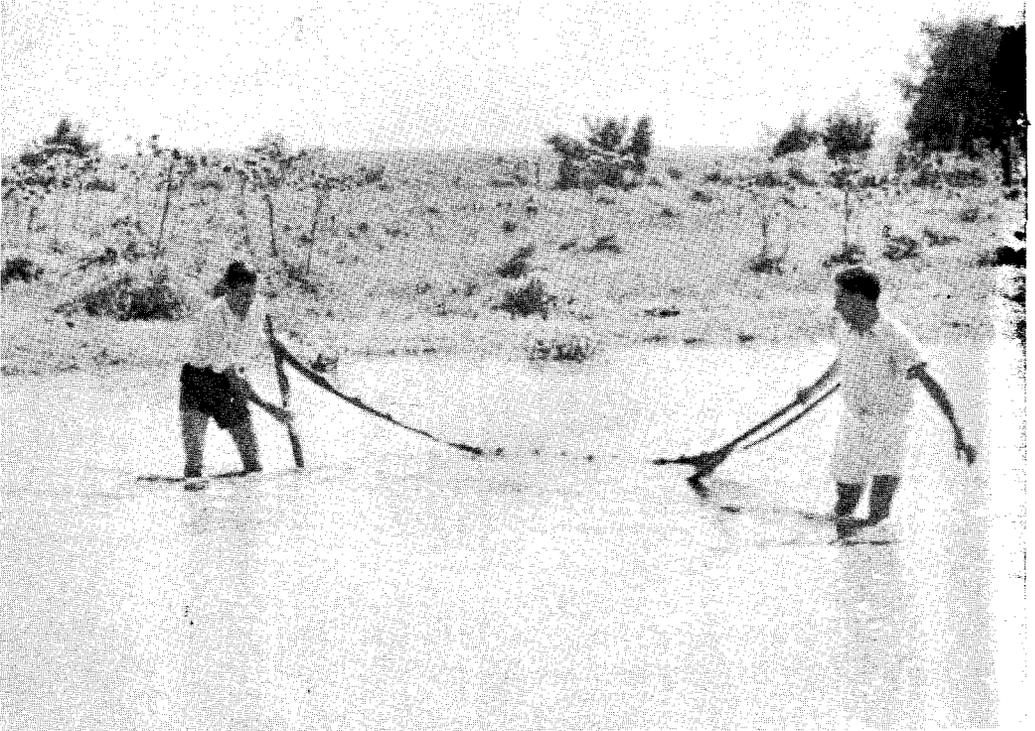
Here *Cynolebias bellottii* live with many other species of fishes. Photo by German U. Fritz.





One type of habitat of *Cynolebias bellottii*.
Photo by German U. Fritz.

streams where there is scarcely any current. In the "Claro" stream of Garin (Buenos Aires Province), we caught them along with *Pseudo-corynopoma doriae*, *Curimata platana*, *Cnesterodon decemmaculatus*, *Jenynsia lineata* and several *Cheirodon* species. They occur less frequently in the Rio de la Plata. pH of the water was 6.9 to 8.0. Their natural diet consisted principally of small crustaceans (*Cladocera*, Ostracodons and Copepods), Amphipods (*Hyalella*), small aquatic insects (*Corixidae*), larvae of *Chironomus* and *Culcidae*, bivalve molluscs and planorbids. These may have had some vegetable content or not. In the Province of Entre Rios they were found in pools which contained *Jusieua*



This is the way the author seined for *Cynolebias bellottii* in Argentina. Photo by German Fritz.

repens, *Myriophyllum*, *Sagittaria*, etc. In other cases there was marshy vegetation which covered the entire region lightly.

REPRODUCTION

An egg-laying species. Sexual dimorphism is greatly accentuated. The males differ from the females in form and color of the body and the number of dorsal and anal fin rays.

METHOD OF CAPTURE

With a seine and hand-net of fine mesh.

HISTORICAL REVIEW

The German ichthyologist Steindachner¹ in 1881 described three species of *Cynolebias* native to the Rio de la Plata. *C. bellottii*, *C. maculatus* and *C. robustus** were considered valid by the distinguished specialists who occupied themselves with the South American fishes: Eigenmann and Eigenmann², Perugia³, Lahille⁴, Garman⁵, etc., but later studies made by Dr. Carlos Berg, while he was Director of the Museo Nacional de Buenos Aires, revealed that the first two *Cynolebias* species originally studied were the same species and the differences observed corresponded to the sexual dimorphism which is very pronounced in this fish**. This work was ignored by Eigenmann⁷, who after the publication of Berg's work still considered the obsolete species as a synonym.

Regan⁸, in his revision of the poeciliid fishes also accepted *Cynolebias maculatus*, but later⁹, thanks to the advice of A. Rachow of Hamburg, who pointed out to him that he had not taken into consideration the work of Berg in his paper, rectified the error, explaining that *C. bellottii* and *C. maculatus* were respectively the male and female of the same species, and that the differences in the number of dorsal and anal rays, which were taken as the basis for distinguishing the species, should be considered a sexual characteristic, which cleared up the problem.

We notice that this beautiful little fish of ours not only attracted the attention of aquarists, but also that eminent ichthyologists in Argentina and Europe occupied themselves actively to establish its correct position taxonomically. There are many species which, like this one, are poorly described or are repeatedly described, as mentioned by Dr. Fernando Lahille¹⁰, when a genus is given as including many local descriptions, where all but one must be invalidated.

For these reasons:

1. When the describer did not have on hand any more than one specimen of what he described.

2. When the species of a genus present a **sexual** dimorphism.
3. When there is a seasonal change of coloration.
4. When there is a sensitivity to change in the medium in which they occur.
5. When specimens are compared which vary greatly in age.

DESCRIPTION

These are fishes which have a laterally compressed oval body, a characteristic in which they differ from the *Rivulus*, members of the same family. The females which have attained maturity show a greater fullness of the abdominal cavity. The back is arched, somewhat more so from the first dorsal fin rays to the head, on top of which it continues in a line which is slightly convex, varying somewhat between males and females. The large mouth is almost horizontal, with strong jaws, the lower prominent and the upper somewhat protractile. On the premaxillary there is a band consisting of tiny conical teeth, somewhat larger in the outer row. This band is separated in the middle. In the mandible there is also a band of little teeth, a bit larger on the outer edge. The teeth in both jaws are sharp, conical, and visibly curved inward. The nostrils, which show quite large tubes, are located at the edge of the snout. The head has large scales, except on the snout and jaws.

On both sides of the head, almost in the center and close to the mouth opening, are the large eyes, crossed by a dark band which is darker in the males than the females.

The single dorsal fin, which is long, has many variations in the amount of rays between the males and females. This also applies to the anal fin. Both are much more developed in the male. Here the dorsal begins approximately in the center of the body (not counting the tail fin) and the pectorals overlap the origin of the anal fin with their long rays. The anal and dorsal continue to a point near the first rays

of the caudal base. In the female, however, the pectorals do not reach back to the anal, which also does not extend to the caudal base.

The number of rays follows:

Males: Dorsal, 21-23; anal, 27-31.

Females: Dorsal, 14-19; anal, 24-27.

To continue, according to Ahl¹¹, we give the systematic key for the determination of *C. bellottii* exclusively, for the purpose of easy determination of this fish.

A. 28-30 scales in a longitudinal line.

B. Eye approximately 4 times and the interorbital space 2 times the width of the head.

A very young pair of *Cynolebias bellottii*.
Photo by G. J. M. Timmerman.



COLORATION

The coloration of these little fishes varies greatly with the sexes, which was one of the reasons behind the mistake when the males and females were considered to be individuals of different species.

Male: coloration varies constantly, depending upon the season, the place where caught, the state of excitement, etc. We have obtained specimens which were newly captured in very cold water, a light pink in color, which disappeared after a day in aquaria where the temperature was higher than 30°F. The color usually of the male *C. bellottii* is blue, varying from dark to sky blue, the darker area being always found in the upper part of the body.

The body, from approximately the region of the gill-plates and the dorsal, anal, caudal, and the base of the anal, shows silvery or half-golden spots which become more pronounced in breeding time; the pectoral fins have an interior edge of blue. The male with this most beautiful blue coloring, although it is a real aquarium pet, is often not given its deserved importance because of the ease with which we can obtain it.

Female: the color of the female is more modest. Base color is light brownish, crossed by an irregular series of dark brown bands which begin at the gill-plates and extend, continuing into the dorsal and anal fins, to the caudal base. The other fins are colorless. The back sometimes shows a very pretty metallic gleam.

BIOLOGICAL OBSERVATIONS

Much has been said about the means of reproduction of *C. bellottii*, but we can assure that some things are exaggerated and also invented about this question. We are still not in any condition to express the final word on the life details of this little fish, but for the time being the present study should only serve as an introduction to more complete studies.

The *Cynolebias* are fishes which live in a medium which may become unstable or not, although almost always the former is the case, that is to say that the water in the pools, swamps or ditches in which they occur does not always support them without drying out in the hot months of the year. By virtue of this, the habitats of these fishes are surprising by the precarious conditions and also by the small amount of water they contain. It is surely no exaggeration of this material to state that in a pool barely a yard in diameter and 8 inches in depth it was possible to fish out 20 or 30 individuals in excellent condition, not only of this species but a larger one, *Cynolebias holmbergi* (?). We also found two specimens in a puddle 6 inches in diameter which were in perfect condition.

The strange behavior of this fish caused many specialists as well as neophytes to become interested in it. Indubitably the most attention was attracted by the fact that in places which became completely dry in the course of the summer, when the first autumn rains fell and there was a little water, it became populated shortly by these fish, which grew with extraordinary rapidity. Surely, and pardon me for the comparison, the first observers of this event probably thought that the philosophers of the Middle Ages were right to explain the origin of life to be spontaneous.

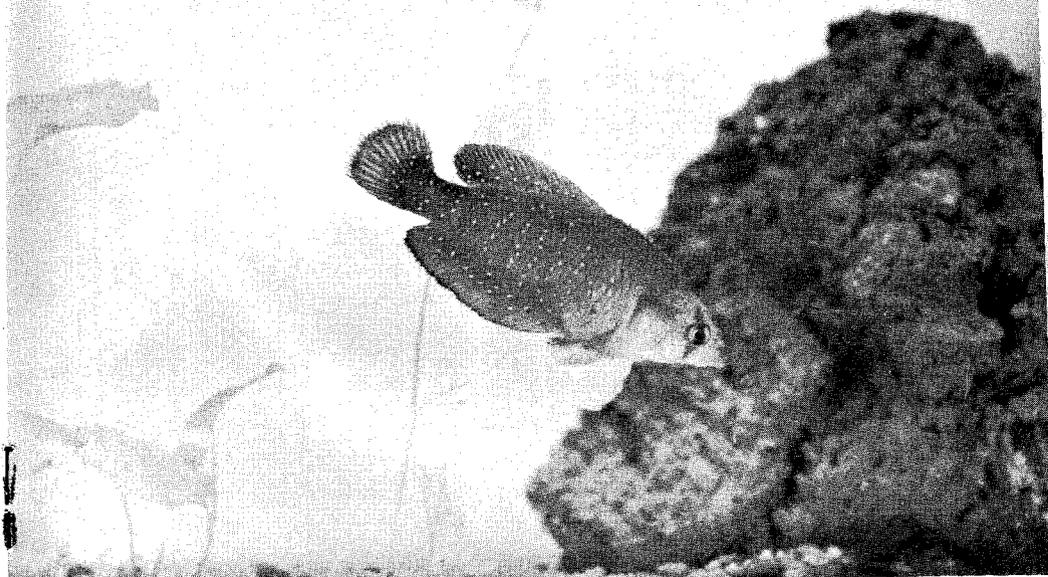
Later investigation solved this mystery. As we said earlier, the places inhabited by *C. bellottii* may become dry in the summer or not. In accordance with these two perspectives, there are two possibilities presented. In a case where the

water dries out with the heat of the summer, the adults would die, but having buried the eggs in the mud or sand on the bottom, they hatch with the coming of the autumn rains, after having withstood the dry period. The other case is simpler; if the water does not disappear completely, and the water remains favorable, the adults survive, but their eggs, without their period of "incubation" in a dry medium, do not have embryos at the end of the period. We will explain these two points in detail.

When the pools begin to recover part of the water which they contained in the course of the winter, the eggs receive the beneficial moistness and hatch. It is interesting to point out that the period when the eggs must remain dry, or with a minimum of moisture, can vary considerably, maybe for the entire summer (December to March), or just a few days. We can verify this by the following fact: there is a pool in "Parques Derechos de la Ancianidad" which was about to lose its water in the middle of last December, when at this date (1952) we caught some specimens of *C. bellottii* in a very poor state of nutrition. Indubitably the small amount of good water did not offer much in the way of food. An analysis of the intestinal contents revealed the existence of a small amount of tiny aquatic crustacea and mud. As we can see, this is not a normal type of nutrition.

In the month of January of this year it was very rainy, causing a pool after the first intense precipitations which took place on the 10th to 12th. The water was brought up to the normal level for the winter. We returned to this place on the 7th of February and at this time were able to fish out some quantities of *C. bellottii* of a size which varied from $1\frac{1}{2}$ to $2\frac{1}{2}$ cm. ($\frac{3}{4}$ to 1 inch). Another species of *Cynolebias* was also found, of a larger size, the specimens of which measured from 2 to 3 inches, but much less in proportion. The immature size of these made identification impossible. If we figure the time that the embryos need to hatch, from the moment they received the rain water and the time the

largest individuals were found, we can estimate that the eggs were dry for only a short time (we suppose not more than 15 days).



A relative to *C. bellotti* is the rare *Cynolebias nigripinnis*. This is a male. Timmerman photograph.

The recently hatched fry grow rapidly, with a speed which is not very common among fishes, attaining a sexual maturity in a short time, then immediately beginning to lay eggs. One fundamental condition is necessary to accomplish this: abundant food. Nature has been generous in this respect because at the same time that these fishes hatch and grow, the same waters hatch an infinite number of crusta-

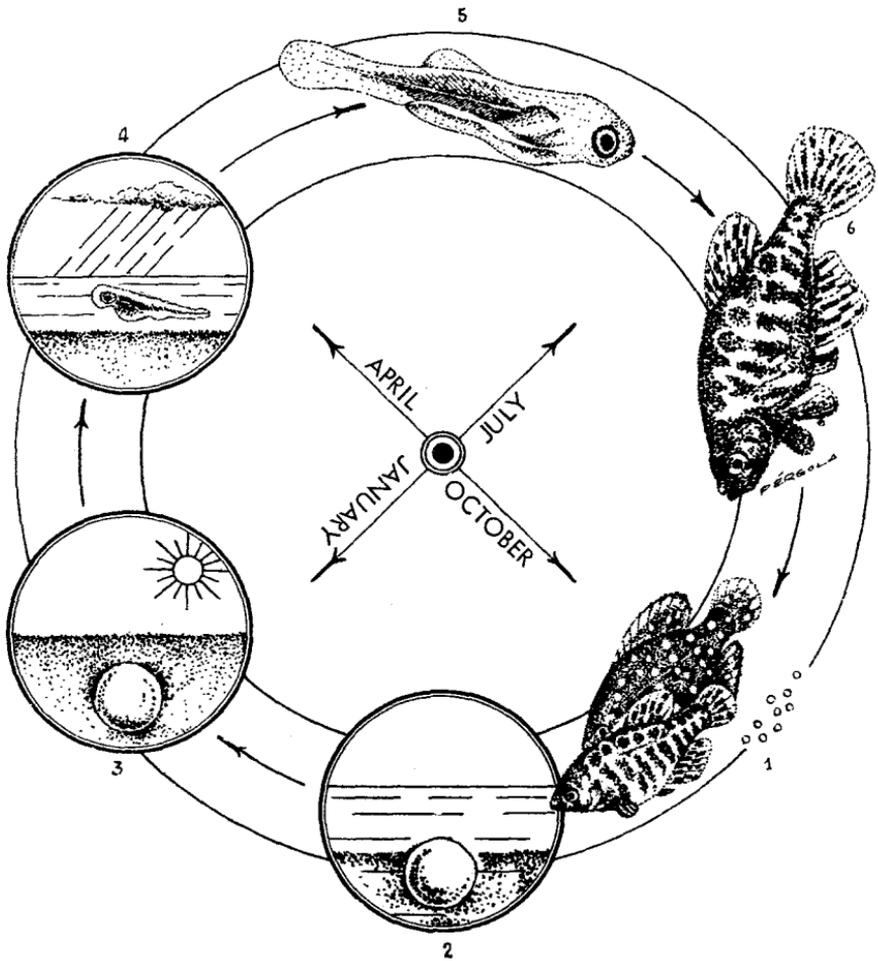
cean plankton, providing in this way a constant supply of fresh food.

This fact has considerable significance, as we see that the life cycle of these fish is short, all the functions necessary to sustain life being completed in a relatively short period.

Usually the life span of *C. bellottii* covers the following period: from the first autumn rains, in the month of March, (the January rains in the year mentioned constitute an exception), hatching begins, followed by rapid growth, continuing to the end of August and the first days of September, the adult stage, reserved for the spawning, with a size of 2 to 3 inches. Breeding continues as long as the water continues to be favorable, generally no later than December, the season in which the pools dry out.

It has been said that in order to get the *Cynolebias* to lay eggs, it is necessary that the pool, or the aquarium if kept in captivity, must be lowered as to water level, giving them in this manner the sensation that there are not many days left to remain alive, under which circumstances they begin to lay eggs. We are in a position to affirm that this does not correspond with the truth. The *Cynolebias* begin to lay eggs as soon as sexual maturity is reached, without any more urging than their reproductive instinct.

The spawning of these fishes is truly interesting and never ceases to have very particular characteristics. The male goes in search of the female, gets close to her, bringing his body close to hers and with wriggings, performed especially by the male, the pair buries their heads in the mud or sand of the bottom, and continuing their undulatory movements they sink deeper, at this moment depositing an egg. After a brief pause for 2 or 3 minutes, the act is repeated. The most interesting part of this act is that the male does not select any particular individual fish for the spawning act but after one has been depleted, he carries on with other females. After each egg has been deposited,



The life cycle of *CYNOLEBIAS BELLOTTII*:

1. The pair spawning.
2. The egg lies dormant in the mud.
3. The sun evaporates the water and the egg hatches.
4. The rains come and the fry hatches.
5. The fry grows at an amazing rate.
6. He reaches maturity and seeks a mate.

the male shows signs of exhaustion, rests a few moments, then begins again. The eggs have a diameter of 1 to 1½ mm, are a clear yellow in color, transparent and non-adhesive.

As we said before, egg-laying in the natural state is prolonged over many months, always provided that the water has not varied from its favorable conditions. In the aquarium this lasts only a few days, because it becomes very difficult to continue to provide food in the quantity and quality which this little fish requires to maintain an optimum state of nutrition, essential for a prolonged spawning. Then again, we have given little attention to raising fry of this fish, owing to the ease with which we can get them. We will speak of this later.

Furthermore, a thing which is uncommon among fishes, the *Cynolebias* require neither a great deal of quiet nor any special water conditions, nor any of the most elementary requisites demanded by the most easily bred of the egg-layers for their reproduction; things have gone to such extremes that we have gotten spawnings in the cans where they were kept after catching them, in the short period of time required for the trip from the pools to our aquaria.

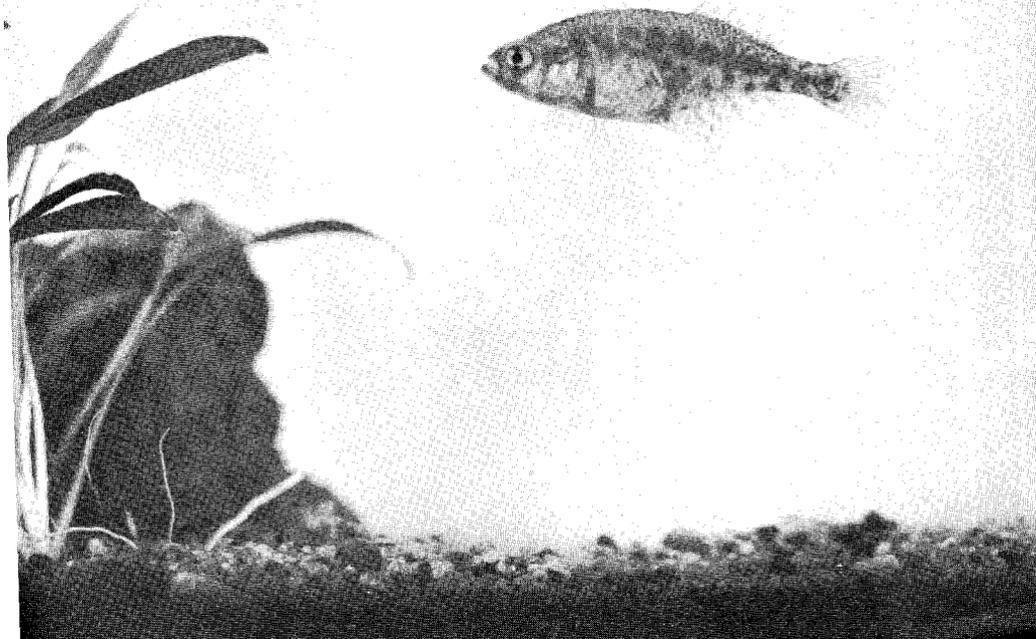
Therefore we can add that the *Cynolebias* will spawn in receptacles where the bottom is completely bare, which proves to us that mud or sand are not essential materials for the spawning of this fish.

The reproductive act of this Cyprinodont is so easy to obtain that it is just a matter of planning it at any desired moment, then performing the simple task of bringing together a pair. One condition is necessary; that the female is carrying ripe eggs.

In no case have we observed a discrepancy in parents except that in individuals which differ in size, excluding of course the moment of mating, because in other times the battle between individuals of the same or opposite sexes is continued.

If the water of the pool does not dry up completely, as we said before, the fishes might live during the summer. This is very infrequent, first because almost all waters inhabited by *Cynolebias bellottii* are without water in the hot months and if this does not disappear completely, the water, losing part of its favorable conditions, because of the intense heat, etc., causes danger to the lives of the fishes, which cannot live without abundant food. This is not to say, however, by any means, that these fishes cannot live for more than a few months, just until the end of the egg-laying season. We have kept this species of *Cynolebias* perfectly for more than a year, even in the course of the warmest months, when high temperatures were withstood.

A female *Cynolebias nigripinnis*. Photo by Gerard Jesus Maria Timmerman.



tured, the lack of food was evident. This was not noticed in the specimens which were preserved in formalin immediately upon capturing them.

We were able to maintain this fish in excellent condition in receptacles which were provided with a large quantity of daphnia; under these conditions they did not become thin, and furthermore the females eventually spawned.

If cladocerans cannot be supplied, they can be given tubifex worms or raw meat, which they accept, but this is not a preferred meal. If fed with meat, special care should be taken to cut it into bits which are sufficiently small that they can be swallowed without difficulty, otherwise, because of the fact that the mouth is ample enough to seize the piece without difficulty, if the piece is too big it cannot be swallowed, the throat being narrow and at the same time it will not be possible to spit it out, owing to the teeth being hooked inwardly impeding this action, a situation which will end by killing the individual.

WATER

The water in which we capture *C. bellottii* varies greatly in pH, but almost always inclines toward alkalinity. This is explainable because the pools inhabited by these little fish are almost always small and the standing waters, with their continual contact with the ground, dissolve the alkaline salts contained therein (carbonates and bicarbonates), adjusting the water to an alkaline pH, which rises slowly. The pH registered varied from 7.0 to 8.0, but always in pools which contained water standing for 3 or 4 months. On the other hand, in places where rain had recently fallen the pH was highly acid to neutral; this is also explainable, if we consider that rain-water is acid. We have kept *C. bellottii* very well in water of pH 6 to 7.5 with the same results, at least as far as living goes.

We kept specimens in outdoor receptacles, which were exposed to the direct sunlight for various hours of the day, which as a result brought the water over 95° without apparent harm; without a doubt this was not an ideal condition for this species, which prefers lower temperatures.

We insist that the fundamental reason why this fish lived in this season is because it had good food in constant supply. When the pools in which they live become unfavorable and the volume of water is reduced, the food becomes scarcer, because it is being shared by all the fish living in the place. This in turn affects the *Cynolebias* and they are quick to die.

We must sum up finally something more on this subject. It can happen that the two possibilities of which we speak might combine; this occurs if the pool which they inhabit drops in level but does not dry out altogether, with the result that part of the banks are dried, where surely the adults have laid eggs, and then when the normal volume returns with the rains, the embryos hatch.

We see, then, that these fishes have adapted themselves marvelously and in an uncommon way to their conditions, in this way assuring themselves the survival of their species in spite of any eventuality.

The maintenance of this beautiful little Argentine fish requires certain care, which perhaps exceed somewhat those given many of our more common aquarium species. We believe and always insist that the thing we must observe especially is its feeding.

FEEDING

The natural diet of *C. bellottii* consists exclusively of animal organisms. This is confirmed by their tooth structure, the shape of the jaws, and the shortness of the intestinal tract, characteristics which give enough clues as to define the type of diet of this fish. Besides, we were able to make analyses of the gastro-intestinal contents of a number of specimens obtained in different seasons and distinct pools and ditches located in "Parques Direchos de la Ancianidad", Bancarli, Garin and Tigre***, Province of Buenos Aires, which revealed that in every case where the specimens were found in a normal state of nutrition, the digestive tract was stuffed especially with Cladocerians (the specimens from "Direchos de la Ancianidad" almost exclusively with Cladocerians of the genus *Chydoridae*), Amphipods (*Hyaella*), a specimen from Garin which measured 2¼ inches in length contained 19 of these crustaceans and 3 small ostracods. Other individuals contained the organisms originally mentioned. In some specimens, we found some mud, but this was surely ingested while eating ostracod crustaceans which were mixed up with it. Of all the specimens analyzed we were not able to find any case of cannibalism, although we also found young specimens of *Cnesterodon decemmaculatus* and *Jenynsia lineata* frequently in the *Cynolebias* pools. In captivity they are eaten.

We deduce from all this that feeding should be constant, avoiding the skipping of meals for any prolonged time, because as we have seen these fish eat constantly. A lack of nutrition affects the *Cynolebias*, and they are easily distinguished by a reduced volume of the abdominal cavity. On an occasion a number of young specimens were captured and brought to our aquaria; in the brief space of one hour or thereabouts that they were in the cans in which they were transported from the place in which they were cap-

tured, the lack of food was evident. This was not noticed in the specimens which were preserved in formalin immediately upon capturing them.

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TEMPERATURE

The temperature may also vary considerably. We have already referred to individuals kept at 95°, and we have caught them at still higher temperatures. Messrs. Nani and Bachmann, in Manzanares, province of Buenos Aires, caught *Cynolebias* in waters which were frozen at the surface, varying from 32 to 40°, in excellent condition. The best actual temperature for this fish is from 58 to 68°.

LIFE IN THE AQUARIUM

One of the great inconveniences when keeping this fish in aquaria is the ferocity found in a relatively large number. These fish battle continuously among themselves, but the interesting thing is that they can get along relatively well with other species, providing they are of the same size.

One can say without fear of lying, that it is almost impossible to successfully put together several males without damage. As we have said before, the pairs only accept each other at the moment that they spawn, but outside of this moment there is fighting between males, or between females, or even between members of opposite sexes, until the strongest conquers his rival, damaging him. In an aquarium with many plants and good feeding the fighting tones down somewhat, but in spite of all, it is not advisable to keep many individuals together. Because of the happy circumstances by which this fish is able to live in a small space, they may be kept like Bettas in divided tanks or otherwise in individual jars of 5 or 10 litres (quarts) capacity, where they grow up well.

As we have seen, these fish have their inconveniences, but they compensate for their shortcomings by their beautifully colored bodies. At times, for apparently inexplicable reasons, they stop eating and waste away without stopping until they die; we must record that the scalares sometimes

do the same. Furthermore, these fish are easily attacked by *Ichthyophthirius multifiliis* and it is not rare to find them in their habitat covered with this protozoan.

We must consider, on the other hand, that we are dealing with a creature which is taken from its natural surroundings, and in order to keep them we are confronted with a series of difficulties which do not present themselves when keeping species which have become acclimated to aquaria.

Another of the questions which might occur to the hobbyist on introducing a number of *Cynolebias* of both sexes to the aquarium in the early spring, is the cause of the voluminous abdominal cavity of the females, and why it disappears in a few days. This can be explained with two reasons. First, as we have said, a scarcity of food and second, a large number of expelled eggs. Surely, in their natural surroundings, the females would not be faced with the possibility of being as much in contact with males which oblige them to lay eggs continually, as they are in an aquarium of small dimensions. This we were able to verify always when mature females were obtained; the males were in constant pursuit, forcing them to lay eggs.

In their habitat, the *Cynolebias* prolong greatly the process of egg-laying. On the other hand, production of eggs is constant, and they are found inside the females in distinct stages of development. In a specimen which measured 2½ inches in length, more than 200 eggs were found of distinct sizes, in a single ovary.

- * *There are 7 species of Cynolebias found in the Argentine Republic, many with a dubious scientific identification.*
- ** *Dr. Berg, besides Cynolebias bellottii, refers to other species of Cynolebias in this work.*
- *** *We are grateful to Mr. Osvaldo Fernandez Santos for his collaboration in obtaining the material studied.*

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