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The Toothcarps and Higher Units

As a rule, related fish have many traits in common: the closer the relationship, the more common traits. Breeders of tropical fish use this when trying to breed aquarium fish that previously have not bred in captivity. Aquarists therefore may need information on the relationship within the group of fish they keep.

Killies belong to the order Cyprinodontiformes (Cyprinodontes) or Microcyprini. The origin of the members of this order seems to be somewhat obscure. Very often the toothcarps which is the popular name for the fish in this order are considered as relatives of some of the pike-like fish (order Esociformes), in particular of the rare Umbra which lives in freshwaters in Southeast Europe and the USA. Other zoologists consider the toothcarps as direct descendents of some old herring-like fish (the extinct suborder Leptolepoidei which lived between upper Triassic and middle Cretaceous, that is to say 100-200 million years before our time) in the order of Clupeiformes. Also the garfish relatives (order Beloniformes) are often placed in some connection with the toothcarps. The best known aquarium fish from this order are the Dermogenys, but also the common garfish and the flying fish belong to this order. Besides this, the very small order of Phallostethiformes have been placed near the toothcarps (Berg a.o.) but also near the order Mugiliformes. The Phallostethiformes are only known by a small number of aquarists. The few species live in freshwater and are generally very small. They look very much like toothcarps, but some of the species have two dorsal fins (the anterior one is very small, but it has spines instead of rays). Tek's "minute Oryzias" may belong to this order (see previous pages). The Mugiliformes contain several good aquarium fishes: the rainbowfish (Melanotaenia), Celebes rainbowfish (Telmatherina) and Bedotia species from Madagascar. Wickler (Zoologischer Anzeiger 1959) considered these questions and proposed the following figure as a question:

(figure missing)

The order Cyprinodontiformes normally is divided into 2 suborders: Amblyopsidei (blind cave toothcarps) and Cyprinodontoidei or Poecilioidei (proper toothcarps). Amblyopsoidei only contain a few species within one family, the Amblyopsidae restricted to the USA. Berg names 4 genera: Chologaster, Typichthys, Trogichthys and Amblyopsis. There is or has been a fifth genus: Forbesichthys. Only in Chologaster do some species have normal eyes (C. cornutus) and live in ditches and pools. This species has been imported as an aquarium fish - slender Fundulus-like fish, 15 cm, with 3 thin and dark

longitudinal stripes on sides. In C. papiliferus however, the eyes are somewhat degenerated. In the species Typlichthys, the eyes have no rods and cones on the retina, but still the nerves run from the retina to the brain. In Amblyopsis also the pupil is closed. In Troglichthys, one finds the maximum of eye degeneration. A. spelaeus from Ohio-Kentucky has been imported as an aquarium fish to Germany as early as 1899. The shape of this blind fish is like C. cornutus and the other species. 13 cm. It does not like any shaking in the tank, probably because other sensitive organs are highly developed. All species are ovoviviparous, that will say that eggs develop within the female. They hatch at once when they come out into the water. The anal fin of the males does not change into a gonopodium. How eggs are fertilized, I do not know.

Cyprinodontoidei often is divided into 2 or more superfamilies. Sometimes zoologists consider 2 superfamilies: one containing the oviparous (egg laying) and another containing the viviparous (live bearers). I use Niolski's division:

- Cyprinodontoidae (killies and others) egg-laying
- Tomeuroidae egg-laying
- Poeciloidae (gambusinos and others) live-bearers

Cyprinodontoidae may be toothcarps that are closest to the forms which lived many millions years ago (fossils about 40 million years old are known). This superfamily is divided into 2 families:
- Cyprinodontidae (killies)
- Adrianichthyidae

The family Adrianichthyidae is restricted to Celebes (freshwater lakes) and has at least 2 genera: Xenopoecilus and Adrianichthys. I know nothing about these fish.

The family Cyprinodontidae contains very many species in very many genera. It has been divided in several ways. Possibly this division is "up to date" (Myers 1955).

- Cyprinodontinae (the Pursy Minnows) Old and New World, Northern Hemisphere
- Fundulinae (the Fundulins) New World only, Northern Hemisphere
- Oryziasinae (the Medakas) Far East only, Northern Hemisphere
- Lamprichthyinae (maybe part of "e") Lake Tanganyika only
- Procatopodinae (the lampeyes) Africa only
- Rivulinae (the Rivulins) Old and New World (largest subfamily)
- Orestiinae (?) Lakes in Andes Mountains, South America
- Pantanodontinae (toothless lampeyes) Tanganyika only

In 1955 Myers mentioned in a short note an "Amazon lampeye" which he named Potamophylax pygmaeus. I have not found any further information on this most interesting fish which may belong to its own subfamily.

Tomeuroidae possibly contains relicts only. It has 2 families:
- Tomeuridae (Tomeurus in South America)

- Horaichthyidae (Horaichthys setnai only from Bombay, India) see previous page.

These two odd fishes are very much alike in the general appearance, however this may be due to convergence. They are "lampeyes" or "Oryzias like" fish. Potamophylax may belong to this group. Temeurus has been included in the Poeciloidae inside the family Poeciliidae (gambusinos).

Poeciloidae the live bearing toothcarps generally are divided into 4 families:

- Goodeidae Mexico and Central America
- Jenynsiidae Southern South America
- Anablepidae (the 4 eyed fish) Central and Northern South America
- Poeciliidae (the gambusinos) New World only

In 1950 Hubbs described a most interesting and odd fish Xenodexia ctenolepis from Guatemala and proposed a certain subfamily (Xenodexiinae) within Poeciliidae for this fish. This species has ctenoid scales (as Lamprichthys). The right pectoral fin of the male is transformed into a copulation organ.

As aquarist however I am not able to deal with the very difficult division of the killie relatives. Therefore I studied among other papers 2 books which I bought recently: G.W. Nikolshy "Spezielle Fischkunde" 1957 and L.S. Berg "System der rezenten und fossilen Fischartigen und Fische" 1958, both translated from the Russian language. Any comments to the division mentioned above will be very welcome.

The "killie family", the Cyprinodontidae

On the previous pages I tried to place the killies in connection with the other toothcarps and with fish in related orders. Further notes on other families within Cyprinodontiformes is outside the scope of these letters.

The family of killies is the greatest family of toothcarps, containing about 400 zoological species (some of these may prove to be errors (synonyms) or subspecies, races or even varieties when modern zoologists consider them). These species are united within about 50 different genera and 7-8 subfamilies. This vast amount of species and forms makes it difficult - even for the aquarist specializing on this family of fish - to ascertain all killies. In the previous section you will find some subdivision of this family into subfamilies. In the next section you will find some subdivision of the subfamily Rivulinae.

Generally the subfamily of "Pursy Minnows" (so Myers calls them), the Cyprinodontinae are considered to be the forms that are closest to the ancestors of killies. This group contains the robust, deep-bodied killies related (or proposed to be related) to the American genus Cyprinodon.

Old World Forms: Cyprinodontinae

Aphanius (Mediterranean area, Near East)

- A. burduricus (southern Turkey) 2 subspecies
- A. chantrei (southern Turkey) 11 subspecies
- A. cypris (Turkey, Syria, Iran, Irak, Israel etc.) 4 subspecies
- A. dispar (shores of Arabia)
- A. fasciatus (shores of eastern mediterranean Sea)

- A. glanosis (shores of eastern Persia)
- A. iberus (shores of western mediterranean Sea)
- A. sophiae (as A. cypris) 3 subspecies
- A. zaccarini (Somalia) 2 subspecies

Anatolichthys (Southern Turkey) like Aphanius, but scales reduced
- A. burdurensis
- A. splendens 2 subspecies
- A. transgrediens (formerly Turkichthys transgrediens)
- Tellia (Atlas Mts. of Algeria, often united with Aphanius) no pelvics
- T. apoda

Kosswigichthys (southern Turkey) no scales, like Aphanius however
- K. asquamatus

Valencia (mediterranean area) robust, Fundulus-like, primitive
- V. hispanica (Spain, near Valencia)
- V. letourneuxi (Crete and Corfu)

All forms, except Valencia perhaps, are very closely related to Aphanius. The Turkish inland forms possibly are relicts of the time when Minor Asia was lifted up from the Tetnys Sea. More fossils of killies have been found in Italy, France, SW Germany, and Persia. These fish appeared in Oligocene-Miocene (30-40 million years old) at the time of the uplift. Several forms are kept as aquarium fishes in Europe.

New World Forms:

Cyprinodon (USA, Mexico, Antilles, and northern South America) 21 zoological species (plus 10 subspecies). The center seems to be the USA. From here they disperse into the Antilles, down to northern Venezuela (Lake Maracaibo) and Curacao. Species are very like Aphanius, but generally more robust. Some are rather handsome. Like many Aphanius also Cyprinodon often are found in brackish water and even in the Sea. Many relict forms are found in the deserts in SW USA under severe conditions. Water temperatures up to 40.0 C.

Jordanella (Florida, Yucatan in Mexico) related to Cyprinodon
- J. floridae (a common aquarium fish many years ago)

Floridichthys (Florida, Yucatan) related to Cyprinodon
- F. mydrus

Garmanella (Yucatan) related to Cyprinodon
- I do not know the name of the sole species in this genus

Cualac (Mexico)
- C. tessellatus (a relict fish, "missing link" between Cyprinodontinae and Fundulinae)

Fundulinae (2 subfamilies of killies) (Canada, USA, Mexico, Central America, Antilles, and Northern Venezuela???) This subfamily generally is separated from the Cyprinodontinae by the form of the teeth. Recently however Turkish zoologists showed (by crossings) that the European forms of Fundulinae (Kosswigichthys and Valencia) should be placed within the Cyprinodontinae. In his description of Cualac, R.R. Miller showed that perhaps the tooth form does not separate these two subfamilies in the

New World.
Adinia (USA in Florida and Texas)
- A. multifasciata (3.5 cm, Fundulus like, 9 silvery crossbars)

Cubanichthys (Cuba) (Cyprinodon like??) near Chriopeops
- C. cubensis (common aquarium fish)

Leptolucania (southern Georgia to Florida, in swamps)
- L. ommata (4 cm, slender, Fundulus like, "Rivulus spot" on tail)

Chriopeops (Florida)
- C. goodei (the "blue fin", well known aquarium fish)

Chriopeoides (Jamaica)
- C. pengellyi (very much like Chriopeops goodei, no red in fins, reduced blue color, 3.5 cm)

Lucania (New York to Texas, "rainfish")
- L. parva (common in the eastern USA, L. venusta may be a subspecies)

Fundulus (Canada, USA, Mexico, Bermudas, and Cuba)
- According to R.R. Miller (1955) there are 26 different species and a number of subspecies. Some are kept as aquarium fishes.

Oxyzygonectes (Costa Rica)
- O. dovii (Panchax like, 15 cm, no particular pattern)

Profundulus (southern Mexico, Guatemala) This genus is considered to be the form from which the other forms appeared. The 5 known species live in the mountains of Central America. Miller considered these species to be "good":
- P. guatemalensis
- P. punctatus
- P. labialis
- P. candalarius
- P. hildebrandi

Empetrichthys (Nevada, USA) - relicts? Live in the desert. Not handsome.
- E. merriami
- E. latos 3 subspecies

Crenichthys (Nevada, USA) near Empetrichthys, also a desert fish
- C. nevadae
- C. baileyi

Hubbsichthys (near Lake Maracaibo, northern Venezuela)
- H. laurae (near Chriopeoides of Jamaica)

Orestiatinae (no pelvics, lakes in the High Andes Mts., South America) Last revision (1945) gave 20 species and a number of subspecies. Biggest are 24 cm, smallest 3 1/2 cm. Shape and pattern much like the general Cyprinodontinae. No importance as aquarium fish. Most species live in or near Lake Titicaca.

Rivulinae New and Old World. The biggest subfamily!

- Oryziatinae (India to Japan and Indonesia)
- Procatopodinae (Africa only)
- Procatopus (Nigeria, Cameroon, see pages before)

- Hypsopanchax (Gabon, Congo Basin, Lake Edward) "Hatchet killies" 5 cm.
- H. zebra (Gabon in the Ogoou_ Basin, 5.2 cm, dark crossbars)
- H. deprimozi (Lake Edward, no crossbars)
- H. platysternus (Belgian Congo at Stanleyville, this crossbars, 4.2 cm)
- H. stictopleuron (French Congo at Oka, 3.4 cm, no pattern)
- Micropanchax (most parts of Africa, except dry areas)

Too big to be considered here. Confused mass of "species" - 46 different on my list. These are the "pure lampeyes":

- Aplocheilichthys (deeper body, crossbars in males)
- A. spilauchen (brackish water along the Guinea Gulf) 7 cm
- Platypanchax (to be placed after Hypsopanchax)
- P. modestus (Nile Basin) very near Hypsopanchax
- Cynopanchax (possibly a Micropanchax)
- C. bukobanus (3.3 cm, broad, dark lateral band, like Micropanchax)
- Plataplochilus (possibly a Micropanchax)
- P. ngaensis (Nga River, Cameroon)
- Lembessia (near Micropanchax, also near Hypsopanchax)
- L. parvianalis (Oka in French Congo)
- Lamprichthyinae (may be a tribus within the Prcatopodinae)
- L. tanganicus (Lake Tanganyika, 13 cm, handsome lampeye)
- Pantanodontinae (toothless lampeyes)
- Pantanodon
- P. podoxys (Dar-es-Salam, Tanganyika) I have no details

This revue of killies will not give you very much information on the various species concerned. However, it could be used to make an impression of the distribution of species and of the connections between the many forms. As far as possible I intend to deal with all genera from which species have been imported as aquarium fish. However, some genera could not be handled, as no zoologist seems to have been considering these for a very long time. Only more species have been added without considering the whole mass of species hitherto described.