A Review of Family-group names for oviparous Cyprinodontiformes (Pisces; Teleostei).

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Abstract :
A full review of the family-group names for oviparous cyprinodontiformes fishes (Killifish) is proposed, according to authorship, date and spelling of each. The family Cyprinodontidae from which the order is derived is newly attributed to Wagner (1828). Aplocheilidae is attributed to Bleeker (1859), while Poeciliidae and "Anablepidae" are confirmed or newly attributed to Bonaparte (1831). Two neglected senior family-group names, "Hydrargyrinae" and "Tellianini", are discussed, but are considered as disused. The spelling of family-group names is reviewed and possibly corrected in order to abide to the code of nomenclature : these are all names derived from genera ending by *Lebias* and names derived from the genera *Adamas, Anableps, Aphyosemion, Epiplatys, Orestias, Procatopus.*

Key words : oviparous cyprinodontiformes, nomenclature, family-group names

Résumé :
Une révision complète des noms du groupe famille appartenant aux poissons cyprinodontiformes ovipares (Killies) est proposée, pour ce qui est de l'attribution de l'auteur, de l'année de publication et de l'orthographe de chacun d'entre eux. La famille Cyprinodontidae, à partir de laquelle l'ordre est dérivé, est attribuée pour la première fois à Wagner (1828). La famille Aplocheilidae est attribuée à Bleeker (1859), tandis que celles des Poeciliidae et "Anablepidae" sont confirmées ou nouvellement attribuées à Bonaparte (1831). Deux noms négligés du groupe famille, "Hydrargyrinae" et "Tellianini", au statut senior, sont discutés et considérés comme inusités. L'orthographe des noms du groupe famille est revue et éventuellement corrigée pour s'aligner sur les règles du code de nomenclature : ce sont tous les noms dérivant de genres se terminant par *Lebias* et les noms dérivés des genres *Adamas, Anableps, Aphyosemion, Epiplatys, Orestias, Procatopus.*

I. Introduction

The case of the family-group names for oviparous Cyprinodontiformes (Killifishes) has arisen following the recent "problematic" erection of a third family of Aplocheiloids, Nothobranchiidae, by Costa (2004a).

Indeed, the split from 2 families (Aplocheilidae for the Old World and Rivulidae for the New World) into 3 families was not a difficult one in terms of systematics, since the molecular work by Murphy & Collier (1997) and the morphological and paleo-biogeographical work by Huber (1998) were congruent with Costa's osteological results.

The problem was elsewhere and had two sides, one in terms of nomenclature and the other of seniority.
First, Costa erected Nothobranchiidae (for Africa), while Aplocheilidae was restricted to India-Madagascar-Seychelles. The name was proposed as a new usage from a single mention by Garman (1895 : a simple footnote at the end of his monumental work). But it appeared that Nothobranchiidae, fully diagnosed by Costa, had also been proposed with precise contents, but no diagnosis, by Radda in Radda & Pürzl (1981). Were these senior mentions to be considered as available according to the code of nomenclature ?

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Second, Costa's definition of Nothobranchiidae appeared to be identical, in terms of its diagnosis and its included generic components with another family name, Epiplatidae, proposed by Murphy (1997) in his Ph.D. thesis (but not by Murphy & Collier 1997) and by Huber (2000). Which of the two family-group names was to be considered as senior and valid ? Should Murphy's thesis be considered as published and thus available according to the code of nomenclature, together with all the family-group names that he proposed, all followed by Huber's published book of 2000? What would be the correct wording of Epiplatidae, since Lazara (2001) had mentioned "Epiplatyidae"?

The present author directed these questions to Prof. W.N. Eschmeyer, California Academy of Sciences, as a specialist in nomenclature, but the matter raised many further questions and problems regarding family-group names for oviparous cyprinodontiformes fishes or Killifish (notably the "ti's" in spelling), and the situation seemed confused overall. It appeared that most family-group names had been neglected in the recent past in this group of fishes, and then they had to be reviewed in depth. Also that all modern authors, specialized in Killifish, including the present author, made errors on family-group names, for senior priority and/or spelling. Hence, this paper, spurred by Eschmeyer's feedback and guidance, has been decided in order that if an author wants to establish, for example, a new subfamily of Killifish in the future, he or she should be able to look at this paper and if one of the genera in his or her new subfamily has a family-name already, then that name must be used, even if the concept of included genera changes.

Two types of issues were then to be solved for each available family-group name :

1. Seniority : what is the oldest publication of a given name in literature that may be considered as available by ICZN? The task is to find the earliest qualifying names/authors/dates.
2. Wording : what is the correct spelling for each family-group name? The task is to bring it conform the ICZN rule of emendation of the type genus name. According to ICZN code, and as stated by Steyskal (1980), "the group names are those formed upon a basonym to which suffixes and compounding elements are added". The basonym is derived from the genitive form of the type genus, and this depends on the way each generic name is formed, i.e. from Latin, from Greek, or from other sources.

Let's summarize, first, the rules of the code of nomenclature on these topics to get their spirit.
The name can be first introduced as a family, subfamily, superfamily, tribe or subtribe (Article 29). They are of equal rank so to speak. A family can be “upgraded” to a superfamily and keeps the same authorship/date. The names found can be used at any level in the family-group category and always keep the same author and date. The tracing of the first author of a certain family-group name is then critical. It is a difficult job as one has to check a huge amount of literature and there are various opinions on the subject.

Family-group names must be formed according to the name of the type genus (articles 11.7, 13 and 29). First point, the initial spelling can be very different than one would expect from ICZN, but it is still acceptable and dates to that author. However, it must be emended to a stem genus –Steyskal's basonym- (derived from its genitive form) plus a suffix. Suffixes are formative elements not derived from a base word. Such are idae (family) or inae (subfamily) or ini (tribe) or ina (subtribe), or oidea (superfamily), or more rarely used (not regulated by Art. 29), ida (infrafamily), idi (supertribe). Second point, it does not matter at what level the name was proposed, only that it was for a category above the genus, and not an order or suborder, and based on an available genus name.

In details, here are excerpts of the last ICZN Code (4th Ed., 1999), relevant to issues of family-group names :
Art. 11.7. A family-group name when first published must be a noun in the nominative plural formed from the stem of an available generic name, be clearly used as a scientific name to denote a supra-generic taxon and not merely as a plural noun or adjective referring to the members of a genus, end with a family-group name suffix (and if the suffix is incorrect it is available with its original authorship and date, but with a corrected suffix).

Art. 29.3.1. If a generic name is or ends in a Greek or Latin word, or ends in a Greek or Latin suffix, the stem for the purposes of the Code is found by deleting the case ending of the appropriate genitive singular.
Art. 29.3.2. If the name of a genus is or ends in a Greek or Latin word Latinised with a change in ending, the stem is that appropriate to the Latinised form, as determined in Art. 29.3.1.
Art. 29.3.3 If a generic name is or ends in a word not Greek or Latin, or is an arbitrary combination of letters, the stem for the purposes of the Code is that adopted by the author who establishes the new family-group taxon, either the entire generic name or the entire generic name elided, or the entire generic name with one or more appropriate linking letters incorporated in order to form a more euphonious family-group name.
Art. 29.4. If after 1999, a new family-group name is based on a generic name which is or ends in a Greek or Latin word, or ends in a Greek or Latin suffix, but its derivation does not follow the grammatical procedures of Art. 29.3.1 or 29.3.2, its original spelling must be maintained as the correct original spelling provided it has a correctly formed suffix (Art 29.2) and its stem is formed from the name of the type genus as though it were an arbitrary combination of letters.
Art. 29.5. If a spelling of a family-group name was not formed in accordance of Art. 29.3, but is in prevailing usage, that spelling is to be maintained, whether or not it is the original spelling and whether or not its derivation from the name of the type genus is in accordance with the grammatical procedures in Art. 29.3.1 and 29.3.2.
Art. 35.4.1. A family-group name based upon an unjustified emendation or an incorrect spelling of the name of the type genus must be corrected, unless it is preserved by Art. 29.5.
Art 35.5. If after 1999 a name in use for a family-group name is found to be older than a name in prevailing usage for a taxon at higher rank in the same family-group name, the older name is not to displace the younger name.
Art. 37.2. If the name in use for a family-group name is unavailable or invalid it must be replaced by the valid name.
Art. 39. The name of a family-group taxon is invalid if the name of its type genus is a junior homonym or has been totally or partially suppressed by the ICZN Commission.
Art 40.1. When the name of a type genus of a nominal family-group taxon is considered to be a junior synonym of the name of another nominal genus, the family-group name is not to be replaced on that account alone (except if the name has been replaced before 1961, as per Art. 40.2).
Art. 40.2. If, however, a family-group name was replaced before 1961 because of the synonymy of the type genus, the substitute name is to be maintained if it is in prevailing usage.

For the sake of clarity, here, the family-group names will be dealt with into 3 parts:

- The family-group name that stemmed the order Cyprinodontiformes
- The old family-group names (before first world war) with mainly seniority issues
- The recent family-group names (after first world war) with mainly wording issues

Obviously this work starts from the recent attempts of organizing a hierarchical pyramid of Killifish based on a synthesis of available publications (Huber 2000; Lazara 2001; and an unpublished work by Richard van der Laan, a Dutch University professor in Biology : Laan 2004, online) : for each family group-name, the publication considered by each of these three authors have been checked, then other earlier potential publications have been studied up to the date of description of the type genus of each. Next, the spelling of each family-group name has been analysed and eventually is proposed to be modified according to the rules of nomenclature.

All herein demonstrated data are synthesized in Table I.

II. The correct name and authorship for Cyprinodontiformes and the stem-family Cyprinodontidae

Up to the present work, Cyprinodontidae seemed to date back to Agassiz (1835). This is what is proposed, for example, by Lazara (2001). However, Jordan & Evermann (1896) indicate Gill did not like the name by Agassiz. They suggested Richardson, 1856 for Cyprinodontidae. Gill (1865) is, on the other hand, proposed by Wildekamp (1993) and Costa (1998b).

Agassiz's paper deals with "Cyprins" (Cyprinids) and it states (translation of the French by the author) :"taken globally, the family of Cyprins seems to me limited to the genera *Cyprinus* and *Cobitis* by Linnaeus (…) ; after detailing those characters (describing the Cyprins), one already has a feeling that I exclude from this family all genera that in the "Animal Kingdom" by Cuvier are following the "Loches" (note: a vernacular French name), i.e., *Anableps, Poecilia, Lebias, Fundulus, Molienisia* and *Cyprinodon*, to make a family on its own, under the name of the Cyprinodonts (…). It is however indisputable that Muges, Atherins, and Cyprinodonts shows strongest affinities to Cyprins and that Cyprinodonts are an intermediate family that links them". Agassiz does not use a family-group name in that paper, only common names in French (Loches, Cyprins, Cyprinodontes, Muges, Atherins) and this can be challenged as not binding with the code of nomenclature, as Jordan & Evermann had suggested. Therefore, Agassiz's French name "Cyprinodontes" for Cyprinontidae should be considered as unavailable. Besides, it would be the same for Cuvier's "Cyprinoïdes" (1829), another common, not Latinised and even senior, name (Art. 11.7).

On the other hand, the German physiologist from Munich, Rudolph Wagner, properly established Cyprinodontidae in a paper of 1828 (i.e., even before Cuvier and Agassiz); here are 2 significant excerpts on the matter (translation of the German by the author): "The genus *Lebias* forms with the genera *Poecilia*, *Fundulus*, *Cyprinodon* and *Molienisia* Lesueur (if I may confirm the last genus therein after further research) a very beautiful small family that I have named the family of Cyprinoïds, due to its great relationship with the *Cyprinus* species, from which it is however distinguished by the teeth in the upper and lower maxillary, by the position of Dorsal and Caudal fins and the number of rays of the branchial envelope". And (translation of the Latin by the author): "Order : Malacopterygii abdominales, Family Cyprinoïdae, 5 Genera, 16 sp. : *Poecilia* (*P. surinamensis, P. unimaculata, P. bogotensis, P. schneideri, P. multilineata*), *Lebias* (*L. rhomboidalis, L. fasciata, L. lineato-punctata, L. sarda*), *Molienisia* (*M. latipinna*), *Fundulus* (*F. coenicolus, F. fasciatus, F. brasiliensis*), *Cyprinodon* (*C. flavulus, C. ovinus, C. variegatus*)".
Anecdotal notes : the text is followed by remarks on each taxon in detail, and it is very much in line with the then known components of Cyprinodontiformes (except *bogotensis*, as mentioned by Garman in 1895) ; *flavulus* is today a synonym in the genus *Fundulus*, not *Cyprinodon*, *Lebias* has been declared invalid by ICZN and *Aphanius* and *Cyprinodon* take its place, and *brasiliensis* is today in *Kryptolebias* belonging to Rivulidae. All, but *bogotensis*, are still within the current definition of Cyprinodontiformes.
Garman (1895) had already accurately mentioned Wagner's paper, but he was unsure whether it was distinctive or amalgamated with Cyprinids. However, from the German translation here, it is clear that Wagner created the new name Cyprinoïdae both to show the phylogenetic link between the two groups (suffix "oid") and to give a new separate name for those 5 genera, with no included fish being a member of Cyprinids (Cyprinidae).
Wagner's paper is thus the earliest paper using a Latinised family-group name based on the genus *Cyprinodon*; and it should be consider as the author of the family Cyprinodontidae and the derived family-group names. Besides, it had been acknowledged as a family in a very old overlooked paper published in France (Anonymous 1829). His wording "Cyprinoidae" is closest to Cyprinidae for which he wanted to make a link, though it is still distinctive and Latinised. However, according to ICZN, it has to be corrected to Cyprinodontidae, because the stem of the genus ending as "don", derived in Greek genitive into "dontis" (tooth), is "dont-".

III. The names and authorships of the discussed old family-group names

The issue of family-group names derived from the genus *Aplocheilus* McClelland, 1839

According to Lazara (2001) and also Parenti (1981), the family group name Aplocheilidae has been indirectly erected by Garman (1895) as Haplochilinae from Agassiz 's genus name, *Haplochilus*, that is an unjustified emendation of it. However, Seegers (1997) and Laan (2004) show that the Dutchman Bleeker (1860) has established the name before as Aplocheilini and after a review of an earlier work by Bleeker, Laan has informed us (pers. comm., December 2004) that the name should even date from Bleeker (1859). Therefore Bleeker (1859) is the author of the present family Aplocheilidae.

The issue of family-group names derived from the genus *Poecilia* Bloch & Schneider, 1801

According to most recent American researchers, including Lazara (2001), the family group name Poeciliidae has been erected by Garman (1895), too.
However Laan (2004) proposes to author and date the family to Prince Bonaparte (1838), a member of French emperor Napoleon's family. Our research on the works of Bonaparte (1831) has shown that he uses as new 2 family-group names: Paecilini, on page 113, with *Paecilia* Schneider, *Lebias* Cuvier, *Fundulus* Lacepède, *Molienisia* Lesueur, *Cyprinodon* Lacepède, and Anableptini, on page 113, with *Anableps* and also in a table within the family Cyprinidae (N°18) with 3 subunits Cyprinini, Anableptini and Paecilini, with on page 94 a diagnosis for the 3 units : (translation of the Italian by the author) for Paecilini "Anal fin, not perforated ; maxillary, with teeth" and for Anableptini "two pupils (the cornea and the iris are divided in two parts with a transversal bar) and an opening at the extremity of the anal fin." In 1838 (page 92) Bonaparte repeats the 3 subunits as 3 subfamilies ("sottofamiglie"). Surprisingly, Garman (1895) had already stated this (shortly) and this had been overlooked. The family-group name by Bonaparte (1831) has, though, to be corrected from Paecilini to the presently acknowledged Poeciliidae, according to the stem "poecili-" of the Latinised genus.

The issue of family-group names derived from the genus *Anableps* Scopoli, 1777

Similarly to Poeciliidae, the family-group name Anablepidae is attributed to Garman (1895), according to most American researchers, including Lazara (2001). As shown above, Bonaparte is the author of that family-group name in 1831 and Ghedotti (1998) and Laan (2004), independently have evidenced this observation. The issue of spelling that family-group name as Anablepidae, following Garman or Anableptidae, following Bonaparte or else is not immediate and is dealt with further.

The issue of family-group names derived from the genus *Nothobranchius* Peters, 1868

The family-group name attached to the genus *Nothobranchius* is complicated because, as already shown, a family-name of Nothobranchiidae was mentioned as a new usage of a superfamily Nothobranchioidea from Garman's, by Costa (2004a). Lazara (2001) attributes it to Radda & Pürzl (1981), however there is a small error : it appears from the text in the German publication that it has to be Radda, in Radda & Pürzl, 1981. On the other hand, Laan (2004) points out that Garman (1895) is the author of the family-group name, and we concur, as Nothobranchiinae. Anecdotally, Garman's description is a simple footnote at the end (page 159) of his book, stipulating that the name Nothobranchiinae "is to precede *Aplocheilichthys*" on his review : the inferred inclusion of the genus *Aplocheilichthys* in Nothobranchiinae appears strange today and is inaccurate, but the family-group name erected by Garman, including its type genus *Nothobranchius*, is fully available. In conclusion,

our first issue on how to name a third family for Aplocheiloids between Epiplatidae (erected after 1997) or Nothobranchiidae is definitely cleared out in favour of the second option and Costa's Nothobranchiidae (2004a) is correctly attributed to Garman, 1895 and precedes by rank the family-group name derived from *Epiplatys*.

The issue of family-group names derived from the genus *Orestias* Valenciennes, 1839

The family-group name derived from the genus *Orestias* is attributed by Laan (2004) to the Dutch Bleeker (1860) as Orestiasini and after a review of an earlier work by Bleeker, Laan has informed us (pers. comm., December 2004) that the name should even date from Bleeker (1859) and we concur. This is also congruent with Garman (1895). The issue of spelling that family-group name - Orestiinae as per Parenti (1981) or Orestiatinae as per Laan (2004) or Orestiasinae as per Bleeker (1859) or even Orestiadinae (hereby studied) - is difficult and is dealt with further.

The issue of 2 senior, but disused family-group names with type-genera presently seen as a synonym or a subgenus

Garman (1895) has properly raised our attention on 2 family-group names, Hydrargyrinae Gill, 1861 and Tellianini Bleeker, 1864 (as 1863, "Pinnae ventrales nullae". *Tellia* Gervais). However, his mention had been overlooked by all subsequent publications, despite the fact that the 2 family-group names are fully available.

Hydrargyrinae has been described 5 years before its synonym Fundulidae Günther, 1866. However, its type genus *Hydrargyra* is a (frequent) misspelling for *Hydrargira* Lacepède, 1803 that is considered as a junior synonym of *Fundulus* Lacepède, 1803 ; besides, *Hydrargira* has its type species designated by monotypy as *Hydrargira swampina* Lacepède, 1803 which is a junior synonym of *Fundulus* "mudfish" (= *Cobitis heteroclita* Linnaeus, 1766), the subsequently designated type species of *Fundulus* Lacepède, 1803. Therefore, Hydragyrinae Gill, properly herein corrected in Hydrargirinae is identical to Fundulidae. In that case Art. 40.1, 40.2 and 35.5 are relevant : since Hydragyrinae has not been published as a senior synonym of Fundulidae prior to 1961, it must be dropped.

The situation is rather different for Tellianini, described 86 years before Aphaniini Hoedeman, 1949 : the type genus *Tellia* Gervais, 1853 (type species by monotypy as *Tellia apoda*, a species without ventral fins) is seen either as a synonym of *Aphanius* Nardo, 1827 (type species by subsequent designation as *Aphanius nanus* Nardo, 1827, a junior synonym of *Aphanius fasciatus*) or a distinct valid subgenus (Huber 2000). The species *Aphanius apodus* and its related species may well be considered in the future as sufficiently distinctive from *Aphanius* s.s., to deserve a separate genus name (the latest molecular studies, with the techniques used today, promote this move, although their authors do not go that far). Therefore, Tellianini Bleeker would be identical to Aphaniini, and it is a real pity that Hoedeman overlooked Gervais' taxon and Bleeker's family-group name. In that case Art. 40.1, 40.2 and 35.5 are relevant : since Tellianini has not been published as a senior synonym of Aphaniini prior to 1961, it must be dropped. The family-group name Tellianini stemmed from *Tellia* (derived from the Tell mountains, northern Algeria, in reference to its origin) should then be corrected into Telliini (see further).

IV. The names and authorships of the discussed recent family-group names

The recent issue of family-group names derived from the genus *Epiplatys* Gill, 1862

Until recently, the issue of erecting a family-group name for genera related to *Epiplatys* was not a priority : the pioneering genetic works by Scheel in the sixties and seventies dealt with all African and

Indian groups as a single monophyletic unit, and this was confirmed by Parenti (1981) within osteological cladistics. However, Murphy (1997: molecular biology) and Huber (1998: morphology and paleo-biogeography) have changed the picture and a family-group name Epiplatidae has been proposed by the former and followed by the latter at the sub-family level (2000).

Murphy's authoritative work is a Ph.D. thesis and unfortunately neither the first publication by the U.S. researchers Murphy & Collier (1997) nor the following papers by these authors mention the family-group names proposed in the thesis. The issue is then : can Murphy's thesis be considered as published and the new herein family-group names be considered as available in terms of nomenclature, as it would often be the case in Europe for theses? The answer by Eschmeyer (pers. comm.) is that European theses sometimes are published as such, but not American ones and if Murphy's thesis was Xeroxed, then Art. 9 and Art. 8 (ii and iii) of the ICZN code apply and rule it out. In the ICZN code in force at that time, deposit of a document (e.g., a thesis) in a collection of documents, a library, or other archive does not constitute publication. Although theses are increasingly being cited and are available for study, they were not prepared for the permanent scientific record and remain unpublished. Lazara (2001) concurs because he mentions a family "Epiplatyidae", without an author's name and date, as "not formally erected by him". Besides, Laan (2004) attributes the names Epiplatinae to Huber (2000), following a mention by Aarn & Sheperd (2001) in their review on *Epiplatys*. And, very recently, Wildekamp & Zee (2004) used also the subfamily name Epiplatyinae.
While Murphy (1997) is not validly published because it is Xeroxed, this leaves the present author as the first describer of the family-group name Epiplatinae (plus a series of other names at a lower level, see table I) because the book Killi-Data (2000) is an ISBN official publication and appears to fill ICZN requirements for 2000 (even if Murphy 's innovative work is hereby acknowledged).
On the other hand, the issue of spelling that family-group name - Epiplatinae or Epiplatyinae - is discussed and complicated. *Epiplatys* is a genus name derived from two Greek roots ("platus", flattened and "epi", above): the masculine adjective "platus" produces the genitive form "plateos" (athematic declension from a very old Greek word, ending with the letters "eta" and "digamma" that evolved into "epsilon" in "plateos"). This is different from ichthys, also ending with "ys", derived from the Greek noun "ichthus" that produces "ichthuos" as a genitive and a stem "ichthu-" or in occidental alphabet "ichthy-". Hence, the family-group name should have the stem "plate-" and should be spelt Epiplateidae, and not Epiplatidae as per Murphy (1997) and Huber (2000), and not Epiplatyidae as per Lazara (2001) and Wildekamp & Zee (2004). This new spelling has kindly been confirmed by Sonnenberg (pers. comm., January 2005) who parallely tackled the issue. In that case, Art. 29.4 could be applied and the initial spelling could be conserved, but the name was only published twice (only for the description and by Aarn & Sheperd) and it is our view that changing the name with the correct spelling is more in line with the spirit of the code. The family-group name is then herein corrected as Epiplateinae.

The issue of family-group names derived from generic names with standard Latin endings

The family-group names derived from generic names ending with "us" (masculine gender), "a" (feminine gender), or "um" (neuter gender) are simple to form from the Latin genitive form, respectively "i", "ae", "i" (there are 2 other rarer Latin declensions, but they are not useful herein). For example, *Aplocheilus* is derived in the genitive "Aplocheili" and the stem for erecting a family group name is "Aplocheil-". If the generic name includes an "i" before the Latin ending, this "i" must not be deleted. For example, *Nothobranchius* is derived into Nothobranchiidae.

If the name is derived from a proper name or a vernacular name, the formation of the family-group name is similar (with a simple emendation, Art. 29.3.3): *Moema* (feminine gender, derived from the vernacular South American Indian name Moema) produces Moemina, *Valencia* (feminine gender, derived from the city in Spain, Valencia) produces Valenciidae, *Tellia* (feminine gender, derived from the Tell mountains, Algeria) produces Telliini and *Rachovia* (feminine gender, derived from the German aquarist Arthur Rachow) produces Rachoviini (not the incorrect Rachovini, erected by Costa

in 1990 and corrected by him in 1998). Similarly, if the generic name is derived from a modern language (Art. 29.3.3), like *Terranatos* (from Spanish "born from earth"), then the stem is derived from the Latinised word : in this case, the stem is "terranat-" and Terranatina erected by Costa (1990) is correct.
The situation is different when the Latinised generic name is derived from one or several Greek words, even if ended by "us, a, um", because then the genitive form may be different (see further *Procatopus*).

The issue of family-group names derived from Greek-rooted generic names with the "ichthys" ending

The Greek suffix "ichthys" ("ichthus" means fish) is trivial among generic names of fishes (masculine gender). The genitive form produces the stem "ichthy-" (ichthu in Greek, as already stated above), like Aplocheilichthyini for *Aplocheilichthys* (and several other examples in table I). This is overall accepted and no problem of spelling has arisen yet. The case for a Greek ending with "ys" may be different and has been dealt with above for *Epiplatys*.

The issue of family-group names derived from generic names built from *Lebias* or ending with "ias"

There are many generic names among Killifish that are derived from *Lebias*, both for recent fishes and fossils. All family-group names that have been erected followed the same pattern by adding a "ti" in between the generic root and the suffix. The first case is Hoedeman 's Cynolebiatidi (1961) for the groups of genera related to *Cynolebias*. This has been followed by Costa for his own numerous family-group names and, probably, both authors followed the same pattern that had been accepted for Oryziatinae (*Oryzias*, a genus today in the related Beloniformes, but once included in the Killifishes) or Orestiatinae (*Orestias*), ending with "ias" or Anableptini (*Anableps,* see above). However, Cuvier's *Lebias* is derived from the Greek masculine name "lebias" (a sort of fish, a rare word) that has the genitive form of "lebiou". It has also been used as a common vernacular French name (les Lébies) by Cuvier. There is no ground to have added a "ti" that must be removed as per Art. 29. The connection to the stem of the type genus (or exceptionally to the whole genus) is mandatory. The stem for the masculine gender *Lebias* (genitive "lebiou") would then be "lebi-" (according to Steyskal 1980, like Oryziidae for *Oryzias*) and the available family-group names have to be corrected accordingly, like Cynolebiinae for *Cynolebias* (see all cases in table I). Alternatively, as permitted by the ICZN code, *Lebias* could have been considered in full and the family-group names could have been Lebiasinae and its variations, but there is no risk of homonymy and this would not be in line with the foundation of other similar family-group names in ichthyology.

Similarly, Orestiasini Bleeker (1859) had already been corrected as Orestiidae by Jordan (1923) or Orestiinae by Parenti (1981), whereas other authors -e.g., Laan 2004- use Orestiatini. Adding the "ti" has no value, like for Cynolebiatini and Orestiatini should not be used. Indeed, the genus *Orestias* Valenciennes, 1839 is derived from the Greek word orestias, an adjective of feminine gender, meaning "living in the mountain" (from Oros, mountain, like the mythology figure Orestes). Anecdotally, the feminine gender is related to the mountain nymphs Orestiades and Valenciennes who started up as Cuvier's assistant was not a linguist (the genus *Orestias* should have been feminine, but the presently prevailing masculine gender is to be kept conservatively). According to the genitive form ("orestiados"), the family-group name should be spelt Orestiadinae, based on the stem "orestiad-". Alternatively, but not likely, the name might have been derived from the Greek word orestias, a masculine noun, meaning "wind of the mountains" with a genitive form of "orestiou" and in that case, the stem would be "oresti-" that would explain the family-group name Orestiinae. It is not possible to apply Art. 29.5 in this case, because there is no prevailing spelling for this family-group name. We should conform to Valenciennes's idea for building the generic name after Orestes and it is proposed to correct the name as Orestiadini.

The issue of family-group names derived from Greek-rooted generic names ending with "pus" or "don"

Names in "pus" are frequently derived from Greek "pous" (meaning foot), are of masculine gender and have a stem in "pod-" based on its genitive form "podos". This is the case of *Procatopus* Boulenger, 1904 (which means "anterior lower foot" for the displaced ventral fins). Therefore, Procatopodinae, proposed by Scheel (1968), is the correct spelling of that family-group name and Procatopinae as per Fowler (the describer in 1916) and Parenti (1981) should be abandoned.

For the names ending with "don" (meaning tooth), like the genera *Cyprinodon* Lacepède, 1803 and *Cnesterodon* Garman, 1895, the family-group name stems from "dont-" (genitive : dontis) as stated above for Cyprinodontidae and also Cnesterondontini, a mostly viviparous tribe that includes only one monotypic genus, *Tomeurus*, oviparous, in a monotypic tribe Tomeurina, according to Ghedotti (2000).

The issue of family-group names derived from Greek-rooted (or not) generic names ending with "ax"

Among oviparous Cyprinodontiformes, the generic ending in "ax" may derive either from the generic name *Panchax* or from the Greek adverb meaning a present participate function.

Panchax Valenciennes in Cuvier & Valenciennes, 1846 is a generic name (today a synonym of *Aplocheilus*) that is derived from the vernacular Indian name Pang-Chax (Bengali language), as the local name of the type species, *Esox panchax*. Since it is not Latin or Greek-derived, it should be treated like all vernacular names (Art. 29.3.3) and the stem is as adopted by the describer "panch-". Therefore, the name created by Huber (2000) as Micropanchina for *Micropanchax* Myers, 1924 and Callopanchina proposed by Murphy (1997) and formally erected by Huber (2000) for *Callopanchax* Myers, 1933 are correct.

Fluviphylax Whitley, 1965 is different : it is derived from a Greek adverb: "phylax" (meaning guard) and "fluvi" (a genitive of "fluvus", meaning of the river or of the stream). According to Steyskal (1980), it can be considered a neologistic noun by virtue of its use as a generic name, it may be treated as Latin to the extent that it would have a stem similar to those of Latin nouns of similar form, viz., it would have the stem "Fluviphylac-" and the family-group name should be Fluviphylacinae, as correctly proposed by its author, Roberts, in 1970.

The issue of family-group names derived from Greek-rooted generic names ending with "ion"

The names ending in "on" are usually masculine in gender and should have "ont-" for a stem (like the names in "ma" that are usually neuter in gender and should have "mat"). *Aphyosemion* Myers, 1924 is ending by "on", but is of neuter gender and according to Steyskal (1980), the ending "ion" is a diminutive ("ion" means small) of neuter gender. This Greek diminutive has spread over several Indo-European languages. The meaning of the genus name -small (from Greek: "ion") fish (anchovy, from Greek: "Aphye") with a flag or banner (from Greek: "semeou")- emphasizes the diminutive form, although it is not fully understood if Myers meant small fish or small banner (for the filamentous fins). The generic root has therefore a stem "Aphyosemi-". The family-group name proposed by Murphy (1997) from a simple emendation and formally erected by Huber (2000), Aphyosemina, should then be corrected as Aphyosemiina. In that case, Art. 29.4 could be applied and the initial spelling could be conserved, but the name was only published once (only for the valid description) and it is our view that changing the name with the correct spelling is more in line with the spirit of the code.

The issue of family-group names derived from Greek-rooted generic names ending with "es"

According to Steyskal (1980), names in "e" drop that letter for their stems (for example, the related genus, *Belone*, outside Cyprinodontiformes, produces Belonidae), but names in "es" drop their syllable for their stems : the genus *Oxyzygonectes* can be seen twofold, either from "oxy", pointed, as a pointed *Zygonectes*, a subgenus of *Fundulus*, or from a combination of Greek words (meaning pointed that swims in circles). In the former case, the stem is "oxyzygonect-" and in the latter case, the genitive form of "nektor" (a swimmer) produces a stem "nect-". Then, whatever is the arrangement, the correct spelling of the group-family name is Oxyzygonectinae, as per the describer, Parenti (1981).

The issue of family-group names derived from Greek-rooted generic names with special endings

Finally, 2 special cases with implications for oviparous Cyprinodontiformes do not fit with the above.

Anableps Scopoli, 1777 derives from the Greek "ana", great, enlarged, and "blepsis", eye, sight, and the genitive form of "blepsis" is "blepseos" which should stem as "bleps-". Therefore, the correct spelling for the family-group name should be Anablepsidae, and neither Anableptini as per Bonaparte (1831), nor Anablepini as per Bleeker (1859), nor Anablepinae as per Garman (1895). Anableptini seems to follow the strange process of adding a "ti". Anablepinae has a wrong linguistic ground since another word exists in Greek with the same meaning and spelt with "pi". It is not possible to apply Art. 29.5 in this case, because there is no prevailing spelling for this family-group name. Scopoli's generic name is spelt from the Greek word "blepsis", with the letter "psi" and not with "pi" and this should be respected. Legitimately, it should be mentioned that Anablepsinae has been written as such by Fowler (1954), but that spelling was not discussed by him to argue that the other spellings were not correct. At last, readers may be confused to see the different outcome for Epiplateinae and for Anablepsidae while the corresponding genitives in Greek, "plateos" and "blepseos", look the same : in fact, they are totally different for expert linguists. The stem for "plateos" is "plate-" (the "o" is written in Greek with the letter "w, omega"), while the stem for "blepseos" is "bleps-" (the "o" is written with the letter "o").

Adamas Huber, 1978, derives from the Greek diamond or steel for steel-blue (adamas, with adamantos, being the genitive form). Therefore the stem is "adamant-". The family-group name proposed by Murphy (1997) from a simple emendation and formally erected by Huber (2000), Adamini, should then be corrected as Adamantini. In that case, Art. 29.4 could be applied and the initial spelling could be conserved, but the name was only published once (only for the valid description) and it is our view that changing the name with the correct spelling is more in line with the spirit of the code.

V. Conclusive suggestion and thanks

This work has shown how much ichthyologists, including the present author, need to be more involved with the ICZN rules for family-group names. For Killifish, a large group of fish with over 1250 named taxa and about 750 valid species in over 100 valid genera or subgenera (Huber 2001-2004), it has been shown herein that the family-group names had been too much neglected in publications since Garman (1895) : in many cases, 2 or 3 different spellings were used without much rationale and without a minimum coherence with the code of nomenclature. While it is obvious that researchers are collectively "guilty", it is also reasonable to consider that they must not necessarily

be experts of ancient languages (the present author has not studied ancient Latin and Greek since the age of 16 and most researchers have not studied them at all). Let's therefore kindly suggest that a special service is officially created within the ICZN staff to answer to researchers' queries regarding proper spellings of family-group names derived from those languages. Alternatively, the Commission could assign an official stem to any described genus : for fish, there have been "only" 102 fish genera during the last 5 years (1999 – 2004), as searched from the online Catalogue of fishes.

This paper would not have been started, would not have been worked out without Bill Eschmeyer's spur, kind assistance and educational guidance. Although the author bears alone the responsibilities of the herein findings and proposed changes, the author wishes to first express his warmest gratitude to him.
After the manuscript was finalized, Bill Eschmeyer was also able to send Fowler's unpublished manuscript of "A Catalog of World Fishes" for Cyprinodontiformes that is just available as a pre-submission typewritten text (some parts have been published for other groups of fish, between 1965 and 1977, but not for that group). In there, Fowler correctly mentions some of the family-group names that had been overlooked in the past before the present publication (Hydrargyrina, Tellianini, Unipupillati) and we are pleased to acknowledge this, on behalf of his memory.

Besides, for their assistance in finding and analysing very old bibliographic references, we are indebted to Isabelle Russo (MNHN general library) and Mathieu Andro (MNHN library of ichthyology). For their expert assistance in the grammar and etymology of ancient Greek words, we are grateful to Patrick Morantin and Olivier Estiez (BNF, French National Library) and to Prof. Reiter (Lycée Louis-le-Grand, Paris). Our special thanks go to Marie-Louise Bauchot, Glen Collier, Jacques Daget, Paulo Lucinda, Richard van der Laan and Ruud Wildekamp, for the shared valuable ichthyological information and/or discussions. The manuscript has been sent to all researchers involved with Killifish systematics for their comments and future support to the proposed changes. Most of them acknowledged receipt, and we notably thank Michael Ghedotti, Rainer Sonnenberg, and Bruce Turner for their inputs.

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Table I. A synopsis of the available family-group names with (1) their proposed position according to Eschmeyer's current online catalogue (December 2004) and (2) according to current research, and (3) their today included generic components for extant oviparous genera of Cyprinodontiformes Berg, 1940 (synonym : Microcyprini Regan, 1911), and (4) with their original spelling name, possibly corrected, and comments.
Notes : Huber's Killi-Data online and Huber (2000) cover family to subtribe, but are identical for families and subfamilies to Eschmeyer's and to Fishbase, by principle (to ensure a minimal coherence between various lists). Current research (January 2005) recognizes 3 Aplocheiloid families and split Aplocheilichthyinae in several tribes at least.

Eschmeyer's Catalog online, current pyramid (only families and subfamilies, in alphabetic order, within accepted suborders)	**Proposed pyramid (family to subtribe), according to current research**	**Currently valid generic components (first, type-genus, then in alphabetic order) or between brackets, type-genus in case of a synonym, homonym or invalid family-group name**	**Original name spelling, author and year of description, with comments on current status**
Aplocheilidae	Aplocheilidae	* Genus *Aplocheilus* McClelland, 1839. * Genus *Pachypanchax* Myers, 1933.	Aplocheilini Bleeker, 1859
		(Genus *Haplochilus* Agassiz, 1846 : unjustified emendation, synonym of *Aplocheilus*).	Haplochilini Garman, 1895 (synonym of Aplocheilini)
Aplocheilinae	Nothobranchiidae		Nothobranchiinae Garman, 1895
	Nothobranchiinae		
	Nothobranchiini		
	Nothobranchiina	* Genus *Nothobranchius* Peters, 1868 * Genus *Fundulosoma* Ahl, 1924	
	Aphyosemiina	* Genus *Aphyosemion* Myers, 1924 * Genus *Episemion* Radda & Pürzl, 1987 * Genus *Foerschichthys* Scheel & Romand, 1981 * Genus *Fundulopanchax* Myers, 1924.	Aphyosemina Huber, 2000 (herein corrected as Aphyosemiina)
	Adamantini	* Genus *Adamas* Huber, 1979.	Adamini Huber, 2000 (herein corrected as Adamantini)
	Epiplateinae		Epiplatini Huber, 2000 (herein corrected as Epiplateini)
			"Epiplatyidae" Lazaza, 2001 (not formally erected, synonym of Epiplatinae)
	Epiplateini	* Genus *Epiplatys* Gill, 1862. * Genus *Aphyoplatys* Clausen, 1967. * Genus *Pseudepiplatys* Clausen, 1967	
	Callopanchini	* Genus *Callopanchax* Myers, 1933. * Genus *Archiaphyosemion* Radda, 1977. * Genus *Scriptaphyosemion* Radda & Pürzl, 1987.	Callopanchina Huber, 2000
Rivulinae	Rivulidae		Rivulini Myers, 1925
	Rivulinae		
	Rivulini	* Genus *Rivulus* Poey, 1860. * Genus *Prorivulus* Costa, 2004.	
	Neofundulini		Neofundulini Costa, 1990
	Neofundulina	* Genus *Neofundulus* Myers, 1924. * Genus *Pterolebias* Garman, 1895. * Genus *Gnatholebias* Costa, 1998. * Genus *Trigonectes* Myers, 1925.	
			Pterolebiatina Costa, 1990 (synonym of Neofundulina, herein corrected as Pterolebiina)
	Aphyolebiina	* Genus *Aphyolebias* Costa, 1998.	Aphyolebiatina Costa, 1998 (herein corrected as Aphyolebiina)

	Moemina	* Genus *Moema* Costa, 1989. * Genus *Micromoema* Costa, 1998. * Genus *Renova* Thomerson & Taphom, 1995.	Moemina Costa, 1998
	Rachoviini		Rachovini Costa, 1990 (corrected as Rachoviini by Costa, 1998)
	Rachoviina	* Genus *Rachovia* Myers, 1927. * Genus *Austrofundulus* Myers, 1932. * Genus *Terranatos* Taphom & Thomerson, 1978.	
			Terranatina Costa, 1990 (current synonym of Rachoviina, according to Costa 1998)
	Millerichthyina	* Genus *Millerichthys* Costa, 1995.	Millerichthyini Costa, 1998
	Plesiolebiina	* Genus *Plesiolebias* Costa, 1989. * Genus *Pituna* Costa, 1989. * Genus *Papiliolebias* Costa, 1998. * Genus *Maratecoara* Costa, 1995. * Genus *Stenolebias* Costa, 1995.	Plesiolebiatini Costa, 1990 (herein corrected as Plesiolebiini)
	Cynolebiinae		Cynolebiatidi Hoedeman, 1961 (herein corrected as Cynolebiidi)
	Cynolebiini		
	Cynolebiina	* Genus *Cynolebias* Steindachner, 1876. * Genus *Austrolebias* Costa, 1998. * Genus *Megalebias* Costa, 1998.	
	Simpsonichthyina	* Genus *Simpsonichthys* Carvalho, 1959.	Simpsonichthyina Costa, 1998
	Spectrolebiina	* Genus *Spectrolebias* Costa & Nielsen, 1997.	Spectrolebiatina Costa, 1998 (herein corrected as Spectrolebiina)
	Cynopoecilini		Cynopoecilina Costa, 1990
	Cynopoecilina	* Genus *Cynopoecilus* Regan, 1912. * Genus *Campellolebias* Vaz-Ferreira & Sierra, 1974.	
	Leptolebiina	* Genus *Leptolebias* Myers, 1952.	Leptolebiatina Costa, 1998 (herein corrected as Leptolebiina)
	Kryptolebiinae	* Genus *Kryptolebias* Costa, 2004.	Kryptolebiatinae Costa, 2004 (a replacement name, herein corrected as Kryptolebiinae)
		(Genus *Cryptolebias* Costa, 2004 : preoccupied name; replaced by *Kryptolebias*).	Cryptolebiatinae Costa, 2004 (synonym subfamily: preoccupied name ; herein corrected as Cryptolebiinae)
Fundulidae	Fundulidae	* Genus *Fundulus* Lacepède, 1803. * Genus *Adinia* Girard, 1859. * Genus *Leptolucania* Myers, 1924. * Genus *Lucania* Girard, 1859.	Fundulinae Jordan & Gilbert, 1883
		(Genus *Hydrargira* Lacepède, 1803 : a junior synonym of *Fundulus*)	Hydrargyrinae Gill, 1861 (synonym subfamily, as per Art. 40 and 35.5; herein corrected Hydrargirinae)
Profundulidae	Profundulidae	* Genus *Profundulus* Hubbs, 1924.	Profundulidi Hoedeman & Bronner, 1951
Goodeidae	Goodeidae	(all viviparous genera, except Empetrichthyinae)	Goodeinae Jordan & Gilbert 1883 (frequently erroneously attributed to Jordan, 1923)
Goodeinae	Goodeinae		
Empetrichthyinae	Empetrichthyinae	* Genus *Empetrichthys* Gilbert, 1893. * Genus *Crenichthys* Hubbs, 1932.	Empetrichthyinae Jordan, Evermann & Clark, 1930
Valenciidae	Valenciidae	* Genus *Valencia* Myers, 1928.	Valenciidae Parenti, 1981
Cyprinodontidae	Cyprinodontidae		Cyprinoïdae Wagner, 1828 (herein corrected as Cyprinodontidae ; first mention of the spelling Cyprinodontidae by Owen, 1846, according to Garman, 1895)

			"Cyprinoïdes" Cuvier, 1829 and "Cyprinodontes" Agassiz, 1835 (unavailable names ; synonyms of Cyprinodontidae)
Cyprinodontinae	Cyprinodontinae		
	Cyprinodontini	* Genus *Cyprinodon* Lacepède, 1803. * Genus *Cualac* Miller, 1956. * Genus *Garmanella* Hubbs, 1936. * Genus *Jordanella* Goode & Bean, 1879. * Genus *Floridichthys* Hubbs, 1926. * Genus *Megupsilon* Miller & Walters, 1972.	
	Aphaniini	* Genus *Aphanius* Nardo, 1827.	Aphaniini Hoedeman, 1949
		(Genus *Tellia* Gervais, 1853 : today a subgenus of *Aphanius*).	Tellianini Bleeker, 1864 (synonym tribe, as per Art. 40 and 35.5; herein corrected as Telliini)
		(Genus *Lebias* Goldfuss, 1820 : invalid generic name).	Lebiatina Costa, 1997 (synonym of Aphaniini ; no spelling correction needed, as the generic name is ICZN rejected : Art. 39)
	Orestiadini	* Genus *Orestias* Valenciennes, 1839.	Orestiasini Bleeker, 1859 (also spelt Orestiinae by Fowler, 1916 ; herein corrected as Orestiadini)
Cubanichthyinae	Cubanichthyinae	* Genus *Cubanichthys* Hubbs, 1926. * Genus *Chriopeoides* Fowler, 1939	Cubanichthyinae Parenti, 1981
Anablepsidae	Anablepsidae	(all viviparous genera, except Oxyzygonectinae)	Anableptini Bonaparte, 1831 (spelt Anablepinae by Garman, 1895 ; herein corrected as Anablepsini)
Anablepsinae	(viviparous)		
Jenynsiinae	(viviparous)		
Oxyzygonectinae	Oxyzygonectinae	* Genus *Oxyzygonectes* Fowler, 1916.	Oxyzygonectinae Parenti, 1981
Poeciliidae	Poeciliidae	(all viviparous genera, except Tomeurina and Aplocheilichthyinae)	Paecilini Bonaparte, 1831 (corrected to Poecilinae by Swainson, 1839, according to Garman, 1895)
Poeciliinae	Poeciliinae		Unipupillati Latreille, 1825 as a tribe : unavailable name (according to Fowler, unpublished ; no type genus), synonym of Poeciliini
	Cnesterodontini	(all viviparous genera, except *Tomeurus*)	Cnesterodontini Hubbs, 1924
	Tomeurina	* Genus *Tomeurus* Eigenmann, 1909.	Tomeurinae Eigenmann, 1912
Aplocheilichthyinae	Aplocheilichthyinae		Aplocheilichthyini Myers, 1928
	Aplocheilichthyini	* Genus *Aplocheilichthys* Bleeker, 1862.	
	Procatopodini		Procatopinae Fowler, 1916 (correctly spelt Procatopodinae by Scheel, 1968)
			Lamprichthyinae Fowler, 1916 (synonym of Procatopodini)
	Procatopodina	* Genus *Procatopus* Boulenger, 1904. * Genus *Hylopanchax* Poll & Lambert, 1965. * Genus *Hypsopanchax* Myers, 1924. * Genus *Lamprichthys* Regan, 1911. * Genus *Pantanodon* Myers, 1955. * Genus *Plataplochilus* Ahl, 1928. * Genus *Platypanchax* Ahl, 1928. * Genus *Rhexipanchax* Huber, 1999.	
	Micropanchina	* Genus *Micropanchax* Myers, 1924. * Genus *Laciris* Huber, 1981. * Genus *Lacustricola* Myers, 1924. * Genus *Poropanchax* Clausen, 1967	Micropanchina Huber, 2000
Fluviphylacinae	Fluviphylacini	* Genus *Fluviphylax* Whitley, 1965.	Fluviphylacinae Roberts, 1970