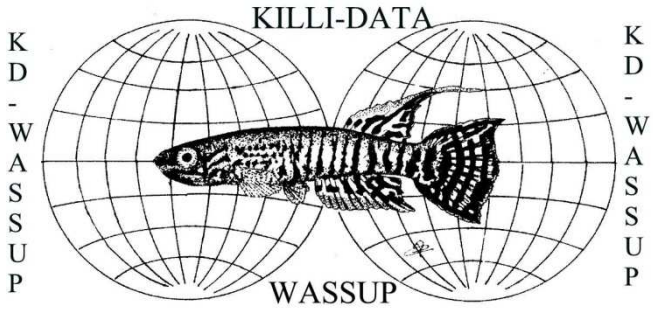


Killi-Data Wassup n°18

Overview of Killifish research output

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INTRODUCTION

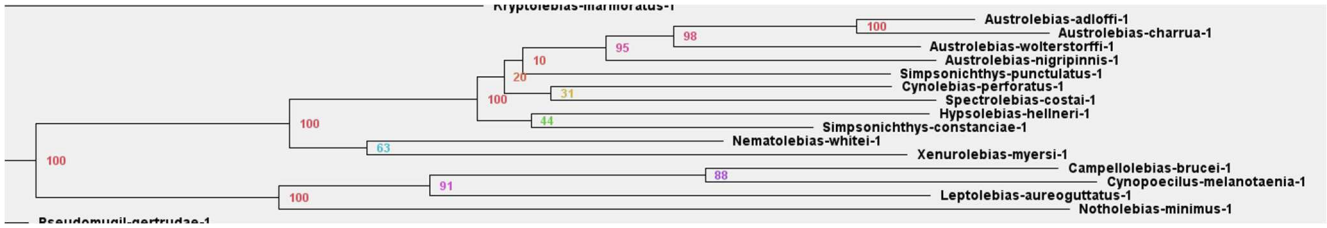
Foreword: important changes In Killi-Data generic status.

The question of splitting or lumping is now in scientific circles completely outdated. Authors just follow up or use 2 options without caring : for example, recently Esmaeili has published a paper on *Aphanius shirini* using *Esmaeilius* as a distinct genus {see reference, further below}, however he was against before (because it was contrary to his own results as first author) ; he was asked why but he could not answer, as simple as that, but since he was in the other group of authors who lumped *Aphanius* groups (except *Aphaniops* and *Paraphanius*), it is today necessary to acknowledge in Killi-Data that *Esmaeilius* is a distinct and valid genus in Aphaniidae (like *Apricaphanius*, *Tellia*, *Anatolichthys*, *Kosswigichthys*) ; of course, research goes on and if somebody will be working and publishing on a revised phylogeny of that group, Killi-Data will align to his-her findings. A decade ago I was writing, as editor of Killi-Data, that there will be a pendulum effect (i.e., back to lumping) : I was fully wrong, there is no way back in the horizon {beware, as a researcher, I remain truly as a lumper… but very old}. There is even a tendency by authors today to push indirectly to splitting in publications (for example, authors do not use the acknowledged genus *Poecilia*, but instead *Limia* as a genus, or authors do not use the acknowledged genus *Aphyosemion*, but {individualistically} instead *Chromaphyosemion* or *Scheelsemion*, as a genus, etc.) and in those {regrettable, for harmony or collectivity sake} cases, Killi-Data does not follow (and other international databases, likewise), until a full global revision of the concerned genera in a large sense {s.l.} is published with a new splitting formal proposal).

Anyway the issue of lumper and splitters is today over and the issue is changing to another debate between over-splitters and hyper-splitters, the latter only favoring somewhat “monotypic” genera (1 genus = 1 species group with a single species or with a few cryptic species or with many molecular species)... and again there will be people to rumor that a debate between over-splitters and hyper-splitters is theoretical : not at all, this is reality, with already 2 cases in killifish, the first being the hyper-splitting of *Austrolebias* group of genera by Alonso et al. (2022, with 1 genus split into 11 genera) and the other being the hyper-splitting of *Aphanius* case above (with 1 genus split into 8 genera), and there is no question in those 2 cases about the global revision of the concerned genera, about the quality of the published work and even more about the notoriety of the 2 involved journals with “laisser-faire” established reviewers. Fortunately for managers of taxonomic databases like Killi-Data (or ironically for lumpers), the hyper-splitting stage is the last one in Linnaeus binominal nomenclature, it is the end of the line, there is no way to split further, if present ICZN nomenclature should last in the long term.

But after this note of major spreading change, let’s go back to a previous major paper with new findings on Cynolebiinae (foreword: those new findings are not formally proposed by Morales et al., 2024, but they are

now fully taken into account in Killi-Data, like for the case of *Nimbapanchax*, moved to subgenus, and *Archiaphyosemion*, a few years ago, because they concur with latest molecular evidence by Ponzetto et al., 2016 and Costa et al., 2017, 2018, which are contradicting major osteological revision by Costa, 2011).



In the above tree (beware there is a *minor* error for *Ophthalmolebias*, just a typo, at *Simpsonichthys constanciae*, Pamela Morales pers. comm. December 2024), to find out that *Nematolebias* and *Xenurolebias* are related and close to *Ophthalmolebias*, hats-off, because nobody did (Costa et al., 2017, showed ambiguous relationships between the 3 taxa), and that looks obvious (afterwards!) since molecular data are congruent with vicariance (and not with morpho-osteology!) ; however, for Costa's *Hypsolebias*, in above tree, only *hellneri* is studied and *hellneri* is part of the "*Hypsolebias*" *flammeus* group but true *Hypsolebias* is a subgenus or a genus with *Simpsonichthys flavicaudatus* Costa & Brasil, 1990, as type-species and that species belongs to a different group than *flammeus*, according to Ponzetto et al. (2016) and Costa et al. (2017).

In conclusion, the new molecular work by Morales et al. (2024) clearly shows {in addition to its major formal findings on *Orestias* and *Fluviphylax*, discussed in last K-D W} that *Ophthalmolebias* and *Xenurolebias* are separated from *Simpsonichthys* and are to be considered as distinct genera and that *Simpsonichthys* s.s. (*punctulatus*) and *Spectrolebias* (*costai*) are separated from each other and are to be considered as distinct genera (but with limited bootstrap support and very few studied *Spectrolebias* sp.) ; however, the key finding by Ponzetto et al. (2016), denied then refused by Costa et al. (2017, 2018) that *Hypsolebias* remains heterophyletic is not solved and a further more detailed molecular study is needed to show (or not) that *Hypsolebias* is confirmed as paraphyletic (then, a new genus would have to be described for all *Hypsolebias* sp. not belonging to the *flavicaudatus* group)… the phylogeny of Cynolebiinae is much more complex than just splitting and upgrading genera with biogeography, not to speak of several family-group names that are left unstable now (e.g., Spectrolebiina) (see the page on family-group names that is updated at https://www.killi-data.org/list-names-familygroup.php) ! Time will tell but anyhow all subgenera of *Simpsonichthys* are moved to distinct valid genera in the Killi-Data knowledgebase (up until a new study tells if, or not, all costal genera, *Nematolebias*, *Ophthalmolebias*, *Xenurolebias* and the restricted *Hypsolebias* to *flavicaudatus* group, deserve to be distinct genera, all the more that molecularly species components of *Nematolebias* (*whitei* and *papilliferus*) and *Xenurolebias* (*myersi* and *izecksohni*) are extremely close, possibly identical!).

Besides those major changes and within this time frame of present Wassup, it must be noted only 3 new species, all maintained as *Rivulus* in Killi-Data, pending a full revision of the genus of *Rivulus*, *Atlantirivulus enigmaticus*, *Melanorivulus melanopterus*, *Melanorivulus terena*, all cryptic species of previous ones, with a major surprise for the former (hence the name) which is not distributed along the Atlantic coast (see map in database), but much in the interior (along an ancient introgression of the sea, though).

And there are some further discussions on major themes:

First and major work is the molecular analysis of all described *Xiphophorus* sp. (26), plus 3 undescribed sp., a real achievement for this livebearer genus also nicknamed sword-tails by (German researchers) Axel Meyer, Manfred Schartl and colleagues; but the key finding, a première in killifish, is that the phylogenetic tree has 100 bootstrap values at all branches (using full genome, of course) ; in addition, the authors introduce natural hybridizations to explain speciation in the genus (congratulations!).

Second concerns a collecting report by Dinesen (2024) that revisits the same localities in Sierra Leone which pushed Roloff to describe *chaytori*, *brueningi* compared to old taxa *liberiensis*, *roloffi* and *geryi* in genus *Scriptaphyosemion*, the author, a renown aquarist-explorer, states at the beginning that fish have been very variable beyond expectations within a population and between them and that it is seen in relation to variability with even the old pops of the early 1970ies (whereas the aquarium strains show stable patterns) ; in this article (in German, but an English translation is available and should be published soon in an English speaking killifish association), long of more than 70 pages, with 125 color photos, the author emphasizes all ecological data and keep as uncertain identifications (cf.) 2 species (*Epiplatys* cf. *bifasciatus*, *Scriptaphyosemion* cf. *geryi*).

Third is the major rediscovery by Zee and Popoola and assignment of a formal type locality of *Fundulopanchax spoorenbergi* at the very border between Nigeria and Cameroun (a species that was previously known from a commercial aquarium trade import, only), sympatrically with several undescribed *Epiplatys* sp. (see the publication hereafter).

Fourth is the emotional rediscovery in Algeria of *Apricaphanius saourensis* (previously *Aphanius*) ; more precisely (see : https://www.arabiaweather.com/en/content/a-rare-fish-was-found-in-the-depths-of-the-algerian-desert and https://www.facebook.com/redouane.tahri/posts/10224096675116963) by the Algerian ecological researcher and photographer, Redouane Taheri ; it is documented by various pictures of the fish and biotope ; the fish, previously considered as extinct, inhabits the Saoura Valley in Béchar, southwest of Algerian desert, as a freshwater species in springs through sand, with algae that takes years to grow ; Algerian authorities are alerted and a conservation program is planned ; likewise, but in a different way, it is understood that *Tellia apoda* is to be translocated back to a suitable wild biotope nearby to type locality in Algeria, based on a French aquarium strain raised in ponds (Jean-François Roux, pers. comm., September 2024), the project being led again by Algerian authorities.

Finally, let's inform the readers that a new item has been added to the knowledgebase, based on a new page in public section (at https://www.killi-data.org/pronunciation.php), i.e., suggested international pronunciations of each name, either genus or species, using internationally acknowledged pronunciations of ancient Latin and Greek, and, for only proper names, local languages ; beware, it is clearly a suggestion in order to avoid (if followed) a sort of a babel tower when people of different nationalities speak about their fish.

SELECTION OF PUBLICATIONS (last in, first out)

- Nester, T.L., A.S. Lopez, S. Perea & I. Doadrio. [The Doadrio team molecularly studies all 18 remaining pops of *Apricaphanius iberus* into 9 ESUs, for conservation purposes in Spain ; there are only 18 surviving (protected) populations of *Apricaphanius iberus* {previously in genus *Aphanius*}, in costal eastern Spain ; the authors perform a SNP-based genetic analysis to delineate management units, or Operational Conservation Units (OCUs) {a concept similar to ESUs, dedicated to conservation}, sampling a total of 176 individuals from 18 locations and analyzing their genetic structure, diversity, levels of gene flow, and degrees of genetic differentiation ; overall, the populations of Alt Emporda present the least amount of nucleotide diversity {and this a concern} ; finally, using *iberus* as a study model, their research exemplifies how to delineate conservation priorities pertinent to killifish species with limited dispersal opportunity as a result of disruptions in population connectivity. 2024. C.G., https://link.springer.com/article/10.1007/s10592-024-01665-z] {Jean Huber, 16-December-2024} <°))))>< <°))))>< <°))))><

- Zambrano, M.J., A.D. Bolzan, A.F. Bonifacio, J.M. Brito, M.V. Amé & A.C. Hued. [Zambrano et al. report LHT data of *Cnesterodon decemmaculatus* in a polluted freshwater system, with growth altered along sites ; the authors the effects of environmental disturbances on age and growth patterns for livebearer *Cnesterodon decemmaculatus* (Poeciliidae), also used as a bio-indicator in ecotoxicological studies, in order to establish reference species values and to compare them among different surveyed sites along an environmental quality gradient in a South American freshwater system (water quality assessments), in comparison to estimated ages, growth pattern ; according to the results, this quality gradient varies across sampling sites with the longest-lived individuals being those from the reference site (degraded), also presenting the highest average age value (almost 2 years) {however, life span is much greater in optimal conditions, like in aquariums} with first slow growth, then later with resumed growth and finally greater maximum length. 2024. J.F.B., https://onlinelibrary.wiley.com/doi/10.1111/jfb.16028] {Jean Huber, 11-December-2024} <°))))>< <°))))>< <°))))><
- Motamedi, M., Ahmadi, S., & Teimori, A. [Motamedi et al. present gill morphology of 2 extremely euryhaline *Aphaniops*, *furcatus* and *hormuzensis*, with additional structures ; the authors provide a detailed histological and ultrastructural characterization of gill morphology in 2 sympatric endemic Aphaniidae, *Aphaniops furcatus* and *Aphaniops hormuzensis*, inhabiting an ecologically extreme environment in southern Iran (collection is from the Khurgu hot-sulphuric spring in the Hormozgan River System which drains into the Persian Gulf) ; both species exhibit gill structures typical of teleosts, with primary and secondary lamellae essential for efficient gas exchange ; besides, for *furcatus*, gills display variations linked to size and gender, with numerous secondary lamellae and a variety of epithelial cells, including squamous, chloride, mucus, blood, and pillar cells ; for *hormuzensis*, gill arches feature a double row of primary filaments with secondary lamellae facilitating oxygen exchange, supported by pillar cells and dense distribution of mucous cells throughout the epithelium : these are adaptive mechanisms for *furcatus* in response to fluctuating environmental conditions {note : readers might consider searching similar papers on euryhaline killifish, notably in *Fundulus* genus}. 2024. A.Z., https://onlinelibrary.wiley.com/doi/abs/10.1111/azo.12525] {Jean Huber, 11-December-2024} <°))))>< <°))))>< <°))))><
- Wilson, E.J., N. Barts,J.L. Coffin, J.B. Johnson, C.M.P. Rodriguez, J.L. Kelley, M. Tobler, R. Greenway. [Wilson et al., by genetically comparing fresh and saline waters pops of *Limia perugiae*, reveal differentiating molecular mechanisms ; the authors use RNA-sequencing (RNA-seq) to investigate genome-wide variation in gene expression between a hypersaline population (Laguna Oviedo, Dominican Republic) and a freshwater population (Los Cocos, Dominican Republic) of livebearing fish species *Poecilia* (*Limia*) *perugiae* ; results show potential molecular mechanisms underlying salinity tolerance in this species, including the enrichment of genes involved in ion transport, maintenance of chemical homeostasis, and cell signaling in the hypersaline population ; by comparing to *Poecilia mexicana* and 4 other non-killifish with also both types of populations, they find out that 10 shared differentially expressed genes and that different genes are involved in salinity transitions across disparate lineages of teleost fishes, then it is not a question of convergence. 2024. Plos, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0315014] {Jean Huber, 8-December-2024} <°))))>< <°))))>< <°))))><
- Gomez-Martinez, R.F., W.A. Matamoros, C.W. Hoagstrom, J.M. Lopez-Vila & E.P.D. de Bonilla. [The Matamoros team recognizes 6 bioregions in phylogenetic clustering for all Poeciliidae, from coastal North America to La Plata in South America ; the authors divide the global distribution area in small squares of 1 latitudinal and longitudinal degree (ca. 111km2) and use the published phylogenies from 164 out of to 261 Poeciliidae species (34 genera), while mapping species richness (SR), phylogenetic diversity (PD), weighted endemism (WE) and phylogenetic endemism (PE) ; besides, a time scale is added by using categorical analysis of neo- and palaeo-endemism to map neo-, palaeo-, mixed and super (mixed) endemism ; results show 6 bioregions (1, Atlantic-Gulf-Caribbean, 2, Pacific Middle America, 3, Atlantic Middle America, 4,

Isthmus, 5, Northern South America, 6 Southern South America) ; highest regional species density and density of PD occurs on the Isthmus of Panama (IOP) ; at the grid-cell scale, the Grijalva–Usumacinta drainage is a hotspot for SR, PD, PE and WE ; Isthmus of Panama has high PD and PE , Isthmus of Tehuantepec (IOT) has high PD, WE and moderately high SR and western Hispaniola has high WE and moderately high SR ; the Grijalva–Usumacinta drainage also includes cells of super (mixed) and palaeo-endemism, while mixed endemism is widespread in Middle America and the Greater Antilles ; phylogenetic clustering is widespread, whereas over-representation of short-branch species {recent speciation} is concentrated in the Chihuahuan Desert–Sierra Madre Oriental region and in western Hispaniola, both hotspots of neo-endemism ; centers of endemism include the Chihuahuan Desert–Sierra Madre Oriental, western Hispaniola, the IOT, the IOP and (most of all) the Grijalva-Usumacinta drainage {as iconography a colored phylogenetical tree and the corresponding map of both America is remarkably shown}. 2024. J.B., https://onlinelibrary.wiley.com/doi/abs/10.1111/jbi.15066] {Jean Huber, 7-December-2024} <°))))>< <°))))>< <°))))><

- Esmaeili, H.R., T. Asrar & G. Sayyadzadeh. [Esmaeili et al. details egg development of *Esmaeilius shirini* {K.D. moved from *Aphanius*} from 2.5 to 131 hours post fertilization ; using live cell imaging microscopy during the embryogenesis of *Esmaeilius shirini*, the authors report the detailed morphology and chronology of the events of all developmental stages (from fertilization to hatching) ; external fertilization of transparent, spherical, sticky and macrolecithal eggs bearing adhesive filaments with an average diameter of 0.83 mm-1 mm is the first step in the ontogenesis ; then embryogenesis continues with a process of meroblastic cleavage (approximately 2 and half hours post-fertilization, HPF), formation of blastula (blastulation), gastrula (gastrulation), neurulation, somatogenesis, organ formation (organogenesis) and pre-hatching ; hatching occurs at approximately 131 HPF (at 24 ±1°C) ; the new larvae are about 3.9 mm-5.8 mm in total length with distinct fin rays and pigmentation on head, body and fins. 2024. A.Z., https://onlinelibrary.wiley.com/doi/10.1111/azo.12524] {Jean Huber, 28-November-2024} <°))))>< <°))))>< <°))))><
- Dinesen, K. [Dinesen reports on his new collecting trip in Sierra Leone, district Kenema, with major findings on *Scriptaphyosemion*, *Epiplatys* ; the author reports on his collecting trip to Sierra Leone in March and April 2022, together with biologist Anton Lamboj of Vienna (Austria) ; a total of 11 locations are sampled in Kenema, Tonkolili and Moyamba districts, with physico-chemistry data given ; killifish fauna is rich, and in genera *Scriptaphyosemion*, *Epiplatys*, *Micropanchax*, 12 valid sp. are listed (3 of them as cf., because of uncertain identifications), often sympatric ; iconography is remarkably rich with all killifish presented in color photos, sometimes with shown variations within and between populations. 2024. DKG-J., https://www.killi.org/viewtopic.php?t=17252] {Jean Huber, 18-November-2024} <°))))>< <°))))>< <°))))><
- Arroyave, J., S.G.A. Hernandez, M.M. Matus, W.A. Matamoros. [The Matamoros team discloses range extension of *Profundulus chimalapensis* and possible intergeneric hybridization with *Tlaloc* ; the authors report on 3 recent collecting localities , as (1) rio Sabinal near resurgence of Paso Burro cave (16°49’33.3”N, 93°16’13.7”W) (Berriozabal municipality, Chiapas state), (2) rio Suchiapa near the access point to El Chorro Grande cave (16°31’13”N, 93°14’39”W) (Villaflores municipality, Chiapas state), and (3) upper reaches of rio Ostuta (16°34’25.1”N, 94°23’17.4”W) (San Miguel Chimalapa municipality, Oaxaca state), outside its distribution range, broadening its extent of occurrence to a total of 3 river basins (Coatzacoalcos [original], Grijalva, Ostuta) and 2 versants (Atlantic [original] and Pacific) ; based on 2-3 molecular sequences, the authors imply a sister-group relationship with congener *oaxacae* ; surprisingly (and remarkably), 2 molecular samples are coming close, not to *Profundulus* sp., but to *Tlaloc* sp., widely genetically separated, and the authors suggest it is an evidence of intergeneric hybridization, a phenomenon previously never reported in family Profundulidae {but frequent in Poeciliidae) and if correct, they propose that the *Tlaloc* sp. living in the same area, *labialis*, be considered as the mother

lineage (*chimalapensis* being the father) of hybrids ; this {probably rare) case raises several broader evolutionary and taxonomic questions, such as the role that introgressive hybridization might be playing as a driver of speciation in profundulid fishes. 2024. Zootaxa, https://www.mapress.com/zt/article/view/zootaxa.5536.3.5] {Jean Huber, 7-November-2024} <°))))>< <°))))>< <°))))><

- Nagy, B. [Nagy molecularly discloses strong infestation by parasites over all-threatened *Nothobranchius* spp. with lesions in the wild from Zaïre ; the molecular evidence of parasites of Aphanomyces group (invadans, laevis) is shown for the first time on *Nothobranchius malaissei* and 2 putatively new *Nothobranchius* spp. (or populations variants) from ephemeral wetland habitats of the upper Congo drainage in southeastern Zaïre (Democratic Republic of Congo) ; those parasites pose an important global threat and cause damage to aquaculture and agriculture by infecting aquatic animals and plants. 2024. AJAS, https://www.tandfonline.com/doi/abs/10.2989/16085914.2024.2401346] {Jean Huber, 2-November-2024} <°))))>< <°))))>< <°))))><
- Hernandez, S.G.A., C.W. Hoagstrom & W.A. Matamoros. [The Matamoros team, after 5 genes molecular study of 130 Central-American killies, shows congruence with historical biogeography ; a major and very documented work focusing on components of the 5 families (Fundulidae, Profundulidae, Cyprinodontidae, Goodeidae and Cubanichthyidae, considered again as distinct) that are distributed in the studied zone, between North America, both Atlantic and Pacific slopes, and Central America not far from Gulf of Mexico ; the authors discuss the relationship of their molecular tree and palaeo-geography with solid arguments (and fossil calibrations) ; they estimate diversification rates, ancestral areas, and ancestral habitats for each node ; (surprisingly) the speciation rate is uniform through time, except for acceleration in Cyprinodontidae after ~10.9 MYA and in other families, neither viviparity nor marine-to-freshwater transition is associated with accelerated speciation ; sea-level fluctuations might have created a speciation pump by stimulating cycles of dispersal and vicariance along coast ; for highland lineages, ancient river drainages fit with lineage distributions {note: again the authors show that *Chriopeoides* is molecularly distinct from *Cubanichthys* and that *Garmanella* is distinct from *Jordanella*, but they refrain to formally propose it [it is already taken into account in Killi-Data]}. 2024. Z.J.L.S., https://academic.oup.com/zoolinnean/article-abstract/202/2/zlae105/7845214] {Jean Huber, 28-October-2024} <°))))>< <°))))>< <°))))><
- Costa J.H.A. da, U.P. Souza, A. Selinger, T.A. Vidal, F. Langeani & R.M. Duarte. [Costa (J.H.A.) et al. rediscover *Leptopanchax itanhaensis*, near type locality, previously nearly extinct in Atlantic forest, Brasil ; the authors report new records of the critically endangered *Leptopanchax itanhaensis* in a temporary pool near its type locality and in a roadside ditch from the same sub-basin {and it is fortunate}, however despite extensive collection efforts over the years to find the species and concerns of potential regional extinction, only 5 individuals are successfully sampled in February and March 2024 and those newfound records stress the urgent necessity for conservation efforts of the species, all the more that current area is under imminent threat of deforestation. 2024. B.N., https://www.scielo.br/j/bn/a/VyFsnWbL7S63cDDFS3N6Wqw/] {Jean Huber, 23-October-2024} <°))))>< <°))))>< <°))))><
- Iranmanesh, M. & M. Askari-Hesni. [Iranmanesh and Askari-Hesni show otoliths differences in 2 pops of Hormuz and Makran basins for widely distributed *Aphaniops stoliczkanus* ; the species is very widely distributed in different geological and ecological environments from Pakistan to coastal Iran {then replaced westerly by *hormuzensis* in the delta of Hormuz, without clear reasons), in freshwater, brackish water and hot sulphur springs, and it is expected it exhibit large intraspecific diversity ; the authors study 2 populations from Hormuz and Makran sub-basins of Iran in terms of otolith morphology and morphometrics ; their results show that those populations can be divided into 2 distinct groups including East and West of the Strait of Hormuzand that there is a relationship between otolith morphology and

type of environment, serving as environmental factors that may influence the formation of specific regions in otolith shape ; despite the remarkable morphological similarities among otoliths in geographically close populations of Charak and Chiruyeh, they have different dorsal tip shapes in otoliths ; in comparison to the data from other studies, otoliths of Qeshm Island appear to resemble the overall shape of otolith found in Oman very closely (Qeshm Island population are understood to have separated from the Hormuz basin populations during the Holocene Sea level rise) ; the authors consider that migration patterns within the Persian Gulf, at the moment poorly known plays a role in shaping intraspecific diversity {note: the authors do not discuss putative revalidation of *teimorii* vs. *hormuzensis* from 2 distinct type-localities in Hormuz delta, as a potentially similar example in the same eco-region}. 2024. A.Z., https://onlinelibrary.wiley.com/doi/abs/10.1111/azo.12521] {Jean Huber, 18-October-2024} <°))))>< <°))))>< <°))))><

- Thompson, A.W., A.C. Black, Y. Huang, Q. Shi, A.I. Furness, I. Braasch, F.G. Hoffmann & G. Orti. [The Orti team molecularly compares old world and new world annual and non-annual Cyprinodontiformes lineages with mixed subbranches ; nearly half of the 800 species of Aplocheiloids, according to the authors, a clade of teleost fishes with a circumtropical distribution, are annual or seasonal species that survive in ephemeral bodies of water that fully desiccate and are unfeasible for growth, reproduction, or survival for weeks to months every year ; the authors present a phylogenomic reconstruction of those killifishes evolution using newly sequenced transcriptomes obtained from a diversity of killifish lineages representing putative independent origins of annualism ; ancestral state estimation shows that developmental dormancy (diapause), a key trait of the killifish annual life cycle, may have originated up to 7 times independently among African and South American lineages, and thereby the authors identify molecular evolutionary signatures of repeated transitions to extreme environments {important note : this work has been previously web-edited -as far back as 2021-, in BioRXiv, then Square, but not published until October 2024, then preceded by the more comprehensive publication by Morales et al. with identical results and this shapes the basis for the future split of *Rivulus* in a large sense after a new phylogeny by the same authors or others}. 2024. M.P.E., https://www.sciencedirect.com/science/article/abs/pii/S105579032400201X] {Jean Huber, 8-October-2024} <°))))>< <°))))>< <°))))><
- Leow, C.J. & K.R. Piller. [Leow and Piller show similarities in DEG genes across life-histories in non-annuals and semi-annuals, distinct from annuals, African sp. ; within African family Nothobranchiidae, components possess today annual, semi-annual, or non-annual life-histories ; this differentiation into 3 types is explored by the authors, using gene expression profiles (QuantSeq) as a marker in 62 individuals from 11 sp. (4 annuals in *Nothobranchius*, *rubripinnis*, *rachovii*, *eggersi*, *fuscotaeniatus* , 1 semi-annual in *Fundulopanchax*, *gardneri* and 6 non-annuals in *Epiplatys*, *sexfasciatus*, *guineensis*, *annulatus* or *Aphyosemion*, *striatum*, *splendopleure*, *bivittatum*) ; results show significant differences in differentially expressed genes (DEGs) across life-histories with non-annuals and semi-annuals being most similar, and annuals being the most distinct ; besides, and congruently, non-annual and semi-annuals share similar gene expression profiles, while annuals are distinct {an interesting and smart comparative technical study, even if other aquarists-tagged semi-annuals like *Aphyosemion batesii-splendidum-kunzi* or *Fenerbahce* components are not included, likewise similar cases in Neotropical South America or Mexico}. 2024. Plos, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0308855] {Jean Huber, 13-September-2024} <°))))>< <°))))>< <°))))><
- Charmpila E.A., A. Teimori, B. Reichenbacher. [The Reichenbacher team discloses otolith and morph gaps among regional congeners *dispar*, *ginaonis*, *hormuzensis*, *kruppi*, *stoliczkanus* ; within today genus *Aphaniops* with 9 components distributed in Eastern Africa and the Middle East, the authors focus on 5 congeners replacing each other vicariantly and, for the first time, they are able to find differences in otolith detailed structure (*sagittae*) among those cryptic sp., using 2 methods, (1) otolith morphometrics,

following prior recommendations, (2) shape analysis of otolith contours based on discrete wavelet transformation, a novel method in killifish otolith research ; not surprisingly, both methods meet challenges (difficulties) in correctly classifying *hormuzensis* due to its high otolith variability ; the authors suggest environmental fluctuations at the sampled hot sulphuric spring (Khurgo) and potential introgressive hybridization between populations of the species {with an uncertain distributional range, notably at its borders} ; the authors confirm that otolith morphometry is a valuable tool for *Aphaniops* species identification and that the distinctiveness of species-specific otolith traits increases with divergence age of a given species. 2024. A.Z., https://onlinelibrary.wiley.com/doi/pdf/10.1111/azo.12518] {Jean Huber, 12-September-2024} <°))))>< <°))))>< <°))))><

- Popoola, M. & J.R. van der Zee. [Popoola+Zee show exact type locality of *Fundulopanchax spoorenbergi* in lower Cross river basin (described from aquarium import) ; the authors receives funding from International Foundation for Science (IFS) for an inventory of ichthyofauna in the eastern part of the area between the Lower Cross River and the border with Cameroon in Nigeria ; the Royal Museum for Central Africa (Tervuren, Belgium) has quite some collections from the Lower Cross (many of them by Ruud Wildekamp) but only a few, e.g. the types of *Fundulopanchax ndianus* (Scheel, 1968) came from this area ; also, other museums lack collections from here ; the first author, from the Ile Ife University in central Nigeria starts the inventory in early April 2020 near the border with Cameroon ; unfortunately, he has to return after 2 days because of covid 19 because local people are afraid that outsiders would bring the virus to their villages ; within these 2 days, he collects *Aphyosemion calliurum*, *bivittatum*, *Fundulopanchax scheeli* and a beautiful undescribed *Epiplatys* with long yellow fins and a wide red border, next to cichlids, catfishes, cyprinids and characids ; he resumes inventory in February 2022 ; then, next to several undescribed cichlids, he collects two undescribed *Procatopus* species and *Fundulopanchax ndianus*, but unfortunately, the new *Epiplatys* species is not collected again ; in order to describe that species he goes back in February 2024 and is able to collect some additional material for the description ; surprisingly, he collects a *Fundulopanchax* species at that location and it is the first time *spoorenbergi* is found in nature after 50 years ; the sample locality is along the Calabar-Ikom road near the village of Owom, 5°32’6.47”N, 8°48’37.54”E ; the mostly rocky, 60 cm deep stream with decaying leaves on the bottom, is partly under canopy cover ; there are several shallow pools along the stream ; back in March 1974, two Dutch aquarists (Piet Boelen and Frank Spoorenberg) visit an ornamental fish importer in Amsterdam ; they purchase some *Fundulopanchax ndianus* and several specimens of an unknown *Fundulopanchax* species from the same shipment ; several experts are consulted, but no one knows this fish ; eventually, several specimens are sent to Berkenkamp who describes it as a new species ; however, *spoorenbergi* is never imported again and the type locality remains temporarily unknown ; initially, the authors have some doubts about the identity of the Owom fish because color pattern of Anal fin is different from that of the aquarium strain ; members of the British Killifish Association provide the authors with pictures of the aquarium strain of *spoorenbergi* with the same color pattern in Anal fin as the Owom fish ; this difference in color pattern is most likely a variable characteristic within the species. 2024. Zootaxa, https://www.mapress.com/zt/article/view/zootaxa.5501.4.10] {Jouke van der Zee & Michael Popoola, 10-September-2024} <°))))>< <°))))>< <°))))><
- Dominguez, O.C. & S.C. Valdez. [Dominguez and Valdez study embryos of *Garmanella pulchra* in Yucatan peninsula with survival out of water and asynchronous hatching ; the Yucatan region in southern Mexico is speciose and diverse ; one of the many killifish species, there, oviparous and ovoviviparous, the estuarine *Garmanella pulchra*, is experimentally studied (LHT study) in artificial conditions after transplant in common garden premises (not aquariums), notably according to 3 incubation temperatures, to embryonic developmental time, to extended (or not) incubation out of the water, survival, metabolic rate, to hatching dynamics and to morphological changes of embryonic cortical structures related to air exposure ; results show that embryos incubated out of water in low and medium temperatures have an extended

incubation period beyond their hatching capability with a deep metabolic depression and with a hatching asynchrony, not related to water availability ; on the contrary, embryos incubated at high temperatures do not show extended incubation, with decreased probability of survival out of water ; besides, the embryonic cortical structures reveal that the perivitelline space and hair-like filaments buffer the deleterious drought effects ; in total the sp. related to pupfishes, shows delay hatching and diapause, supporting a true continuum between the 2 characters, rather than independence and dichotomy and the authors link the evolution of those traits with to aerial exposure during low tides in estuaries. 2024. D.D., https://anatomypubs.onlinelibrary.wiley.com/doi/abs/10.1002/dvdy.732] {Jean Huber, 3-September-2024} <°))))>< <°))))>< <°))))><

- Volcan, M.V., F. Severo-Neto & L.E.K. Lanés. [Volcan et al. describe *Melanorivulus terena* {K-D maintained in *Rivulus*} endemic to rio Paraguay basin, with orangish red margins ; the new species of *Melanorivulus* is described from upper rio Taquari drainage, upper rio Paraguay basin, in Brasilian cerrado, as a member of the *Melanorivulus pictus* group, endemic to the central plateau and adjacent areas ; by color pattern of male, it is closely related to *linearis*, *interruptus* and *egens*, by absence of dark markings on post-opercular region in male, that are endemic to the upper rio Parana basin (upper Paraguay is close-by, both major rivers joining downstream today but possibly interconnected in the past in their upper parts, according to the authors) ; it is separated from all other components of its group by a orangish red distal margin at unpaired fins and also Ventral fins {but no interpopulational variability is tackled and it is only know from one spot} ; the authors also list clearly all sp. belonging to that *pictus* group within *Melanorivulus* totaling today 65 taxa, like for the *zygonectes* group for *melanopterus*, but there are several sp. group within *Melanorivulus* that are poorly understood. 2024. J.N.H., https://www.tandfonline.com/doi/full/10.1080/00222933.2024.2387798] {Jean Huber, 30-August-2024} <°))))>< <°))))>< <°))))><
- Langdon, Q.K., J.S. Groh, S.M. Aguillon, D.L. Powell, T. Gunn, C. Payne, M. Schartl & K. Du. [Langdon et al. disclose that genome evolution is predictable after initial independently formed hybridization in Xyphophorus sp. ; over past 2 decades, hybridization, or genetic exchange between distinct lineages, has been disclosed as unexpectedly common, notably in ovoviviparous killifish (Poeciliidae) and it is a major driver to speciation {cf. Du et al., 2024, published just before} ; here, the authors address the issue of independently formed hybrid populations, for *Xiphophorus birchmanni* and *cortezi*, 2 related congeners ; results are that local ancestry in one hybrid population is remarkably predictive of local ancestry in another, demographically independent hybrid population ; the authors suggest that this could be explained by strong selection in earliest generations after initial hybridization and that ancestry at regions under selection has remained stable over the past approximately 40 generations of evolution. 2024. Plos, https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002742] {Jean Huber, 23-August-2024} <°))))>< <°))))>< <°))))><
- Nielsen, D.T.B. & W.M. Ohara. [Nielsen and Ohara describe *Melanorivulus melanopterus* {K-D maintained in *Rivulus*} with a black-tailed male, from Rio Madeira basin ; the species, belonging to the *zygonectes* species group, is described from the rio Galera, within Amazon basin, Mato Grosso state, in Brasil and it is diagnosed by lacking Ventral fins and presence of a black band along entire caudal-fin margin in male, as a belt, more conspicuous upperly and lowerly ; the authors list clearly all sp. belonging to that group within *Melanorivulus* totaling today nearly 65 taxa [note: the character of missing or vestigial Ventral fins is found also in other *Rivulus* sp. without rationale]. 2024. Zootaxa, https://www.mapress.com/zt/article/view/zootaxa.5496.3.2] {Jean Huber, 20-August-2024} <°))))>< <°))))>< <°))))><
- Du, K., J.M.B. Ricci, Y. Lu, M.O. Garcia, R.B. Walter, W.C. Warren, T.O. Dodge, M. Schumer, H. Park, A. Meyer & M. Schartl. [The Meyer-Schartl team disclose phylogeny of 26 *Xiphophorus* sp. and 3 un-named sp. with hybridization then speciation in 3 groups ; intra-generic hybridization is today recognized to play

important roles in evolution, notably for the oviparous genus *Xiphophorus* {commonly known as the sword-tails because of unique male appendage} ; the authors disclose complete genomic resource including annotations (mitochondrion and nuclear genome) for all described 26 *Xiphophorus* species and three undescribed taxa and resolve all uncertain phylogenetic relationships (with all bootsrap values at or near 100 when mito and nuclear-genomes are fused) ; the authors discover dramatic size-variation of some gene groups, despite reticulate evolution, rapid speciation and short divergence time within 3 evolutionary groups and, surprisingly, show that hybridization has often preceded speciation. 2024. N.Comm., https://www.nature.com/articles/s41467-024-50852-6] {Jean Huber, 7-August-2024} <°))))>< <°))))>< <°))))><

- Volcan, M.V., Y.R. Suarez, F. Severo-Neto, P.F. Amorim & W.J.E.M. Costa. [Volcan et al. describe *Atlantirivulus enigmaticus* {K-D maintained in *Rivulus*} not from coastal plain (ca. 700 km of previous taxa) ; the new species originates from rio Parana basin in the Mato Grosso do Sul, Brasil, i.e., not in coastal plain, but in inland plain, far away from standard range of components of *Atlantirivulus* {*depressus*, *guanabarensis*, *haraldsiolii*, *janeiroensis*, *jurubatibensis*, *lazzarotoi*, *luelingi*, *maricensis*, *nudiventris*, *paranaguensis*, *ribeirensis*, *riograndensis*, *santensis*, *simplicis*, *unaensis*} ; on the contrary, the region is known to be a hotspot for *Melanorivulus* components ; according to the authors, *enigmaticus* is distinguished from all (sub)congeners by its unique coloration {in male}, which consists of purplish grey sides with light green iridescence along with brownish red dots scattered all along, by the neuromasts pattern of the infraorbital series (aligned around eye), and by presence of a short ventral process of post-temporal ; molecularly (cyt sequence) the new species is closely related to *luelingi* from the coastal drainages of Santa Catarina state ; then the authors propose possible explanations for this disjunct distribution {but they do not explore the issue of a past introgression seas}. 2024. Z.A., https://www.sciencedirect.com/science/article/abs/pii/S004452312400069X] {Jean Huber, 4-August-2024} <°))))>< <°))))>< <°))))><
- Lopez, E.S., J.L. Pérez, L.F.F. Del Moral & T.A. Hernandez. [Lopez et al. report on 6 new collecting localities of endangered viviparous *Girardinichthys viviparus* in Valley of Mexico city ; the common-named Mexclapique is a true viviparous fish in family Goodeidae, endemic to Valley of Mexico basin and it is endangered following habitat alterations due to urbanization and pollution in central Mexico over the last 70 years, which has contributed to its population (sharp) decline ; the authors disclose 6 new collecting sites located in the upper basins of rios Moctezuma and Atoyac and this extends the species distribution to the east of the state of Tlaxcala in Tecolutla River basin ; however the authors stress the lack of aquatic biodiversity preservation projects in Tlaxcala and this does not guarantee its long-term conservation. 2024. N.B.C., https://neotropical.pensoft.net/article/126767/] {Jean Huber, 4-August-2024} <°))))>< <°))))>< <°))))><

Dominguez, O.C. [Dominguez shows in agonistic experiment on 3 color phases of male *Millerichthys robustus* that orange correlates with many wins : there are 3 color phases in that annual species, red, orange and yellow and the author compares their agonistic behavior ; results show that orange morph (or phase) is related to winning the greatest number of encounters, whereas yellow loses the most, the red morph registers the greatest number of ties ; in contrast, the least aggressive morphotype (yellow) tends to raise its aggressiveness against the most successful morphotype and lower it in matches against its own color, changing to a scheme between contenders with symmetrical aggression levels ; obviously the results suggest that differential aggression between morphotypes can influence the evolution of color polymorphism in *robustus*, differentially influencing the fitness of individuals {note: this study is a follow-up of previous ones, with references: Dominguez, O.C. 2021a. Agonistic Interactions with asymmetric Body Size in two adult-age Groups of the annual killifish *Millerichthys robustus* (Miller & Hubbs, 1974). Journal of Fish Biology (J. Fish Biol.), 99 (3) (September): 773-781, https://doi.org/10.1111/jfb.14757 and Dominguez, O.C., T.M.C. Muñoz, S. Valdesalici, S.C. Valdez & C. Passos. 2021a. Male Mate Choice in the

annual killifish *Millerichthys robustus* and its Relationship with female Polymorphism, Size and Fecundity. Ethology, Ecology and Evolution, https://www.tandfonline.com/doi/abs/10.1080/03949370.2021.1883121 and Dominguez, O.C., T.M.C. Muñoz, S. Valdesalici, S.C. Valdez & C. Passos. 2021b. First Description of Color Variations in the annual killifish *Millerichthys robustus*, and preliminary Observations about its geographical Distribution. Environmental Biology of Fishes (Environ. Biol. Fish), 104: 293–307, https://doi.org/10.1007/s10641-021-01076-w}. 2024. A.Eth., https://link.springer.com/article/10.1007/s10211-024-00444-w] {Jean Huber, 25-July-2024} <°))))>< <°))))>< <°))))><

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