

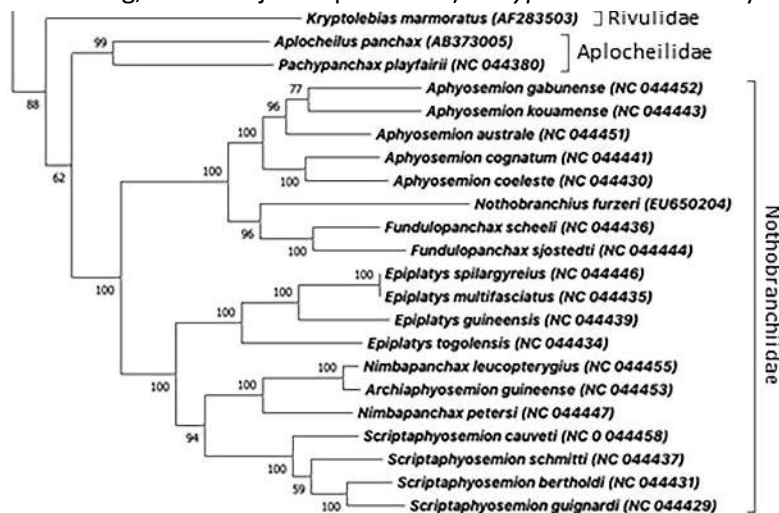
INTRODUCTION

First 2 important indirect results reshuffle the panorama, according to like we say in French "un train peut en cacher un autre" which would translate into "one train can hide another".

- 1- A new molecular study, not on Cyprinodontiformes, but on related Beloniformes, notably on genus *Oryzias* from Indo-Asia, gives another insight on first divergence of our fishes. A mainly Japanese large team studying Adrianichthyidae (a family holding *Oryzias* and *Adrianichthys* in Beloniformes) with full mitogenomes and parts of nuclear genomes and fossil calibration, shows that Cyprinodontiformes origin may lie at ca. 80-85 MYA (million years of age) with a blue confidence interval that extends +/- 15 MYA, and first direct ancestor emergence at ca. 90-95 MYA (same confidence interval), more in line with Reznick et al. (2017) [Ref.: Kazunori et al., 2021 : Mesozoic Origin and 'out-of-India' radiation of ricefishes (Adrianichthyidae). *Biology Letters* 17: 7 pp., suppl., <https://royalsocietypublishing.org/doi/10.1098/rsbl.2021.0212>]. Then, to sum-up, the most recent evidence for dating origin of Cyprinodontiformes points out 4 alternate scenarios: (1) vicariance mainly when Gondwana is a single unsplit continent (ca. 150 to 120 MYA), a scenario pushed by early molecularists that is nicely congruent with continent drifts, but not at all with fossil dating, (2) subsequent pseudo-vicariance, ca. 100-90 MYA, when Gondwana is weakly split with Atlantic ocean limited to a 'narrow and shallow' (very relatively) channel between South America and Africa (and similarly between East Africa and India-Madagascar) and when Atherinomorpha and Cyprinodontiformes as coastal marine fish can easily extend, then migrate into nearby brackish, then fresh waters (in line with Reznick et al., Kazunori et al.), (3) oceanic dispersal contemporary (to K-T boundary, 65 MYA), in fact a 'little' (by MYA!) anteriorly or posteriorly to the meteor 'catastrophe' in line with an option by Matschiner et al. but not in accordance with known fossils of Cyprinodontiformes and not in accordance with the missing capacity (as far as known) for Cyprinodontiformes of migrating thru deep seas over thousands of kms, or (4) much later independent multiple colonizations (i.e., ca 45 MYA) more in line with another option by Matschiner et al., some partial molecular data and fossil evidence of Cyprinodontiformes but not in accordance with the availability of only 1 or 2 ancestor(s) per continent, for India, Madagascar, Africa, South America (why not more?), in line with dispersal along floating seaweed mats or tiny land rafts at sea surface (a theory publicized by scientist Alan de Quieroz, supported once by Brazilian Wilson Costa), putatively in correspondence with present major family-group names in the tropics, but not in accordance with previous key role of palaeo-Tethys sea of first scenario... latest molecular research with known fossils would favor scenario n°2 for the emergence of ancestor of Cyprinodontiformes (85-100 MYA), when Atherinomorpha expanded all over coasts of just fully split Gondwana, before, unlike most its other components, Cyprinodontiformes decide to go for freshwaters (when exactly? along a single move or

more probably several? from coastal fringes or from deep seas?). Future will tell more, hopefully, on that fascinating enigma of origin, type of move-expansion and initial timing of emergence-breakups of Cyprinodontiformes families (or further sub-branches). Beware, those 4 scenarios are theoretical and speculative for Cyprinodontiformes and like for most fish groups, emergence (order level), first breakup (family level) and further branches of tree (subfamily level) are presently very unstable and uncertain (for more on palaeo-tectonics look at ODSN , <https://www.odsn.de/odsn/services/paleomap/paleomap.html> , over time (e.g., type Age to be reconstructed [My]: 110, or 100, or 95, or 90, or 85, up to K-T boundary 65, or 45, and so on).

2- In a new paper (Core et al., 2021) reporting the full mitogenome (not full genome, but still very interesting, and a major step forward) of *Cyprinodon salinus* by a team around Sean Lema the tree



(herein only for its Aplocheiloidei part) is extended with other full mitogenomes taken in Genbank of several aplocheiloids genera and species (those genomic data are first established by Cui et al., in 2019, showing both nuclear and mitochondrial sequences, but they do not use them with a purpose of systematics, rather for a comparison of sequences between annual and non-annual species... and because (quote)

their mitochondrial phylogeny often disagrees with the nuclear genome). The Lema's paper restricted to full mitogenome is though systematically explicit that *Nimbanpanchax* is a junior synonym of *Archiaphyosemion* because the tree branches are heterogeneous and contradict Sonnenberg's generic move (with Busch), although Lema's team is not formally proposing that. For me (as a researcher) it is no surprise after my paper (2011) showing that Sonnenberg's identification of the type of *maeseni* is erroneous (and that is confirmed recently by Romand et al., in 2020). On generic terms the original diagnosis of *Nimbanpanchax* vs. *Archiaphyosemion* appears to me as morpho-osteologically too thin (and other authors have not followed the distinctness of *Nimbanpanchax*, e.g. Furness in 2015, or, already quoted, Cui et al., molecularly, but without pointing the synonymy, just disregarding *Nimbanpanchax*). Also in 2015, Costa publishes another diagnostic (not major) character for *Nimbanpanchax* (on a single vertebra). In Killi-Data, *Nimbanpanchax* has been (and is still now up to a published formal synonymization) considered as a subgenus of *Archiaphyosemion* only. On the other hand, other more generalist databases keep *Nimbanpanchax* as a distinct genus... Remember that some people, during the 1990ies, claim that with early molecular data the alpha and omega of truth in systematics are reached, full stop (the same persons who have claimed the same with cladistics 10 years even before??). As you know the prediction have not worked well. Then it has been thought that multiple sequences (2nd generation) molecular data are compulsory to get that truth (and the paper describing *Nimbanpanchax* belongs to that period). Now it is clear from full mitogenomes that it is better but not sufficient (do not forget that we are still facing the major gap between results given separately by mitochondrial and nuclear molecular data or simply by selecting some sequences and not others). With the current new papers with full mitochondrial data, cards are (again) reshuffled... will that be sufficient? Will the ultimate full genome with all mitochondrial and nuclear data (just starting) be sufficient ???

Quoted refs.:

- * Core, A.A. Del, C.S. Cleveland & S.C. Lema. 2021. Complete mitochondrial Genome of the Salt Creek pupfish, *Cyprinodon salinus salinus*: Characterization and Identification of single nucleotide polymorphisms (SNPs). Mitochondrial DNA, part B, 6 (8): 2229-2232.
<https://www.tandfonline.com/doi/full/10.1080/23802359.2021.1945964>
- * Cui, R., T. Medeiros, D. Willemsen, L.N.M. Iasi, G.E. Collier, M. Graef, M. Reichard & D.R. Valenzano. 2019. Relaxed Selection limits Lifespan by increasing Mutation Load. Cell, 178 (July): 15 pp.,
<https://doi.org/10.1016/j.cell.2019.06.004>
- * Furness, A.I. 2015. The Evolution of an annual Life Cycle in killifish: Adaptation to ephemeral aquatic environments through embryonic Diapause. Biological Reviews of the Cambridge Philosophical Society (Biol. Rev.) , 91 (3) (August): 796–812.
- * Sonnenberg, R. & E. Busch. 2009. Description of a new genus and two new species of killifish (Cyprinodontiformes: Nothobranchiidae) from West Africa, with a Discussion of the taxonomic Status of *Aphyosemion maeseni* Poll, 1941. Zootaxa, 2294: 1-22, 10 figs.
- * Huber, J.H. 2011. Comments on the Identification of Poll's type of *Aphyosemion maeseni* by Sonnenberg & Busch, 2009. Killi-Data Series 2011, 10-12.
- * Costa, W.J.E.M. 2015. Comparative Morphology, Phylogeny, and Classification of West African callopanchacine killifishes (Teleostei: Cyprinodontiformes: Nothobranchiidae). Zoological Journal of the Linnean Society, 175 (1) (September): 134-149, figs.
- * Romand, R., J.-F. Agnès & W.J.E.M. Costa. 2020. On the Identity of the West African killifish *Aphyosemion maeseni* Poll, 1941 (Cyprinodontiformes: Aplocheilidae). Cybium, 44 (3) : 179-183.

Finally the order Cyprinodontiformes is at stake! A new publication (major, not just a new opinion or a witness contribution), a new review of all teleosts [Ref.: Dornburg, A. & T.J. Near, 2021. The emerging phylogenetic Perspective on the Evolution of Actinopterygian Fishes. The Annual Review of Ecology, Evolution, and Systematics; 52: 427-452, abstract and link at: <https://www.annualreviews.org/doi/abs/10.1146/annurev-ecolsys-122120-122554>] proposes to lump Cyprinodontiformes and related orders into Blenniiformes (the new delimitation of Blenniiformes includes the Blenniidae and 46 other families that consist of ca. 5,865 species), and if accepted everything in Killi-Data tree and list of FGN at <https://www.killi-data.org/list-names-familygroup.php> (and all worldwide databases!) will be downgraded by 2 steps and Cyprinodontiformes will become a superfamily only in suborder Atherinoidei, as Cyprinodontoidea... time will tell!

Within this time frame of present Wassup, the menu contains (1) no new species (but Wilson Costa seems to have changed his focus and now describes new taxa in other groups of fishes, outside Cyprinodontiformes), (2) as a consequence, many papers are digging into known or virgin themes of research without any taxonomic objectives, e.g., the link between Mycobacterium infections and some events of belly sliding in annuals by the Reichard lab, or, the link between annual egg development in lowland-highland sp. and cues from predators, or, the link between placentation and superfetation sympatric livebearers and body shape with daylight and night niches, or, the link between larger brain size in adult (not juvenile) fast-living killies (vs. slow-living) independent from size, or, the link between otoliths, sexual dimorphism and maximum lifespan for *Empetrichthys latos*, or the evidence in viviparous *Ataeniobius toweri* of rudimentary trophotaeniae, contrary with past understanding (3) several papers continuing to disclose full mitogenomes of killifish, preparing new future phylogenetic trees at upper levels including publications by purely Chinese teams (as a major new paradigm in biological sciences), and (4), only one taxonomic molecular study for *Characodon* in Goodeidae that confirms the validity of only 2 species in genus, as defined, but fails to assign them to 2 taxa among 3 described, and (5) still populations to name as new sp., following Rohde et al. who collect 8-11 *Rivulus* sp. in 20 sites very near Manaus with 4 possibly (molecular) new sp. vs. related *uatuman* and *kirovskiyi*.

Finally it should be stressed that the wave of publications is getting higher and higher today concerning extensive and detailed field reports of regional fish fauna in Brasil, by local Brazilian teams, preparing in an unprecise future a solid distributional monitoring of all species in that species-rich and area-huge country, not only for Cyprinodontiformes, and not only in fabulous rio Amazon basin.

SELECTION OF PUBLICATIONS (last in, first out)

- Chuanchen R., Xinyu Z., Fang M., Yifan L., Hongqiang W., Kun Z., Bingjian L., Enshang Y. [Ren et al. from Zhoushan univ, China, first disclose full mitogenome of *Poropanchax normani*, closer to Goodeidae than Poeciliidae ; its size is 16,878 bp and total length of encoding sequence is 11,435 bp, accounting for 67.75%, encoding 3800 amino acids in total ; phylogenetic analysis shows that African lampeye *normani* is most closely related to *Xenotoca eiseni* {today as *Xenoophorus*}, and less so {surprisingly} to genera *Valencia* and *Aphanius* {like early molecular, but on limited sequences, data suggest} ; {note : this analysis should be replicated including further lampeyes and *Valencia* full mitogenomes}. 2021. MitDNA, <https://www.tandfonline.com/doi/epub/10.1080/23802359.2021.1970633>] {Jean Huber, 2-September-2021}
- Beltran, R.G.L., A.A.D. Gonzalez, M.B. Soria, M.A.S. Garduño, C.C. Xochitla, R.H. Rodiles & C.P.G. Ornelas. [Beltran et al. molecularly show in endangered *Tlaloc hildebrandi* a lower level of genetic diversity with 3 genetic regional clusters ; endangered Chiapas killifish {previously in *Profundulus* genus} is an endemic freshwater species that lives in 4 sub-basins of rios Grijalva and Usumacinta basins (recently records are extended in rios Jataté and Tzaconejá sub-basins in upper Usumacinta basin ; currently, scarce populations of *hildebrandi* are known in only a few localities in the Grijalva and Usumacinta basins, are fragmented and living under unfavorable conditions {due to human-derived constraints} ; the authors molecularly study 3 mitochondrial (mt-atp8, mt-atp6 and mt-nd2) and 1 nuclear (nuc-s7) marker in order to assess its genetic diversity and find that, in comparison with other endangered freshwater fish species from Mexico, it shows a lower level of genetic diversity, implying further conservation risks ; they call for official recognition of at least 3 evolutionarily significant units (ESUs) for the species and the urgent implementation of ex situ and in situ conservation and management efforts. 2021. P.J., <https://peerj.com/articles/11952/>] {Jean Huber, 28-August-2021}
- Carcamo, V.T., I. Vila, F.R. Llanquín, A.A. Sáez & C.J. Guerrero. [Carcamo et al. molecularly show collapse of Parinacota volcano impacts *Orestias* populations of Caquena and Lauca sub-basins, Chile ; from early Miocene (ca. 23-16 MYA), uplift of Andes Mountains starts with intense volcanic activity and occurrence of successive periods of dryness and humidity, all impacting Altiplano watersheds, and consequently evolutionary history of *Orestias* endemic taxa ; the authors molecularly study *Orestias* populations from Caquena and Lauca Altiplanic sub-basins of northern Chile to determine their genetic differentiation and relationship to their geographical distribution using partial mitochondrial (D-loop) and nuclear (microsatellite) molecular markers ; results suggest that *Orestias* have been spread homogeneously in the studied region, but local events may induce local disturbances and isolations, possibly explaining {high} speciation. 2021. P.J., <https://peerj.com/articles/11917/>] {Jean Huber, 24-August-2021}
- Eastis, A.N., K.M. Fast & M.W. Sandel. [Eastis et al. publish complete mitogenome of *Xiphophorus variatus* with 16,624 bp and identical gene order as other Poeciliidae ; the authors selects strain Zarco (Arroyo Zarco locality west of Encino, Tamaulipas, Mexico) and only one sample for their study {hence it is not known if the species deserves its nickname, based on strong intra and inter-populational pattern variations, as Variable Platyfish} ; the phylogenetic tree suggests *variatus* is more related to *couchianus*

than to the paired congeners *hellerii-maculatus*, but less so than anticipated between *hellerii* and *maculatus*. 2021. MitDNA, <https://www.tandfonline.com/doi/full/10.1080/23802359.2021.1963339>] {Jean Huber, 14-August-2021}

- Uribe, M.C., P.-I. Cerda-Jardon & D.G. Blackburn. [Uribe et al. evidence nutrient provision to embryos in viviparous *Ataeniobius toweri* with rudimentary trophotaeniae (unlike before) ; trophotaeniae are, among viviparous Goodeidae, specialized, elongated extensions of hindgut that are exposed to fluids, which occupy ovarian lumen ; among Goodeidae, the sole exception is *Ataeniobius toweri*, whose embryos lack trophotaeniae but are nevertheless matrotrophic, up to the present study ; contrary to statements by previous authors, embryos of that species develop minuscule trophotaenial rudiments that extend slightly into ovarian lumen ; through late gestation, vitellogenic follicles form and oocytes are discharged into ovarian lumen, contributing to embryonic nutrition {then similarly to all Goodeidae}. 2021. JMor, <https://onlinelibrary.wiley.com/doi/abs/10.1002/jmor.21407>] {Jean Huber, 14-August-2021}
- Lackmann, A.R., S. Kettelhut, B.L. Paulson, C.M. Anderson, S.C. Goodchild, K.D. Guadalupe & C.A. Stockwell. [Lackmann et al. show, from otoliths, sexual dimorphism and a 10 year maximum lifespan for female (7 for male) in *Empetrichthys latos* ; the species is historically endemic to Manse Spring in Nye Country, Nevada, USA, but anthropogenic disturbance leads conservation managers to transplant fish to additional sites prior to, alas, extirpation of native population by 1975 ; thin-sectioned otoliths to age 121 specimens are used from a planted population collected in June 2017 ; analyses suggest a maximum age of 10 years for females and 7 years for males, with a substantial portion of all fish greater than 4 years old ; based on thin-sectioned otoliths of various stages, growth in length as a function of age is modeled ; other studies based on scales, morphs, contain biases for life expectancy (comparisons with *Cyprinodon tularosa*, *salinus*, *Aphanius iberus*, *fasciatus*, and *Empetrichthys latos*). 2021. NAFJM, <https://afspubs.onlinelibrary.wiley.com/doi/abs/10.1002/nafm.10677>] {Jean Huber, 14-August-2021}
- Bragança, P.H.N., F.P. Ottoni, C.S. Gama & E. Henschel. [Bragança et al. report new collection of *Poecilia (Pamphorichthys) scalpridens* about 300 km more northeasterly in Amapa, N.E. Brasil ; recent field expeditions in rio Jari drainage, in addition to examination of uncatalogued poeciliids, allow identification of specimens as *Poecilia (Pamphorichthys) scalpridens* ; its known range includes lakes and igarapés {small creeks, named marigots, in Africa} in lower reaches of tributaries near main channel of Amazon River between city of Parintins and mouth of rio Tapajos {note: the authors consider its isomorphic congener, partly sympatric, *minor*, also described by Garman (1895), as distinct, following Figueiredo's unpublished thesis, but German specialist, Manfred Meyer, is of the opinion they are identical... more to be seen after live topotypes of *minor* are studied}. 2021. C.L., <https://checklist.pensoft.net/article/68106/list/9/>] {Jean Huber, 1-August-2021}
- Rohde, F., S. Smith & D. Smith. [Rohde et al. collect 8-11 *Rivulus* sp. in 20 sites very near Manaus with 4 possibly new sp. vs. *uatuman*, discuss *obscurus-compressus* ; the goal of the trip is to sample, identify, photograph, and fin clip killifishes of genus *Rivulus* from vicinity of Silves and Manaus, Brasil with special attention to collecting *Rivulus ornatus* and *obscurus* from their type localities (Silves and Manaus, respectively). Over 5- and a half days 27 sites (car and boat) are sampled around Manaus resulting in *Rivulus* catch at 20 of them ; unfortunately, Silves is not reached {by far} due to safety concerns ; based on own molecular analysis, Garman's original descriptions, and Costa (2006), *Rivulus ornatus* is a very sexually dimorphic species and what is previously considered to be *obscurus* should be actually female *ornatus* {but topotypes of *ornatus* are still missing and this remains an hypothesis till then} ; the authors find *Rivulus kirovskyi (duckensis* is a junior synonym) from Manaus is molecularly closely related to *uatuman* and a group of undescribed species collected north of Manaus ; the authors collect 2 distinct taxa assignable to *micropus* and *compressus* {but unequivocally Costa has synonymized the latter into the

former by allocating the type locality of the latter into the former}, and this needs further, more detailed taxonomical study. 2021. JAKA, no webpage] {Jean Huber, 29-July-2021} <°))>< <°))>< <°))><

- Rocamontes, J.A.M., Gutiérrez, C.R., Rios-Cardenas, O. & P.C.R. Hernandez. [Rocamontes et al., in a molecular, morphological and range study, show *Xiphophorus hellerii* diverged along hydrological regions ; in freshwater systems, structure of basins, geographic distance, climatic fluctuations linked with Pleistocene contractions and expansions period {from 2,58 MYA up to quaternary at 117 thousand years ago} as well as extant environmental variation are important drivers of population divergence ; *Xiphophorus hellerii* is widely distributed in basins of Gulf of Mexico slopes {over more than 3000 kms from North to South} in Mexico and southwards countries ; molecular results show strong genetic structure conforming to basins and isolation by distance models ; body shape of *hellerii* varies among basins and hydrological regions ; temperature seems to affect body shape, since individuals with shallow bodies are collected in basins with low temperature and high altitudes {note : present molecular results are perfectly in line with other molecular results of similarly strongly variable species with wide range where vicariance and river basins play a major role}. 2021. Hydr., <https://link.springer.com/article/10.1007/s10750-021-04664-0>] {Jean Huber, 26-July-2021} <°))>< <°))>< <°))><
- Paranhos, C.O., L.C. Neves, W.S. Silva & R. Kennedy Luz. [Paranhos et al. measure effects of salt and pre-food type on transportation of annual neotropical killi (dissolved oxygen, pH, time); the authors aim to evaluate survival and water quality during the transport of *Hypsolebias flagellatus* {K-D maintained in genus *Simpsonichthys*} using different concentrations of salt in water and different transport times in association with different previous diets ; in lab experiment I, 40 males (weight 1.38 ± 0.83 g) are tested with water salinities as 0 (control), 2, 4 and 6 g of salt/l (dissolved oxygen is highest with salt concentration of 4 g/l and lower in control treatment) ; in experiment II, 30 males are previously fed (weight 0.68 ± 0.27 g) with commercial diet and 30 males (weight 1.48 ± 1.00 g) with artemia and are transported during 12, 24 and 48 hours ; survival after transport is lowest in 48 hours sample ($P < .05$) ; water pH is higher in animals fed with commercial diet ($P < .05$) ; water temperature and water total ammonia increase with increasing transport time ($P < .05$) ; dissolved oxygen decreases regardless of diet ($P < .05$) {notes : according to Daniel Vielvoye, personal communication : the technology of "breathers bags" (TM) is becoming more widespread, and it is a pity that this method is not taken into account in the comparison of this study ; according to the manufacturer (kordon.com), a breathers bag allows gas exchange (CO₂ out, O₂ in) which ensures that percentage of oxygen remains high in bag (maybe it also allows oxidation cycle of nitrogenous components towards their less dangerous form, nitrate ?) and as a real revolution in terms of transporting aquatic organisms it extends the acceptable transport time almost without practical "limits" (i.e., well beyond 48 hours of the present study), personal experience being rather a 5 days transport as acceptable ; and there are other advantages to "breathers bags" in addition to quality of transport material such as reduced water volumes and weight, and of course also disadvantages such as individual packaging more difficult to automate and contact with air during transport (such bags should not be placed one on top of the other, the bags "sweat" a little, therefore it is necessary to manage the humidity), such as relative fragility of those bags, and of course their price}. 2021. JAA, <https://www.tandfonline.com/doi/abs/10.1080/10454438.2021.1943102>] {Jean Huber, 23-July-2021} <°))>< <°))>< <°))><
- Godoy, R.S., V. Weber, L.E.K. Lanés, M. Reichard, T. Gemelli, R. Von Hohendorff & L. Maltchik. [Godoy et al. show in 2 *Austrolebias* (*botocudo*, *lourenciano*) that 3 predators types cues induce differentiated delays in hatching ; for annual fish species, embryo development can show variation at multiple levels influenced by many environmental factors, such as photoperiod, temperature, and predator cues ; the authors study influence of predator cues on embryonic development and hatching of two *Austrolebias* sp. (one from

highlands above 1000 m, the other, *lourenciano*, from lowlands) that inhabit ponds with differences in hydroperiod and risk of predator presence ; results confirm a differentiated response between the two annual fish species tested, corroborating modulation of hatching against the risk of predation by native predatory fish ; further, development times vary between the two annual fish species, regardless of presence or absence of predators (e.g., *Hoplias* aff. *malabaricus*, or *Oreochromis niloticus* as non native fish, or Odonata larvae, as invertebrate predator) ; variation in embryonic development is strongly affected by different level of hydroperiod unpredictability faced by the two species. 2021. JFB, <https://onlinelibrary.wiley.com/doi/10.1111/jfb.14856>] {Jean Huber, 22-July-2021} <°))>< <°))>< <°))><

- Rodriguez, R.S. & I. Schlupp. [Rodriguez and Schlupp show in lab that critical thermal maximum in Dominican *Limia* does not depend on altitudinal original collection ; 8 species of livebearing *Limia* {a subgenus of *Poecilia*, according to present consensus} are studied, 1 ranged in Cuba, 1 from Jamaica, all others from Hispaniola island {presently divided into 2 states, Haïti and Dominican Republic} ; the authors assess variation in tolerance to extreme temperatures measured as critical thermal minimum (CTmin) and maximum (CTmax) and compared thermal breadth for various populations from lowlands and {relatively} highlands, but they find thermal tolerance and altitudinal distribution of *Limia* species are not related to temperature gradients expected in nature {note : *Poecilia* sp. concerned are *perugiae*, *vittata*, *yaguajali* and *sulphurophila* from low elevation, warm environments including saline coastal lagoons, *zonata* and *melanogaster* from low to intermediate elevations and often associated to relatively cool springs, plus one population of *dominicensis* and another of *versicolor* collected in mountain streams at relatively high elevations, with some identifications at stake according to experts, but that would not change the meaning of the work}. 2021. N.C., <http://novitatescaribaea.do/index.php/novitates/article/view/264/255>] {Jean Huber, 21-July-2021} <°))>< <°))>< <°))><
- Sowersby, W., S.E. Liedholm, A. Kotrschal, J. Näslund, P. Rowinski, A. Gonzalez-Voyer & B. Rogell. [Sowersby et al. show larger brain size in adult (not juvenile) fast-living killies (vs. slow-living) independent from length ; using 21 species of killifish comparing relative brain size and pace of life-history (mainly annuals vs. non annuals), the authors find that, contrary to predictions, relative brain size is larger in adult fast-living killifishes, compared to slow-living species (but not between juvenile killifishes) ; note : studied sp. are, fast-paced (annual species) *Austrolebias nigripinnis*, *Callopanchax toddi*, *Fundulopanchax filamentosus*, *Gnatholebias zonatus*, *Millerichthys robustus*, *Nematolebias whitei*, *Nothobranchius guentheri*, *Nothobranchius kadleci*, *Notholebias minimus*, *Simpsonichthys (Ophthalmolebias) constanciae*, *Rachovia* sp. (Monteria) vs. slow-paced (non-annual species, including semi-annual sp.) *Aphyosemion striatum*, *Aphyosemion splendopleure*, *Rivulus (Cynodonichthys) chucunaque*, *Rivulus (Cynodonichthys) fuscolineatus*, *Epiplatys roloffii*, *Fundulopanchax cinnamomeus*, *Fundulopanchax scheeli*, *Kryptolebias marmoratus*, *Pachypanchax playfairii*, *Scriptaphyosemion cauveti*. 2021. Evolution, <https://onlinelibrary.wiley.com/doi/abs/10.1111/evo.14310>] {Jean Huber, 21-July-2021} <°))>< <°))>< <°))><
- Beltran, R.G.L., R.R. Pérez, O.C.G. Montañez, J.M.A. Artigas, M. Köck, A.F.S. Mar, O.D. Domínguez. [Beltran et al. separate with multiple sequences genus *Characodon* into 2 valid sp. but yet fail to assign the 2 to 3 known taxa ; genus *Characodon* is the earliest diverging lineage of which 3 species have been described: *lateralis*, *audax* and *garmani*, with latter and older taxon, considered extinct {unknown live and poorly known, only by types} ; both *Characodon lateralis* and *audax* are classified as endangered, and are the subject of taxonomic controversy since their description: previous studies have recognized a genetic differentiation in 2 groups separated by the El Salto waterfall, but morphological analyses contradict these genetic results ; the authors perform a phylogeographic study using mitochondrial cyt-b gene and d-loop region of both groups of populations ; results confirm two highly differentiated haplogroups, one distributed north and the other distributed south of waterfall, with divergence calculated to have occurred

1.41 MYA ; hence the recognition of 2 distinct valid species {note : the authors are not apparently aware that, following aquarist-collectors surveys, reported in Huber, 2019, usual type locality plotting of *garmani* is strongly doubted because Parras {today Parras de la Fuente} in Coahuila is a village in an isolated valley with desertic climate within Chihuahua desert, several hundreds of km away from any population of *Characodon* genus, however another village with the same name lies about 7km south of Durango city and it is likely that it is the correct type locality, although it is not known if it is to be assigned to populations above or below that critical waterfall, therefore more study is necessary to name the 2 valid sp. in *Characodon*}. 2021. PeerJ, <https://peerj.com/articles/11492/>] {Jean Huber, 13-July-2021} <°))>< <°))><

- Dykova, I., J. Zak, M. Reichard, K. Souckova, O. Slaby & R. Blazek. [The Reichard lab team shows swim bladder infected by mycobacteria in belly slider *Nothobranchius* sp. (bloodworms, egg substrate) ; swim bladder inflates early after fish hatching via its interconnection with digestive tract (ductus pneumaticus) and the process may be altered by infections ; through analysis of tissues (histology) the authors relate secondary loss of swim bladder function ('belly sliders') with Mycobacterium spp. infection at an individual-specific age ; nearly all examined belly sliders of genus *Nothobranchius* have swim bladder walls thickened and impairments ; Mycobacterium infection in juveniles originates from digestive tract linked to swim bladder ; infection in adults is systemic and mycobacteria are present in all examined organs {notes : PDF is freely downloadable at <https://reichardlab.eu/pdf/MR160.pdf> likewise the full original protocol for lab breeding is at <https://reichardlab.eu/pdf/MR97.pdf> ; there is no cure against Mycobacterium infection, and usage of acriflavin, or similar products, as antiseptic against occurrence of belly-sliders, in aquarium water and egg bathing in a 1% disinfectant bath (isobetadine 10% diluted 10 times in pure water) for several minutes (small eggs 2-3 mn, large eggs up to 10 minutes) may help according to Kiril Kardashev and Daniel Vielvoye, but that is distinct from Mycobacterium infection and according to Reichard, personal communication, mycobacterium-based belly sliding starts at day 7 or 8, not earlier and earlier belly sliding is related to other problems}. 2021. D.A.O., <https://www.int-res.com/abstracts/dao/v145/p111-117/>] {Jean Huber, 6-July-2021} <°))>< <°))>< <°))><
- Core, A.A. Del, C.S. Cleveland & S.C. Lema. [The Lema team discloses full mitogenome of *Cyprinodon salinus salinus* with low intraspecific variation (subsp. *milleri*, not studied) ; Salt Creek pupfish, *Cyprinodon salinus salinus* Miller, 1943, is endemic to Death Valley, California, USA, and resides as a single population within one of the most extreme inland aquatic environments {desertic} capable of supporting fish ; complete mitochondrion genome consists of 16,499 base pair (bp) with 13 protein-coding regions, 12S and 16S rRNAs, 22 tRNAs, and an 832 bp D-loop region. 2021. MitDNA, <https://www.tandfonline.com/doi/full/10.1080/23802359.2021.1945964>] {Jean Huber, 6-July-2021} <°))>< <°))>< <°))><
- Black, A.N., J.R. Willoughby, A. Brüniche-Olsen, B.L. Pierce & J.A. DeWoody. [Black et al. show low diversity and heterogenous differentiation in full mitogenome of *Cyprinodon tularosa* (with introgression?) ; the species, endemic to New Mexico, USA, is of conservation concern, due in part to invasive species, chemical pollution, and groundwater withdrawal ; present study counts 25,260 annotated protein coding genes (BPs), including 95% of the expected Actinopterygii conserved complete single-copy orthologues ; comparison with invasive *Cyprinodon variegatus* highland populations, its immediate ancestor with a divergence time of ca. 1.6-4.7 MYA, shows high concordance. 2021. M.E.R., <https://onlinelibrary.wiley.com/doi/abs/10.1111/1755-0998.13447>] {Jean Huber, 6-July-2021} <°))>< <°))>< <°))><
- Hagmayer A., A.I. Furness & B.J.A. Pollux. [Hagmayer et al. show in underwater experiment that placentation and superfetation sympatric livebearers prefer deeper and dynamic waters ; obviously, pregnancy imposes a heavy reproductive burden on female and that burden might be reduced by 2 adaptative processes, (1) placentation (embryo provisioning via a placenta) and (2) superfetation (ability

to carry multiple broods at various developmental stages) ; the authors here compare microhabitat selection for 5 sympatric Costa Rican live-bearing fish species, *Poeciliopsis retropinna*, *Poeciliopsis paucimaculata*, *Poeciliopsis turrubarensis*, *Poecilia gillii*, *Brachyrhaphis roseni*, known for different processes of placentation and superfetation because those processes improve body streamlining and swimming performance in female ; based on underwater visual fish surveys, results show significant interspecific differences in day-time microhabitat use: species with both placentation and superfetation are found in deeper and faster-flowing parts of river, species that lack both adaptations are confined to shallow slow-flowing areas, and species with one adaptation (i.e., only superfetation) inhabit intermediate areas, notably distinctive in reproductive adults (intermediate in immatures, and absent in juveniles, the latter of which being all found in shallow low-velocity zones) ; reversely, at night, all fishes, regardless of species or age-class, congregate in shallow slow-flowing waters to rest (sleep) on river bottom. 2021. F.B., <https://onlinelibrary.wiley.com/doi/pdf/10.1111/fwb.13786>] {Jean Huber, 30-June-2021} <°))>< <°))>< <°))><

- Prazdnikov, D.V. [Prazdnikov shows major role of thyroid hormones (normal, hyper, hypo) in color diversity (timing, rate) of male *Poecilia wingei* ; all species of male guppies (entire subgenus *Acanthophaeus*, not only for subcongener *reticulata*) display an outstanding diversity of color patterns within a single population which is formed as a result of a complex interplay between sexual selection, predation, and other environmental factors, unknown in other Cyprinodontiformes, except for related subgenus *Micropoecilia* ; thyroid hormones (THs) are known to be important regulators of ontogeny of fish and serve as a link between environmental changes and phenotypic development ; here, a possible role of THs in formation of diversity of color patterns in male is tested in *Poecilia wingei* raised with different hormonal regimes ; alterations in TH status cause changes in timing, types and rate of development of coloration {note : it is not unlikely that aquarists who produce distinct breeding characteristics of a strain (before further inbreeding selections) may start, without knowing, by inducing TH variations}. 2021. E.B.F., <https://link.springer.com/article/10.1007/s10641-021-01102-x>] {Jean Huber, 29-June-2021} <°))>< <°))>< <°))><

Rossi, G.S. & P.A. Wright. [Rossi and Wright, in lab, show for *Kryptolebias marmoratus* that more terrestrial fish have a cognitive advantage over water-only ones ; obviously amphibious fishes by transiting between aquatic and terrestrial habitats must learn and memorize how to navigate 2 dramatically different environments ; *Kryptolebias marmoratus* is used to test hypothesis that spatial learning ability of amphibious fishes is altered by exposure to terrestrial environments because of neural plasticity in brain region linked to spatial cognition ; in a lab experiment, 8 weeks of fluctuating air–water conditions or terrestrial exercise improve some markers of spatial learning (besides exemplified by more proliferating cells in their dorsolateral pallium) for a large share of studied specimens relative to control fish. 2021. P.R.S., <https://royalsocietypublishing.org/doi/10.1098/rspb.2021.0603>] {Jean Huber, 19-June-2021} <°))>< <°))>< <°))><

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