



Killi-Data Wassup n°1

Overview of Killifish research output

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Editor: Jean H. Huber (editor@killi-data.org)

EDITORIAL

Killi-Data Wassup is a new service of information to members as a follow-up of Killi-Data News.

It is rather in line with K-D informal letters sent to members back in 2004, and actually it is quite different from Killi-Data News:

- It does not aim to be comprehensive of whole Killifish research output (it presents only a subjective selection of articles, primarily those being coherent with Killi-Data focus on names, systematics and nomenclature)
- It is not regular (it will be produced when time permits and when a significant number of articles is published, not too many articles so that the reading is short, not too few articles so that the service is real and not too frequent)
- It separates clearly, the “selection of publications” with (1) a full neutral synthesis for each major publication, (2) a quick snapshot of contents for other publications, (3) the results of new collecting trips, AND, within a paragraph titled “View from the chair”, personal, but impartial and balanced comments raised from some of those selected publications IN VIEW OF THE TRANSLATION OF THEIR RESULTS INTO Killi-Data, and not as opinions or judgments on the quality of those research papers
- It mentions for each “selected publication” (listed as last-in first-out) the source and importantly a link to abstract online, but not the full reference (which is anyway online)
- It does not contain each time an Editorial but it may also contain a “Guest Editorial” from key experts from time to time

Killi-Data Wassup is not a published document (there is no ISSN number).

Hence please note the following disclaimers and limited responsibility:

- This publication is disclaimed for purposes of Zoological Nomenclature, in accordance with I.C.Z.N. code, 4th edition, articles 8.3 and 8.4.
- No new names, or nomenclature changes are available from statements in this publication.
- No systematic changes may be purported from statements in this publication.
- No statements in this publication may be quoted in any other media without prior formal permission.
- The section titled “View from the Chair” in this publication contains no criticism (and obviously no offense) whatsoever to authors by any means.
- This publication only aims to disseminate the results of selected new research works and their analyses, as possible improvements of scientific knowledge on cyprinodontiformes fishes.

Killi-Data Wassup n°1 contains several features that push to some comments raised from some of the selected publications in view of the translation of their results into Killi-Data, and not as opinions or judgments on the quality of those research papers.

First another molecular global study of the genus *Fundulus* (a genus with 6 subgenera in Killi-Data and about 40 species of medium to very large size : *Fundulus s.s.*, *Fontinus*, *Plancterus*, *Wileyichthys*, *Xenisma*, *Zygonectes*) is published by Rodgers et al. Not surprisingly it shows many, but not all, significant unresolved differences with previous studies because it is based on nuclear genes while a previous study (Whitehead, 2010, *Evolution*, 64: 2070-2085, 4 figs.) uses mitochondrial genes or another (Ghedotti & Davis, 2013, *Fieldiana Life and Earth Sciences*, 7 :1-65, 22 figs.) uses combined morpho-osteological and molecular data. Rodgers et al. find that a present subgenus of *Fundulus*, *Wileyichthys*, is more ancestral than outgroup *Lucania* in *Fundulus*, they concur that *Adinia* is synonymous to subgenus *Zygonectes* but do not propose a new diagnosis of redefined *Zygonectes* to include it and they state that *Fontinus* is a doubtful subgenus being probably synonymous of nominotypical subgenus *Fundulus* but do not propose a new diagnosis of redefined nominotypical subgenus *Fundulus* (subgenus *Xenisma* not studied). Most trees derived from the 2 techniques, morpho-osteological and molecular (or their combination), are not congruent in literature to date (including outside Cyprinodontiformes), and it seems now that a potential solution would only be to have full genomes and many species and populations in the sample of molecular data alone in order to obtain a comprehensive solid tree (still that tree will be significantly -and sometimes dramatically- distinct from the tree derived from morpho-osteological characters in the matrix). Then the next systematic issue is indeed what to do out of multiple not congruent trees and what to do with (future) ultimate molecular trees that may well be distinctive with morpho-osteological trees. A theoretical option would be to describe generic names based on molecular data alone which might be considered (why not?) as a diagnostic tool (and loose morpho-osteological diagnoses that are today linked to ICZN nomenclature). Another theoretical option would be to stick to morpho-osteological diagnoses and keep molecular data for other purposes than naming (and loose the phylogenetic objective) , e.g., stating what is congruent or not in the obtained tree with current systematics before the given publication (like today Rodgers et al.), but not more. While it seems (today) that combining both techniques leads to a dead end, the only way out would be to renew completely morpho-osteological assessments if at all possible (presently to have morpho-osteological and molecular trees be congruent is to start from molecular results and try –hard- to disclose morpho-osteological characters that end up with a tree mimicking the molecular tree!).

Second, Infante discloses the high variation in color pattern of mainland *Rivulus hartii*, making differences between lowland and highland populations in terms of color pattern (apparently not taking into account the typical populations of Trinidad island that, besides, have already been shown as strongly variable molecularly wise, not only based on altitude) and that study is an important contribution in the understanding of species definition in oviparous killifish. On the other hand most (if not all) named species in the recent decades have been described (and are still only known) from a single locality and by few specimens (if not from a single sweep of fish net by the collectors) with obviously no information of intra-population or inter-population variations of color pattern in both sexes. Besides from the very limited information on life pattern variation that are available on killifish it seems that variation in life pattern may be present or may not be present in a given species and that observation cannot be explained as a rule whatever intra-population or inter-population is concerned for the group of populations that define a given species name. Will the purported diagnoses of those new species stand in the future with such variations being added? Will it be possible, when variation data are available, to propose new stable diagnoses?

Third Freyhof et al. along the description of the new *Aphanius kruppi* revalidate *stoliczkanus* (previously a junior synonym of *dispar* since decades) and, based on molecular data, the authors consider *richardsoni* as a distinct species, not subspecies of *dispar* anymore, and since they give new diagnoses of the considered valid names (with a diagnostic key based on live color patterns), Killi-Data readily acknowledges the systematic changes as the latest published evidence. Note that it was only partly the case for a previous publication by Freyhof et al. 2017 (Zootaxa, 4294 (5): 573-585) because for *saldae* and for *maeandricus* (to the contrary to *iconii* and *fontinalis*) they did not propose new diagnoses to revalidate the 2 taxa, and *saldae* and *maeandricus* are kept as synonyms in Killi-Data, cf. Exception page at <http://www.killi-data.org/exceptionsKD.php>. Besides a careful look at the molecular tree of the new publication shows that *stoliczkanus* and *kruppi* are molecularly related, however in the tree separating (slightly) Arabic populations of both there is a population of *stoliczkanus* from Fanja, Oman, within the *kruppi* sub-branch and reversely there is a population of *kruppi* from Al Hoota, Oman (as cf.), within the *stoliczkanus* sub-branch, hence implying a not stable differentiation or various introgressions or even another speciation process. On top of that, the precise type locality of *dispar* sensu restricto is unknown and the molecular data of several populations assignable to *dispar* sensu restricto are very distinctive and should represent distinct bio-species (diagnosable or not? and if yes, named how?), according to the authors. In more general terms (but no generalization terms) the revalidations of previously old synonyms as cryptic species by various authors recently (and probably much more in the future) raise the issue of the practicality of those moves if (1) pattern variability is not taken into account, if (2) an identification (with the current binominal nomenclature) of a fish collected in-between 2 or more cryptic species is to be done, when (3) cryptic species in a given genus become so numerous and with tiny differences that species cataloging is painful (Joergen Scheel, in the 1960ies, used codes of 2 letters for karyotypes of similar populations, instead of creating new names or revalidating old ones, but even that seems today simplistic compared to molecular complexity, so that knowledge progress might be seen as correlated with systematic clarity regression). Side note following exchanges with J. Freyhof : according to present evidence, aquarium populations, countries and distributions of restricted *dispar* and revalidated *stoliczkanus* are for *dispar*, Abaytou, Athlit, Djibouti, Jeddah (ASC 11-01), Lac Assal, Red Sea, Scusciuban, Siwa Oasis | Egypt; Ertra {Erythrea}; Ethiopia; Israel; Saudi Arabia; Somalia; Sudan; Yemen | large, along marine line (and much inland) from northwestern Egypt to northern Somalia (Egypt, eastern Sudan and Ethiopia, and in the Red Sea regions up to Yemen (probably, with the switch to *stoliczkanus* easterly in Yemen being unknown), including western Saudi Arabia (eastern Saudi Arabia is also dwelt by *stoliczkanus* with the switch between the 2 taxa being unknown) | and for *stoliczkanus*, Al Quartif, Corniche Al Quam, Dubaï, Faluja Mossul, Jebel Akhdar, Jirdab, Khor Kalba, Narara-Salt Pans, Shur River | Bahrein; Emirates; India; Iraq; Iran; Koweit; Oman; Pakistan; Qatar; Saudi Arabia | huge, along marine line (and somewhat inland) between northwestern India and Yemen (probably, with the switch to *dispar* westerly in Yemen being unknown), including eastern Saudi Arabia (western Saudi Arabia is also dwelt by *dispar* with the switch between the 2 taxa being unknown).

SELECTION OF PUBLICATIONS

- Dominguez, O.C., S. Valdesalici & A.M.T. Rosales. [Dominguez et al. disclose in *Millerichthys robustus* protective cortical structures and sexual synchronization through pheromones. The species is the only annual fish that has developed an annual life history through diapauses, in North America (including Mexico). The study focuses on embryology and on hormone substances that could explain embryo development and sexual synchronization. The authors disclose protective cortical structures on perivitelline space and egg envelope which may have a role during the ovogenesis and as emergency nutritional reserve, like oil droplets). They also show the role of secretion of pheromones in sexual

synchronization and possibly in reproductive behavior that allows fish to spawn under the substrate. While it is not possible to state if those results are applicable to other annual killifish from far away regions in South America or even in Africa or are specific to isolated and ancestral (according osteology and morphology) *Millerichthys robustus*, the authors propose that the species become part of an integrative model of research. 2018. J.A.I., <http://onlinelibrary.wiley.com/doi/10.1111/jai.13623/abstract>] {Jean Huber, 15-January-2018} <°))>< <°))>< <°))><

- Nagy, B. & E. Vreven. [Nagy and Vreven describe a new lampeye from Lufira basin in Zaïre, *Micropanchax petnehazyi* {K-D maintained in *Lacustricola*}, with straight bars, related (and similar) to *hutereaui* 2018. IEF, http://pfeil-verlag.de/wp-content/uploads/2018/01/ief28_2_05.pdf] {Jean Huber, 6-January-2018} <°))>< <°))>< <°))><
- Nagy, B. [Nagy describes *Nothobranchius ditte* (*N. brieni* superspecies) from lake Mweru basin, in Zaïre, with banded Caudal and Anal fins 2018. IEF, http://pfeil-verlag.de/wp-content/uploads/2018/01/ief28_2_03.pdf] {Jean Huber, 6-January-2018} <°))>< <°))>< <°))><
- Costa, W.J.E.M. [Costa describes 3 new *Melanorivulus* species {K-D maintained in *Rivulus*}, *proximus*, *nigromarginatus*, *linearis*, from central Brazilian Cerrado. *Melanorivulus proximus* (already known and misidentified in part as *pictus* or *scalaris* by the author) and *nigromarginatus* are possibly more closely related to other species endemic to streams draining the slopes of the Caiapo range, whereas *linearis* recalls *egens*, from the same river basin. Intense habitat loss recorded in recent years and high species diversity each with limited range, according to the author, suggest that species of *Melanorivulus* endemic to this part of the Brazilian Cerrado are highly threatened with extinction. The females of *proximus* and *scalaris* are shown as very colorful and similar to male (unlike *punctatus* and related) but slightly subdued. The author stresses his previous observations of the occurrence of different congeners in *Melanorivulus* inhabiting separate sections of the same river and single drainage (herein *scalaris* and *proximus*). 2018. Z-E, <https://zse.pensoft.net/article/21321/>] {Jean Huber, 5-January-2018} <°))>< <°))>< <°))><
- Lee, B.-Y., D.-H. Kim, H.-S. Kim, B.-M. Kim, J. Han & J.-S. Lee. [Lee et al. from Korea disclose 74 cytochrome P450 genes in *Kryptolebias marmoratus*, with CYP genes in clan 2 as most expanded 2018. BMCG, <https://bmcgenomics.biomedcentral.com/articles/10.1186/s12864-017-4410-2>] {Jean Huber, 4-January-2018} <°))>< <°))>< <°))><
- Zee, J.R. van der, G. Walsh, V.N. Boukaka Mikembi, M.N. Jonker, M.P. Alexandre, R. Sonnenberg. [Zee et al. describe 3 new *Aphyosemion* in uncertain genus (*cyanoflavum*, *mandoroense*, *cryptum*) from southern du-Chaillu Massif in Congo, also based on molecular data. *Aphyosemion cyanoflavum* is a member of the *ogoense* superspecies, separated by color pattern (with similarities to *thysi* and *schluppi*) and by cephalic sensory system. *Aphyosemion mandoroense* and *cryptum* are members of *coeleste* superspecies. *Aphyosemion cryptum*, new species, is in appearance very similar to *coeleste*, but lacks the typical post opercular metallic green blotch and is generally larger in body size. However *Aphyosemion cryptum* and *coeleste* occur sympatrically in several locations, still distinct by microhabitat preference. *Aphyosemion mandoroense* is closer to *citrineipinnis*, but is separated by lack of red pigmentation. In the molecular tree, a population of *cryptum* (as cf.) falls in-between 2 sub-branches of *coeleste*. The female of *cyanoflavum*, a rare species in the field, is unknown {note: Zee et al. herein label the genus *Aphyosemion* between commas because at least one of the co-authors is preparing a global systematic review of the genus with splitting consequences and distinct species allocation from current knowledge}. 2018. Zootaxa, <http://www.mapress.com/j/zt/article/view/zootaxa.4369.1.3>] {Jean Huber, 3-January-2018} <°))>< <°))>< <°))><
- Nagy, B. [Nagy reports on a collecting trip searching for a mysterious banded *Nothobranchius* in Uganda, previously discovered by Colin Tait in 1969 and 1971 as preserved specimens but never recollected afterwards despite several attempts and unknown live. During his 20 locations trip with co-workers in June 2017 the species has been re-discovered in 2 places (Apapi and Madi Opei), photographed live and

labeled as new, to be described in the future ; it is sympatric with *N. ugandensis* in one place ; another undescribed sp. is reported in genus *Lacustricola* (lampeyes) in 6 places between Iganga and Soroti ; other known species collected during the trip all around Uganda are *Nothobranchius robustus*, *Nothobranchius ugandensis*, *Lacustricola kassenjiensis*, *Lacustricola bukobanus* ; the ecology of collected species is given 2017. JAKA, <http://www.killi-data.org/registration.php>] {Jean Huber, 31-December-2017} <°)))))>< <°)))))>< <°)))))><

- Rodgers, R., J. Roach, N. Reid, A. Whitehead & D.D. Duvernell. [Duvernell's team, in first RNA molecular of Fundulidae, shows *Lucania* inserted within *Fundulus* with *parvipinnis* more older lineage (basal structure of the phylogeny still unresolved, family Fundulidae as a paraphyletic grouping), with genus *Fundulus* previously divided in subgenera as *Fundulus s.s.*, *Zygonectes*, *Plancterus* and *Wileyichthys* also still precisely unresolved, with *parvipinnis* recovered as the most distantly related of Fundulidae, with (excepted *parvipinnis* and *similis*), all *Fundulus* species within 2 major radiations corresponding largely to the *Zygonectes-Plancterus* and *Fundulus* clades, with genus *Adinia* confirmed as a synonym within genus *Fundulus*, and subgenus *Fontinus* unconfirmed and doubtful, subgenus *Xenisma* not studied, and, with several species at odds in the tree compared to previous evidence, notably Whitehead (2010) and Ghedotti & Davis (2013). 2017. MPE, <http://www.sciencedirect.com/science/article/pii/S1055790317305559>] {Jean Huber, 28-December-2017} <°)))))>< <°)))))>< <°)))))><
- Vermeulen, F., I. Mikolji, V. Perez & H. van Muijsenberg [Collecting trip to Venezuela, January 2017 ; a short trip to the northern part of Venezuela in order to search for a *Rivulus* spec. aff. *hartii* in the headwaters of rio Yaracuy ; two years earlier a single live male, that had very distinct color pattern, was send to me from San Filipe ; all members of the expedition were invited to be guests at the Estacio Guaquira, a huge private property where rio Yaracuy and Quebrada La Guaquira spring, close to the town San Filipe ; at Estacio Guaquira, less that 9 kilometers from the San Filipe city center, we did collect several *Rivulus* aff. *hartii*, but I was quite disappointed by the dull colors of the fish, in small creeks on the property ; its markings, however, are the same as the specimen I got earlier and different from the *Rivulus hartii* we know from the coast and from the islands of Isla Margarita and Trinidad, indeed ; male does not show red in Anal fin, has side scales with red blotches that form 5-6 red lines on a golden background, Anal fin is blue with 3-4 horizontal lines formed by small diagonal stripes between each fin-ray, Caudal fin has a light blue center with white-orange upper and lower margins ; female does not show the typical supracaudal blotch on peduncle while it is distinctive in all typical *hartii*, so far ; due to the increasingly instable political situation of Venezuela, it is very uncomfortable and even life threatening to return there today and search for it again 2017. Frans Vermeulen pers. comm., unpublished] {Jean Huber, 30-December-2017} <°)))))>< <°)))))>< <°)))))><
- Huber, J.H. [Huber discusses 3 systematic and nomenclatural cases emerged from recent knowledge. First, the types of *Epiplatys marnoi* are restudied along the history of its discovery and collection, together with the types of sympatric *Epiplatys bifasciatus*, their common type locality is localized according to an old map of year 1881 and writings by the discoverer Ernst Marno and lectotypes for both are designated. Second, the analysis of published data on *Rivulus rachovii* Ahl, 1925 and of the published description of *Atlantirivulus paranaguensis* Costa, 2011 show that they show the same live pattern in both sexes and then they may correspond to the same species due to an error in transcription of the type locality of the former (as Para, instead of Parana or Paranagua) and a possible synonymization is suggested, not formally proposed. Finally, the nomenclatural availability of *Cyprinodon darrorensis* Gianferrari, 1933 is reviewed and appears doubtful to the contrary to the 3 other *Aphanius* species (*desioi*, *zaccarinii*, *airebejensis*), later described by the same author in the same year, probably due to an in-between information of compulsory diagnosis in prevailing ICZN rules since 1931 to Gianferrari, and likewise *Haplochilus carlislei* Horst, 1934. 2017. K-D-S, <http://www.killi-data.org/series-kd-2016-2017-Huber2.php>] {Jean Huber, 27-December-2017} <°)))))>< <°)))))>< <°)))))><

- Huber, J.H. [Huber after study of single type of *Rivulus ocellatus* proposes to revalidate *Kryptolebias caudomarginatus* and to synonymize *hermaphroditus* into *ocellatus*. Detailed morphological comparative analysis reveals that no single diagnostic character versus its closest congener, also sympatric in part in type area, can be found on that single specimen with certainty, but that a single character, LL counts, counted on the lower range of variations of the 2 species, is congruent with the main conclusions by Seegers and that 2 other characters, notably related to pattern can be proposed supporting the same decision, contrary to Costa (2011). Hence pending the future but undated possibility of molecular analysis of that type, Costa's decision is not followed anymore, *hermaphroditus* is synonymized, *ocellatus* is redefined and *caudomarginatus* revalidated. 2017. K-D-S, <http://www.killi-data.org/series-kd-2016-2017-Huber1.php>] {Jean Huber, 27-December-2017} <°)))))>< <°)))))>< <°)))))><
- Smith, S.S. & F. Rohde. [Collecting trip to Peru, October 2017 (2 weeks), Iquitos region and towards Rio Nanay (a planned trip to Pebas, not achieved by lack of time, a trip around Santa Clara to collect *Aphyolebias peruensis* achieved but when arrived all of pools are dry, a thread to collect a *Moema* sp., related to *hellneri*, from rio Itaya not pursued), many samples of known *Rivulus* fauna (*iridescens*, *speciosus*, possibly *rubrolineatus*, *intermittens*) with for the first time evaluation of male color pattern variation within a population, between populations and from year to year ; also caught *Rivulus rubrolineatus*, *Rivulus elongatus*, and *Rivulus rectocaudatus* at Quistococha 2017. pers. comm. Scott Smith, unpublished] {Jean Huber, 28-December-2017} <°)))))>< <°)))))>< <°)))))><
- Garcia, D., M. Loureiro, E. Machin & M. Reichard. [The Reichard team field-surveys 3 sympatric *Austrolebias* sp. and surprises with rather synchronous hatching including predatory sp. 2017. Hydr., <https://link.springer.com/article/10.1007/s10750-017-3484-9>] {Jean Huber, 26-December-2017} <°)))))>< <°)))))>< <°)))))><
- Lins, L.S.F. T. Shawn, A. Sockell, M.-C. Yee, A. Tatarenkov, C.D. Bustamante, R.L. Earley & J.L. Kelley. [The Tatarenkov team discloses more heterozygosity in 15 lineages for the full genome of *Kryptolebias marmoratus* than microsatellites studies (showing low heterogeneity) and that is unexpected because the species is a self-fertilizing hermaphroditic fish (then producing clones) which reduces heterozygosity and decreases genetic diversity. Hence there is a previously undescribed variation within lineages of *marmoratus* (maybe due to even rare outcrossing with primary males). Although this study is limited by the number of lineages that are available, the results highlight the need to sequence additional individuals within and among lineages. 2017. Gen., <http://www.nrcresearchpress.com/doi/abs/10.1139/gen-2017-0188>] {Jean Huber, 26-December-2017} <°)))))>< <°)))))>< <°)))))><
- Infante, E.R. [Infante study color pattern variation of *Anablepsoides hartii* [K-D maintained in *Rivulus*] in 19 lots of Venezuelan collections with 4 color patterns, male, female, intermediate (with characters of both male and female in single specimen) and montane (with a series of incomplete lateral rows, followed by a half-body reticulation), allowing the identification of the differences in this morphologically variable species 2017. RBT, <https://revistas.ucr.ac.cr/index.php/rbt/article/view/28273>] {Jean Huber, 14-December-2017} <°)))))>< <°)))))>< <°)))))><
- Vermeulen, F., K. Normandin & D. Mejia [Collecting trip to Colombia (3 weeks), between November 16 and December 4, 2016 ; this expedition is known under the code ICE 2016-** (for International Colombian Expedition 2016) ; first goal was to find *Rivulus tessellatus* in the Meta River basin, near its type locality at so-called Lake Mozambique ; we were able to collect between Villavicencio and Puerto Gaitan (Rio Meta) then went south all the way to San Jose del Guaviare (Rio Guaviare) ; along route we found several *Rivulus* spec. and these need some deepened research for identification and status ; near San José de Guaviare where we discovered *Terranatos* aff. *dolichopterus* and *Renova oscar* for the first time and by that to widen their geographic range by 660 kilometers in straight line ; the second goal was to cross the border with Ecuador and find the type locality of *Rivulus limoncochae* at the Napo River in Ecuador (abandoned due to instable and dangerous situation with guerillas along the border) ; instead we went to Morelia where we found *Rivulus taeniatus* alive for the very first time since its description by Fowler in 1945 ; the

third goal (in a third attempt) was to find *Austrofundulus myersi* from near its type locality at Sincelejo, Sucre dept., but unfortunately we did not find the *Austrofundulus*. We were able to collect again *Rachovia splendens* from Toluviejo and found the locality of *Rachovia* spec. Monteria destroyed by roadworks ; in pools nearby, *Rachovia* was not found but it is sure they will be available in another season ; on the route north we collected *Rivulus ribesrubrum* and *Rivulus azurescens* at their type localities 2017. pers. comm. Frans Vermeulen, unpublished] {Jean Huber, 15-December-2017} <°)))))>< <°)))))>< <°)))))><