

# What are today's biggest challenges for a better knowledge of Killifish (oviparous Cyprinodontiformes)? Part Two.

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## 6- *schreitmuelleri*: *Megalebias* vs. *Austrolebias*:

This case is not simple at all, because again, authors are not in agreement; the type locality, Rio de Janeiro, Brazil, may be erroneous because it is again a trade import (but lately *Leptolebias marmoratus* was re-discovered live from the same region after 50 years !); this single aquarium import of three males, however, is variably analysed: either as a synonym of *Megalebias wolterstorffi* (then from Uruguay, not Brazil, as per Lazara, K.J. 1982b. The taxonomy and nomenclature of South and Central American Killifishes. J. Amer. Killifish Assoc., 15 (5): 166-184] or as an *Austrolebias* valid species that needs re-collecting [as per Wildekamp, R.H. 1995b. A World of Killies. Atlas of the Oviparous Cyprinodontiform Fishes of the World. Vol. 2. Amer. Killifish Assoc. Publ.: 384pp, figs.], or finally as a nomen dubium (a doubtful name) also in *Austrolebias* [as per Seegers, L. 2001a. Killifishes of the World. New World Killis. III. Aqualog, Mörfelder-Walldorf, Band 12: 210 pp., figs.]; all 3 authors agree on one issue : the fish does not originate from Rio in Brazil, but from Uruguay or the neighbouring region of southeastern

Brazil, i.e. very far from Rio; since the 3 types appear to be lost in the Berlin Museum, the situation is not brilliant

## 7- *Cynolebias porosus*:

This case is important because, like for *Rivulus micropus*, it is a very old taxon described by Steindachner, in 1876; shipped from Pernambuco (today Recife; in fact from inland of Pernambuco state but probably not far, due to travel contingencies), in northeastern Brazil, Costa [2001, The neotropical annual fish genus *Cynolebias* (Cyprinodontiformes: Rivulidae): phylogenetic Relationship, taxonomic Revision and Biogeography. Ichthyol. Explor. Freshwaters, 12 (4): 333-383, 32 figs., 9 tabs.], hypothetically, suggests that it could have been collected during (or brought to) the Thayer (North American) expedition (Louis Agassiz), on July 31. or August 1. 1865; these clues should allow to rediscover the fish if it is not extinct because the region is extremely dried out today and urbanization has dramatically increased within a century; but let's not be pessimistic: *Cynolebias microphthalmus*, that Costa sees as distinct, is still living not far ...

### **8- *Laciris pelagica* and *Aphanius apodus*:**

Both cases are similar because these 2 fishes are extremely endangered, if not extinct; both species are unique: for *pelagica*, it is endemic to lake Edward in the Rift Valley of central Africa (deep waters of Lake Edouard, Zaïre and Uganda {0.350S;29.583E}); for *apodus*, it is the single, very old *Aphanius* species without ventral fins (in all known localities, it is extinct: the only solution is to discover a brand new locality in Algeria); the problem is man who introduced alien species that phased them out; shame on us ...

### **9- *Pantanodon madagascariensis* and *Millerichthys robustus*:**

Both cases are similar because these 2 fishes are extremely important in the understanding of Killifish phylogeny (both are probably very primitive because they belong to very primitive areas); the problem is not their type localities that are not too difficult to reach (*madagascariensis*: Mahambo, eastern coast, Madagascar {17.260S;49.230E}; *robustus*: 5 km S. Papaloapan (today El Hule), Mexico {18.170N;96.100W}); the problem is again man who made these species extremely endangered, if not extinct, because he drastically changed their very reclusive biotopes to develop better his own conditions of life; who will face the challenge (with collecting permits)? Shame on us (again)...

### **10- *Rivulus obscurus* and *ornatus*:**

This is a complicated case and a con-

fusion due to the simultaneous publications of 2 authors (end of 1992 and beginning of 1993, without knowing the project of each other): first, the author's *Rivulus* book [Huber, J.H. 1992. Review of *Rivulus*. Ecobiogeography - Relationships. Cybium Suppl., Société Française d'Ichtyologie Publ.: 586 pp., 40 pls., 85 figs., 8 tabs, 13 maps.] where lectotypes of *ornatus* and *obscurus* are designated; and second, Costa's paper in DKG Journal [Costa, W.J.E.M. 1993. Zur Identität und Verbreitung von *Rivulus ornatus* und *Rivulus punctatus*. D.K.G. (Deutsche Killifisch Gem.) J., 25 (3): 44-46, 2 figs.] where he mentions that the true *ornatus* is in fact *obscurus* according to material from near Manaus (3.130S, 60.020W) and the aquarium *ornatus* is then an unknown species, without knowing the lectotype designation for *ornatus* from Silves, i.e. not in the area of Manaus; this is unfortunate and lies only in the lack of communication between Costa and Huber; but the problem actually comes from the fact that in his descriptions, Garman (1895) used several lots for *ornatus* with 3 different and distant localities and one lot for *obscurus* with a type locality near Manaus, identical with one of the 3 for *ornatus*: in details for *ornatus*, the 3 localities are Silves, Lake Saraca, N. Brazil {2.880S, 58.350W}; Parana do Januári, Brazil {3.200S, 60.080W} (near Manaus); Lago Cudajas, now L. Badajos, N. Brazil {3.250S, 62.780W} and for *obscurus*, Lago Januária, vicinity of Manaus, N. Brazil {3.200S, 60.080W};

by selecting Silves as the official type locality for *ornatus*, without knowing Costa's research, Huber made Costa's publication inappropriate because Costa allocated *ornatus* to a fish we do not know if it is identical with the fish from Silves; let's wait until live material is collected from the 2 fixed type localities, Silves for *ornatus*, and Januaria, near Manaus for *obscurus* and the issue can be fixed which, in turn, if the two fish are identical, then (Eschmeyer, per. comm., ICZN law of first reviser) *ornatus* has priority over *obscurus*; if they are distinctive, then the two names remain valid; which will enable us to address another issue, the identification of the aquarium strains of *ornatus*: one as an aquarium import from Obidos (?), lower Amazon (NSC-2), Brazil {1.920S, 55.520W} and the other from Padre Isla, Iquitos, Peru {3.620S, 73.700W} ...

#### **11- *Aphyosemion bualanum*:**

This question was raised after Seegers's publication [1988d. Bemerkungen über die Sammlung der Cyprinodontiformes (Pisces: Teleosta) des Zoologischen Museums Berlin. 1. Die Gattungen *Aphyosemion* Myers, 1924 und *Fundulosoma* Ahl, 1924. Teil 2. Mitt. Zool. Mus. Berlin, 64 (1): 3-70, figs.] and Huber's reaction [1998: Miscellaneous Notes on some Systematic difficulties regarding old World Cyprinodonts. J. Amer. Killifish Assoc., 31 (1): 3-17, 28-32]; after the study of the same single type of *bualanum*, Seegers believes that it

belongs to an unknown *Meso-aphyosemion* sp. (e.g. like *cameronense* or *wildekampi*) and Huber is cautious and does not find morphological differences with what was understood as *bualanum* since Scheel (a fasciated fish); no solution from the renewed study of the single type: it has been smashed for unknown reasons; to solve that issue, only successful collections around Bouala {6.417N;15.583E}, in Central African Republic, are required, but this is a challenge: a remote place in highlands (1200 m altitude) with no primary forest ...

#### **12- *Aphyosemion escherichi* vs. *A. microphtalmum* issue (linked to *Plataplochilus ngaensis*):**

This question was also raised after Seegers's publication [1988d. Bemerkungen über die Sammlung der Cyprinodontiformes (Pisces: Teleosta) des Zoologischen Museums Berlin. 1. Die Gattungen *Aphyosemion* Myers, 1924 und *Fundulosoma* Ahl, 1924. Teil 2. Mitt. Zool. Mus. Berlin, 64 (1): 3-70, figs.] and Huber's reaction [1998: Miscellaneous Notes on some Systematic Difficulties Regarding old World Cyprinodonts. J. Amer. Killifish Assoc., 31 (1): 3-17, 28-32]; after the study of the same type series of *escherichi*, Seegers believes that it is a senior synonym of *microphtalmum* and Huber is cautious and does not find morphological differences with *striatum* (a lineated fish that is often sympatric with *microphtalmum* in northern Gabon); to solve that issue, only col-

lections near Attogondema, Nga river, German Cameroon (today Attokondama, tributary to Noja river, northern Gabon, near the border with Mbini, according to Seegers) are required but this is a challenge: a remote place in the foothills {0.850N;10.250E} of Monts de Cristal highlands with the possible sympatry of the 2 species; if sympatry is also recorded there, then only a molecular study of the types may solve the problem; in any case the collection is important for 2 reasons: first, *escherichi* may be a different fish, related to *A. aff. cameronense* from the foothills of Monts de Cristal (that Huber has refrained to describe as a new species, in 1977, precisely to avoid any risk of future synonymization); second, because it is also the type locality of *Plataplochilus ngaensis* which is unknown alive (after its rediscovery, a full since long awaited revision of the genus *Plataplochilus* could be undertaken) ...

**13- *Fundulopanchax deltaensis, gularis, fallax, kribianus, schwoiseri*:**

This question was also raised after Seegers's publication (1988d. Bemerkungen über die Sammlung der Cyprinodontiformes (Pisces: Teleosta) des Zoologischen Museums Berlin. 1. Die Gattungen *Aphyosemion* Myers, 1924 und *Fundulosoma* Ahl, 1924. Teil 2. Mitt. Zool. Mus. Berlin, 64 (1): 3-70, figs.) and Huber's reaction is to be published soon after a re-evaluation of the case (Seegers proposed the synonymization of *kribianus* and *schwois-*

*eri* with the older name *fallax*, on the basis of material in BMNH and on aquarium imports of the same years in Germany); Killi-Data online opts for a conservative situation, considering *deltaensis* and *gularis* as valid, *kribianus* and *schwoiseri* as valid too, and *fallax* as a nomen dubium), pending Huber's publication; no doubt that this will not be the end of the story; apart from the renewed study of preserved material in Museums, the target is indeed an in-depth sampling of annual forms of that genus in southern Nigeria; there is little doubt that the discontinuity in populations of *sjoestedti* in western Nigeria and in north-western Cameroon does not reflect reality: between west of the mouth of Niger river and the Cameroon boundary there must be populations of large annual *Fundulopanchax* species with a median band on sides of both sexes, if not *deltaensis* ...

**14- *Fundulopanchax walkeri* and/or *spurrelli*:**

This case is a very long story and after more than 20 years without new evidence it is probably time to reassess it calmly, considering a third taxon in addition, *Fundulopanchax litoriseboris*; all 3 have been considered either as valid species, or valid subspecies of *walkeri*, or the last 2 taxa as conspecific with *walkeri*, or a mix of these options, sometimes with a consensus approach, sometimes with a controversial approach; details in Radda, A.C. [1976c. Description of *Aphyosemion litoriseboris* spec. nov. J. Amer.

Killifish Assoc., 9 (11): 301-305, 2 figs.], then Berkenkamp, H.O. [1976c. Über *Fundulus walkeri* Boulenger, 1911, *Fundulus spurelli* Boulenger, 1913 und *Aphyosemion litoriseboris* Radda, 1976. D.K.G. (Deutsche Killifisch Gem.) J., 8 (12): 151-160, 5 fig.], Berkenkamp, H.O. [1977b. Zum Abschluss der *Aphyosemion litoriseboris* Diskussion. D.K.G. (Deutsche Killifisch Gem.) J., 9 (8): 121-128, map.], Berkenkamp, H.O. & V. Etzel [1980c. Aquarienfische aus der Elfenbeinküste. 7. Die Formen von *Aphyosemion walkeri* aus der Elfenbeinküste und Ghana. D.K.G. (Deutsche Killifisch Gem.) J., 12 (3): 33-40, 12 figs.; 12 (4): 51-58, 5 figs., map.], Berkenkamp, H.O. & V. Etzel. 1981a. [Aquarienfische aus der Elfenbeinküste. 8. Kreuzungen mit Formen von *Aphyosemion walkeri* (Blgr., 1911). D.K.G. (Deutsche Killifisch Gem.) J., 13 (5): 71-81, 16 figs.]; this case is full of scientific weaknesses: the first 2 taxa are unknown live from their type localities in Ghana since their description and the type locality of the third is an aquarium import; the first duty would then be to fill these "holes" with hard data and live fish; *spurelli*: vicinity of Bibianaha, near Dunkwa, between watersheds of Tano and Ankobra rivers, Ghana {5.167N;2.700W}; *walkeri*: Bokitsa Mine (a misspelling for Bokitsi Mine within Wasa district, 1.2 km south Ayenfuri or Ayenfor and 18 km from Dunkwa, i.e. about 55 km south-southwest of Kumasi, subseq.), Ghana {5.983N;1.900W}; and *litorise-*

*boris*: aquarium strain collected by Arnoult in 1963 (bred by E. Pürzl), from Ivory Coast (should not be too difficult to precise from Arnoult's notes or old Aquarium magazines); a patient, objective work ...

### 15- *Fundulopanchax powelli*:

This case is apparently very simple, the name was described from a precise locality (N.W. Bakakodia, Nana creek, ca. 20 km northeast of Escravos river mouth and 55 km west northwest of Warri, northwest of Bakakodia or Okokodiagbne village, Delta state, Niger delta, S. Nigeria {5.672N;5.325E}); however, only preserved juveniles are known and first attempts to re-collect the fish there did not succeed; knowing the dynamisms of fish exporters in Lagos, active correspondence and money, at least, should be a spur to deliver a solution for this very special fish, probably primitive and a key to the understanding of the huge speciation in the Niger delta...

### 16- viviparous *Epiplatys bifasciatus/spilargyreus*:

Since Guma'a [1982. On the Biology of Female *Epiplatys bifasciatus* (Cyprinodontidae) from Southern Sudan. Hydrobiologia, 89: 285-300, 5 figs., 8 pls., 3 tabs.] and since the description of *Epiplatys marnoi* [Steindachner, F. 1881a. Ichthyologische Beiträge (X). Sitz. Akad. Wiss. Wien mathem.-naturwiss. Klasse Abt.1, 83: 179-219, 8 pls. (17 figs.)], there are strong suspicions that a viviparous *Epiplatys* species is avail-

able in eastern Africa; it is unknown if it will be identifiable to *bifasciatus*, or to *marnoi* (a present synonym of *spilargyreus*), but it is a fascinating venture...

**17- *Epiplatys lokoensis*:**

This case is also apparently simple like *powelli*; re-collections of the fish in the very limited area of Sierra Leone (Bonkorkon, west of Port Loko, Port Loko district) should allow to re-study the fish and disclose if the describers were right to erect a new name or if the synonymization by Romand [1980b. Comments on *Epiplatys lokoensis* Berkenkamp & Etzel (1978) from Sierra Leone (Pisces, Cyprinodontidae). Rev. Zool. Bot. Afr., 94 (3): 591-599, 9 figs., tab.] with *barmoiensis* was correct; but the whole question of the *bifasciatus* super-species should be re-evaluated because the separation by Romand into 2 valid subspecies (with *bif. bifasciatus* and *bif. taeniatus*), based on habitat (respectively savannah vs. forest) is discussed, because the type locality of *taeniatus* is not in forest (Jebba, Niger river, N. Nigeria {9.117N;4.817E} Madsen, 1927) and should be restudied with a comparative diagnosis; and first of all, a precise type locality and the first (ever) collection of live topotypes of *Ep. bifasciatus* (type localities: Bahr-el-Seraf (Zeraf) and Bahr-el-Gebel (Jebel), White Nile system, Sudan) are prerequisite ...

**18- *Nothobranchius mkuziensis*, *orthonotus* and *rubroreticulatus*:**

Since a World of Killies [Vol. IV, AKA

Publication, 2004, also as a pers. comm. to Killi-Data online], Wildekamp has proposed that the status needs a re-evaluation; it may be a distinct species related to *rachovii*, anyhow clearly not a junior synonym of *orthonotus* as previously thought; a re-discovery is thus highly interesting at type locality: Mkuzi (today Mkuze) river, Natal (province), South Africa {27.417S;32.417E}; besides, the first live collection of *Nothobranchius rubroreticulatus* (a species described already years ago) would be also desirable to separate it also from isomorphic populations that Bellemans discovered in Sudan; the type locality: near the capital city of Chad (Koundoul, S. N'Djamena, S.W. Tchad {11.960N;15.150E}); these "easy" challenges must not hide the critical issue remaining in *Nothobranchius*: are allopatric colour variations possibly distinct species, and notably is *mkuziensis* distinct from *rachovii* or, around Beira in Mozambique, *kuhntae* distinct from *orthonotus* ? Not the end of the story ...

**19- *Poropanchax normani* and the Angolan lampeyes:**

This case is an old one, since *Poropanchax normani*, and *Lacustricola mediolateralis*, *Lacus. nigrolateralis*, *Lacus. (?) macrurus* have never been collected live from their type localities and their descriptions are more than 50 years old; this is notably a pity for *normani* (is it a true *Poropanchax*?) and *macrurus* (is it related to *spilauchen* or not at all ?)

that are old taxa (respectively 1928 and 1904) and important phylogenetic units; type localities are: *normani*, near Katagum, Kiyawe river, N. Nigeria {12.283N;10.350E}; *macrurus*, Marimba, Lake Sarmento (near mouth of Cuanza river, subseq.), N.W. Angola {8.367S;17.033E}; *mediolateralis*, near Cuango-Muquehe river source, N. E. Angola {10.850S;19.300E}; *nigrolateralis*, Tchimenji river, N.E. Angola {7.967S;21.117E}; targets for lampeye lovers ...

### 20- *Rivulus holmiae* and *lanceolatus*:

Both cases correspond to fish described by Eigenmann in 1909-1912 that apparently cannot be re-collected despite major efforts in recent years; the description of *Riv. holmiae* is very good for the beginning of the twentieth century, plus numerous type specimens of both sexes are available in good conditions; at type locality (near Holmia, at entrance of Chenapowu river, upper Potaro river basin, Guyana (ex British Guiana), 500 m altitude {4.970N;59.580W}), only *Riv. waimacui* could be caught; by morphology, *holmiae* is close to *igneus* and to *immaculatus*; it differs from *igneus* by the frontal scalation, the male colour pattern and minor morphological characters; it does not differ from *immaculatus* except by having a supra-caudal ocellus in female (but this is a variable character, like the dark border at male caudal); in addition, *holmiae* and *immaculatus* are living in the plateau; of course both may well not be

synonyms, but our thinking is biased by the historical collections in the lowlands of Guyana and Suriname that were identified as *holmiae* in the sixties and that may be closer to *hartii* (or to *igneus*); on the other hand, the description of *lanceolatus* is less obvious and a single type, in poor condition, is available: the unique feature is the "lanceolate" shape of the caudal fin (that cannot be confirmed from the type); at type locality (Rockstone, (British) Guiana {5.980N;58.560W}), only *stagnatus* like fish have been collected, yet; various hypothesis have circulated, including a possible identity as a juvenile *Moema* sp. that is also reported in the area (apparently ruled out), a possible synonymy with *stagnatus* (unlikely), a possible synonymy with *agilae* (then a female specimen); no precise argumentation can be forwarded to demonstrate that Eigenmann made a mistake about the type localities or in the descriptions: he stayed in the region several months and as a researcher his reputation is excellent; then to collect intensively again in the type area of *holmiae* (or in the region in-between with *immaculatus*) and to compare the material with the lowlands in Guyana, for the first case, and in the type area of *lanceolatus*, for the second case, are the only way for better times ...

### 21- *Aphyosemion elegans* and *decorsei*:

This case is an old one and concerns the Congo cuvette like the 4 next cases *elegans* and *decorsei* are the oldest

members of the lyre-tail *Aphyosemion* group, mainly dwelling that huge basin; the former has been described in 1899 and the latter in 1904; not surprisingly both are unknown live from their type localities (Bikoro, Lac Tumba {0.750S;18.117E} and Mbandaka {0.067N;18.267}, N.W. Zaïre for *elegans* and Bessou, Oubanghi basin, S.E. Centrafrique {5.090N;19.540E} for *decorsei*); The fish have been assigned to these 2 names: a fasciated fish common not far the type locality for *elegans* and a poorly (or strongly, depending on authors !) punctuated fish for *decorsei* these identifications may be right or completely wrong; for example, first, in his description of *elegans*, Boulenger does not mention the bars on male sides, second in sampled regions of Central African Republic for *decorsei*, there are at least 2 very distinct phenotypes (with many spots and with few spots) and third, 2 sympatric species of that group are not rare in general in the cuvette; then, who is who, a key issue to correctly identify these 2 species and all other (about 10 !) members of that superspecies subsequently described from the cuvette (including topotypes of *schoutedeni* at Madié: 2.417N; 27.302E)...

**22- *Aphyosemion splendidum, batesii, kunzi*:**

This case is confusing since taxonomic and systematic issues are mixed; first, the cuvette dweller, *splendidum*, has never been studied alive (material has been collected live from the type

locality, near Ouessou {1.617N; 16.067E} in northern Congo and several other spots in the cuvette) but it was not brought back alive in labs: the phenotype (poorly dotted on sides and fins) is distinct from *batesii* from central Cameroon (the latter being deeper bodied, with many large spots and no chevrons on sides and large and equal yellow margins on fins of male) and from *kunzi* (with anterior chevrons and a lower band on sides and unequal yellow margins on fins of male); is it polymorphism (conspecific variability) as Brosset [1982. Le Peuplement de Cyprinodontes du Bassin de l'Ivindo, Gabon. Rev. Ecol. (Terre Vie), 36: 233-292] has shown from in-depth samples in Gabon or is the picture much more complex (with 2 or 3 species being valid) as aquarists tend to believe ? Only many DNA samples may allow a better understanding of these relict fishes that are semi-annuals, but not close to *Fundulopanchax* (to what then ?)...

**23- *Hylopanchax silvestris* and *stictopleuron*:**

This case is a difficult one, like many systematic issues concerning lampeyes; since Huber's collections [1982a. Rapport de Synthèse sur l'Expédition au Congo (1978). Cyprinodontidés récoltés et *Micropanchax silvestris*, Synonyme de *stictopleuron*. Rev. fr. Aquariol. Herpétol., 9: 1-12, 9 figs., tab., 5 maps], not far from the type locality of *stictopleuron* (Oka, 18 miles (29 km) north of Eovo, Congo basin

{3.600S;15.267E}), both names have been synonymized; however, Lazara [2001. The Killifishes, an annotated Checklist, Synonymy and Bibliography of recent Oviparous Cyprinodontiformes Fishes. Killifish Master Index. 4th Edition. Amer. Killifish Assoc. Publ.: 624 pp., 3 appendixes], after the study of several Museum samples from Zaïre (*silvestris* type locality: Yangambi, Lusambila river {0.783N;24.400E}), believes that the morphological variation is so big that the two names must be valid; then one, two or more valid species for this phenotype dwelling the entire Congo cuvette? Again, only many DNA samples may allow a better understanding of these relict fishes that pushed the *Hypsopanchax* phenotypes (with several valid names !) to the periphery of the cuvette ...

#### **24- *Epiplatys nigricans* and *chevalieri*:**

This case is similar to *Hylopanchax*; since Huber's collections all along the western belt of the Congo cuvette [1979b. Cyprinodontidés de la Cuvette Congolaise, *Adamas formosus* n. gen., n. sp. et nouvelle Description de *Aphyosemion splendidum*. Rev. fr. Aquariol. Herpétol., 6: 5-10, 6 figs., 2 tabs.], both names have been synonymized and this was not a big surprise: several authors had expressed doubts and difficulties in separating them, and concluded either they could be synonyms or subspecies; expert aquarists, though, did not follow this stance; up to now no new published

evidence has been put forward to change the field results; Wildekamp [1996. A World of Killies. Atlas of the Oviparous Cyprinodontiform Fishes of the World. Vol. 3. Amer. Killifish Assoc. Publ.: 330pp, figs.] has proposed that western populations (i.e. west of Congo river) be named *chevalieri* while eastern ones be named *nigricans*, on the basis of colour pattern differentiation of some populations; but that was tentative to maintain a conservative position and he did not use the same model for the *multifasciatus* group (*boulengeri* / *multifasciatus*) with strong genetic gaps, though; indeed, there are differences between populations of *chevalieri* / *nigricans* from the Congo cuvette but it is simply unknown if these differences are stable, if they correspond to strong genetic divergence, if they are linked to geographical criteria (there is absolutely no barrier, but the concept of refugium may apply, like for lake Tumba); all is known are a few populations from the Kisangani area (*nigricans* type locality: Dungu, at the Kibali-Dungu river junction, north-eastern Zaïre {3.633N;28.567E}), from the Brazza area ({4.267S;15.250E}, type locality of *chevalieri*), from the Likouala area and from isolated spots like the one from lake Fwa, thousands of kilometres apart; and neither molecular studies, nor detailed morphological measurements have been performed on these populations ; it is totally insufficient..

To be concluded....