

Male of the new species, *Moema quiii*.

## A New Species Of Annual Killifish From Southeastern Peru, With A Uniquely Barred Color Pattern *Moema quiii* n.sp.

By Dr. Jean H. Huber

Laboratoire d'Ichtyologie générale, Muséum national d'Histoire naturelle, 43, rue Cuvier, 75231 Paris cedex 05, France

All photos © 2003 by Lance R. Peck unless otherwise noted



Two females of the new species, *Moema quiii*.



Male and female of the new species, *Moema quiii*.

### Abstract:

A new species of *Moema*, *M. quiii* n.sp., is described from southern Peru, Puerto Maldonado region. It is distinguished from all other known *Moema* components by a unique color pattern in life for both male and female, made of small brown-bordered squares. No other *Moema* species is showing the diagnostic vertical bars on sides, in addition to the longitudinal pattern. The systematic status of the genus *Moema* is discussed: it is conservatively regarded as valid, although the author argues a personal preference to consider it as a subgenus of *Trigonectes*.

### Résumé:

Une nouvelle espèce de Killi Annuel du Pérou méridional, avec un patron de coloration fascié unique, *Moema quiii* n.sp.

Une nouvelle espèce de *Moema*, *M. quiii* n.sp., est décrite du Pérou méridional, dans la région de Puerto Maldonado. Elle est séparée de tous les composants connus de *Moema* par un patron de coloration unique à la fois chez le mâle et la

femelle vivants, constitué de petits carrés bordés de marron. Aucune autre espèce de *Moema* ne présente des barres verticales sur les flancs, en plus des marques longitudinales. Le statut systématique du genre *Moema* est discuté: il est considéré provisoirement comme valide, bien que l'auteur apporte des arguments personnels en faveur d'un statut de sous-genre de *Trigonectes*.

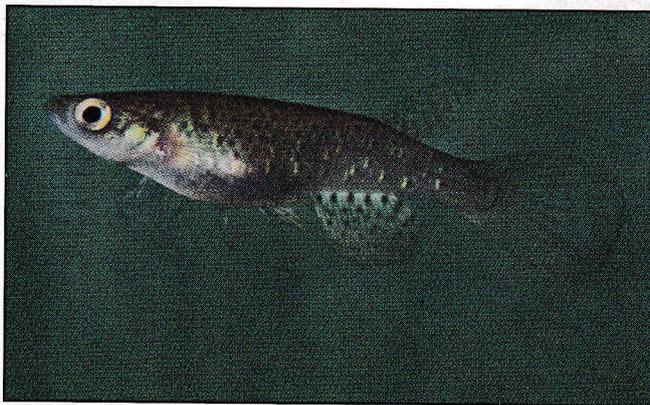
### Introduction:

Peru, a small country in western South America, can be divided into 3 biogeographical regions concerning the oviparous Cyprinodont (or Killifish) fauna (Huber, 1992), with specific refugia hypothesized in the western foothills (Huber, 1998):

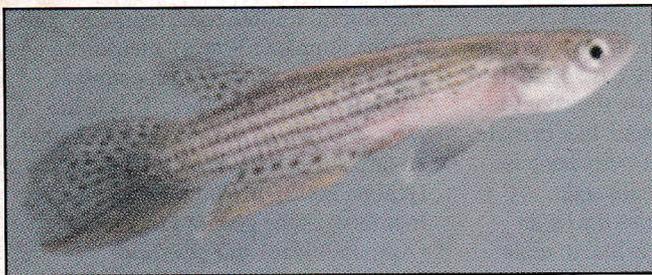
- 1 - The Andes and the mountainous lakes and rivers, around 4000 meters altitude, including the large Lago Titicaca, that are dwelt by the components of the endemic genus *Orestias*, with 6 to 40 valid species according to authors (Huber, 2001-2002).



Male of *Aphylebias rubrocaudatus*.



Female of *Aphylebias rubrocaudatus*.



Male of *Moema pepotei*, Rio Grande, Bolivia, by Wolfgang Staeck.



Female of *Rivulus christinae*.



Male of *Rivulus christinae*.

- 2 - The Amazonian lowlands that correspond to the western belts of the huge Amazon river basin and that are dwelt by non-annual and annual killifishes belonging to the same groups as in the corresponding regions of Brazil, Colombia, Bolivia. The following species have been recorded (with their distribution by country between brackets with local names): Genus *Aphyolebias*: *A. peruensis* [Peru], *A. rubrocaudatus* [Peru], *A. wischmanni* [Peru], genus *Fluviphylax*: *F. pygmaeus* [Brasil (Amazonas); Colombia; Peru; Venezuela], genus *Moema*: *M. pepotei* [Bolivia; Brasil (Rondonia); Peru (?)], genus *Rivulus*: *R. (Anablepsoides) atratus* [Brasil (Amazonas); Colombia; Peru], *R. (Laimosemion?) rectocaudatus* [Peru], *R. (Oditichthys?) christinae* [Peru], *R. (O?) derhami* [Peru], *R. (O?) elongatus* [Peru], *R. (O?) intermittens* [Peru], *R. (O?) iridescens* [Peru], *R. (O?) ophiomimus* [Colombia; Peru], *R. (O?) ornatus* [Brasil (Amazonas); Peru], *R. (O?) peruanus* [Peru], *R. (O?) rubrolineatus* [Peru], *R. (O?) speciosus* [Peru].

- 3 - The foothills of the Andes, between 600 and 1200 meters altitude that are dwelt by only 3 groups of *Rivulus*, with counterparts in the lowlands: *R. (O?) derhami*, *R. (O?) iridescens*, *R. (O?) peruanus*. These extend, with variations or not, to neighboring regions of the same altitude in Ecuador.

Among the Amazonian fauna, only components of *Aphyolebias* and *Moema* are annual killifishes, although recently (Huber, 1998), *Rivulus rectocaudatus* has been



Type locality biotope of the new species (also dwelt by *Aphyolebias rubrocaudatus*).

hypothesized as semi-annual. This annual or semi-annual character may seem strange in the Amazon basin where water is present everywhere, compared to the "true" landscapes of annuals (e.g. in eastern Brazil, northern Colombia and Venezuela, or in eastern Africa) that are usually dry, except during the rainy season where the full cycle of these fish takes place. However, a close analysis of their biotopes in Peru shows that they usually live in temporary biotopes, such as overflow ponds, fluvial islands, irregular creeks in flood beds where water is actually supplied for a short period in a year (and sometimes, not at all for several years).

The region of Peruvian Amazon, in terms of ichthyological collections, has been scarcely sampled except for 2 spotted areas, around Iquitos and around Pucallpa. There, a strong species diversity — speciation — has been exemplified like for Manaus, in Brazilian Mid-Amazon, with up to 7 Killifish species living sympatrically and with the species living in Iquitos usually distinct from those in Pucallpa. For example, *Aphyolebias peruensis* in Iquitos and *A. wischmanni* in Pucallpa.

The area around Puerto Maldonado was up to now even less known with 2 different samples, only, which concluded into the descriptions of 2 probably endemic species, *Aphyolebias rubrocaudatus* and *Rivulus christinae*. The new species is then the third Killifish species registered as live from the area, but a photo showing a species related to *R. ornatus* is available from Lance Peck and preserved material assignable to *R. iridescens* has been also studied (Huber, 1992) and confirmed by a photo from Lance Peck. Therefore, the speciation that is known in the Iquitos and Pucallpa areas is most probably to be met in Puerto Maldonado area, too.

*Moema quiii n.sp.*

**Holotype:** MNHN 2003-0602, male 73.4 mm SL, 99.4mm TL. Fundo Shape, southeastern Peru, Rio Tambopata 15 Km upriver from Puerto Maldonado, 12.733°S 69.217°W, 140m altitude. Lance R. Peck and Roberto Masias Sehue, leg. June 14, 2002, 9:00 a.m.

**Paratypes:** MUSM (Lima, Peru) 20295, 4 specimens, registration through Hernan Ortega, MNHNP (Asuncion, Paraguay) 33556 registration through Dario Mandelberger, 4 specimens, MNHN 2003-0603, 1 female, 1 male; BMNH 2003.6.22.1-3, 3 specimens, CAS 217427, 3 specimens; all collected with holotype. Types (9) from MNHN, BMNH and CAS have been measured and radiographed, and they have been fixed in alcohol to enable future molecular studies.

**Description:**

Diagnosis: A large species, with an average morphology for the genus and with extended pectoral fins in male like its congeners, but with a less pike-like morphology of the head and with a unique color pattern in both sexes, made of small, brown-bordered, squares. No other yet known *Moema* species is showing the diagnostic vertical bars on sides, in addition to the longitudinal pattern.

**Color Of Live Fish:**

Male: The basic color of the flanks and the interior of the caudal, anal and dorsal fins is dark brown. Belly is somewhat lighter. On sides, 3 or 4 longitudinal continuous lines of red spots are conspicuous, each underlined and overlined by a cream yellow line and 10-12 dark brown vertical bars wipe out the longitudinal pattern where present, some being slightly oblique. The alternate longitudinal and vertical pattern produces small brown squares with 3 longitudinal lines (yellow, then orange, then yellow). A mood dependent post-opercular black blotch is available. Unpaired fins are marked by large orange and dark brown spots, more or less organized across rays. Caudal fin shows in addition an irregular dark brown line in prolongation of lower body base and a faint orange lower submargin. Both anal and dorsal fins also show a series of dark spots close to body base (3 at dorsal fin, 5 at anal). Paired fins are little darkly dotted. Head is having the 3 characteristic oblique series of yellow spots on brown background and the eye is barred with a dark oblique line, not extending beyond the orbit.

Female: The dichromism is very marked: the body is beige brown with dark longitudinal spotting that is overlined and underlined with a cream yellow edge. Three of these lines are more conspicuous, while in-between lines are thinner, more irregular, discontinuous and less dark. In addition, 7-10 vertical dark bars are present, like in male, but they are less conspicuous and restricted to between upper and

lower mid sides. The unpaired fins are strongly dark spotted, rather across rays. Dark spots close to body base of anal fin are distinctive because they contrast on a light blue background, like in male. The longitudinal lighter belly zone is much broader than in male and, opposite to male, includes the lower head. The head pattern is like in male: eye barred, but the oblique pattern is less conspicuous.

Remarks regarding bars: According to Lance Peck, "They appear in sub adult males as the red pigment develops to define pattern. Adult females have the bars as faint shadows, not bold. Females appearance is of horizontal lines of spots with underlying bars. Adult males show them stronger as a result of the red pigmentation which the females lack. Juvenile sexes look like females somewhat, but lack color as seen in adult females. Juveniles of both sexes show strong horizontal lines."

**Color In Alcohol:**

Male: No bars can be seen after a while on preserved specimens exposed to dry air: bars can only be seen on very large males and females, immediately after they are pulled out from the alcoholic solution. This observation suggests that this character is exceptionally derived for this species, to the contrary to most Cyprinodonts where it is relatively primitive. Additional characters: 3 series of more prominent dark dots on sides (less so in dominant male); a post-opercular dark blotch; unpaired fins, with light, dark-ocellated, blotches; a whitish lower submargin at caudal fin; lower lip, with a dark gray underline.

Female: no bars can be seen after preservation, like in male; 3 series of more prominent dark dots on sides, like in male; a post-opercular dark blotch, like in male; unpaired fins, with dark dots and with a fin dark edge (not always in Dorsal and lower Caudal); lower lip, with a dark gray underline, like in male.

**Size, Proportion And Formulae:**

About 170mm total length, as a

maximum, for the male, markedly less for the female (130mm), measuring end of season wild collected specimens, according to Lance Peck. This is the largest *Moema/Trigonectes* also known so far, and also the largest Rivulinae (Huber, 2000). In South America, only members of the genera *Megalebias* (Aplocheilidae) and *Orestias* (Cyprinodontidae) include species of larger size.

Micromorphological characters: Frontal scalation is very irregular, probably of the 'D' type (rarely 'E'); the frontal neuromasts are not numerous, like for other species of *Trigonectes et al.*, and like all *Rivulus*: the first anterior pair is set strongly apart, the 2 pairs of 3 supraorbital neuromasts are set in isolated holes within very shallow winding channels, the 2 pairs of 3 posterior neuromasts are fully exposed with a standard "U-shaped" organization; the pre-opercular 2 neuromasts are well exposed like in *Rivulus*; no neuromast or sensory buttons could be seen on the scales of sides or on fins; ctenoidy is scarce; teeth, sharp and monocuspid, are strongly recurved and very externally positioned, which together with the large mouth opening suggests a predatory behavior.

The morphological and meristic data of the 9 types in MNHN, CAS and BMNH (holotype first and in bold type; abbreviations explained in Huber, 1992; \* refers to "in % of SL") are, after radiophotographic confirmation, as follows in the chart below.

Other characters: The elongated pectoral fins reach the level of tip of Ventrals in male and the level of insertion of these fins in female; the ventral fins are not elongated, unlike components of *Trigonectes*; number of Caudal rays varies between 34 and 36; the hypural plate is undivided, often with a narrow median (darker) ditch.

**Phylogenetic Relationships:**

The new species cannot be placed nearer to any of the already described *Moema* species: none shows such a vertical pattern and all *Moema* species

	D	A	D/A	LL	TRAV	CIR	vertebrae	SL (in mm)	TL*	PD*	PA*	PV*	height at anal fin*	head*	inter orbital*	eye diam.*	snout*
Holo.	<b>9</b>	<b>19</b>	<b>10</b>	<b>37</b>	<b>11</b>	<b>18</b>	<b>16+19</b>	<b>73.36</b>	<b>135.6%</b>	<b>74.4%</b>	<b>62.2%</b>	<b>50.1%</b>	<b>17.7%</b>	<b>30.7%</b>	<b>16.4%</b>	<b>6.2%</b>	<b>8.3%</b>
Para.	10	19	10	36	10	20	15+19	66.8	137.9%	75.5%	62.5%	48.9%	19.3%	30.2%	16.8%	8.1%	9.6%
Para.	9	18	10	36	11	20	15+18	69.45	134.6%	75.9%	62.2%	52.5%	20.0%	31.9%	16.7%	7.3%	8.4%
Para.	10	19	11	37	11	20	15+19	64.86	136.8%	76.6%	62.4%	48.4%	18.7%	31.8%	16.3%	7.3%	9.6%
Para.	9	17	11	38	11	18	16+19	58.06	133.9%	76.6%	60.4%	50.2%	17.3%	32.3%	15.8%	8.9%	10.4%
Para.	10	18	11	36	11	18	16+19	52.03	131.7%	75.1%	62.4%	49.0%	16.8%	32.9%	16.1%	8.6%	9.5%
Para.	9	18	10	36	10	19	16+20	55.47	133.1%	75.0%	64.2%	51.2%	16.8%	29.9%	16.4%	7.7%	8.8%
Para.	9	17	10	35	11	18	16+18	48.99	133.3%	78.2%	65.4%	53.1%	18.1%	31.2%	15.7%	8.6%	10.3%
Para.	9	17	9	37	10	20	15+20	55.3	132.0%	75.3%	65.0%	50.4%	17.1%	32.3%	15.8%	8.2%	9.0%
Mean	9.3	18.0	10.2	36.4	10.7	19.0	15.6+19		134.3%	75.8%	63.0%	50.4%	18.0%	31.5%	16.2%	7.9%	9.3%
Std Dev.	0.5	0.9	0.7	0.9	0.5	1.0	0.6		2.1%	1.1%	1.6%	1.6%	1.1%	1.0%	0.4%	0.9%	0.7%

## PROGRESSIVE MARINE

- ★ CLAMS      ★ ALGAE CRITTERS
- ★ ACROS      ★ LIVE ROCK
- ★ XENIAS     ★ LIVE SAND
- ★ AND MUCH MUCH MORE!!!



7144 BELLE CHASE DR.  
MOBILE, AL 36695  
251/639-4591  
FAX/634-1403  
WWW.PROGRESSIVEMARINE.COM

are very similar by morphology and by meristics, with similar extensions in pectoral fins of male, with identical lower orange submargin in caudal fin and with a similar post-opercular black blotch.

There are 3 distinctive color patterns in *Moema* males.

First, the "unequal" pattern, where some longitudinal lines on sides are more conspicuous than others (situated in-between), is seen in *M. staecki* (and also in the very similar *M. portugali*, according to Wildekamp, 2003).

Second, the "discontinuous" pattern, where series of longitudinal spots on sides are irregular and not in lines, is seen in *M. piriana*.

Third, the "mosaic" pattern, where posterior series of longitudinal lines become less regular to form a mosaic, is seen in *M. pepotei*.

Finally, a different pattern, labeled "regular", where all lines are regular and equal, up to the peduncle, like for the related *Renova oscar*, might be available in still poorly known populations from Ecuador and northern Peru, which may represent a distinct species.

With its "irregular" pattern, only in female, the new species may be

tentatively related to the widespread species, *M. staecki*, from Brazil and British Guyana. However, the live pattern of the female of *M. pepotei* is not known either and a relationship of *quiii* with that species cannot be ruled out, because it is its probable vicariant (geographic neighbor).

### Remarks On Genus Assignment To *Moema*:

The new species, *quiii*, is conservatively assigned to the genus *Moema* which is externally defined by a less pronounced pike-like snout than *Trigonectes*, the extension of pectoral fins in male, a lineated pattern in male and female, a lower orange submargin in male caudal fin, an annual behavior (Costa, 1993). The shape of the caudal fin is, unexpectedly, quite variable among *Moema* species: fan-like in *piriana*, lanceolate in some populations of *staecki* and spade shaped in others, without clear geographic pattern, extended in the new species, like in *Aphyolebias peruensis*. Thus it cannot be considered as a diagnostic character. On the other hand, in *Trigonectes*, snout is more pike-like and male ventral fins are extended and pectoral fins are not extended, while the lineated pattern is very similar.

However, after having studied and described the atypical species, *Trigonectes aplocheiloides* (Huber, 1995) and the distant population of *Moema staecki* from British Guyana, *Moema* has also been considered, with *Renova*, as a subgenus of *Trigonectes*, following a PAUP analysis of 74 characters (Huber, 1999).

With the new species, there remains only one diagnostic character for *Moema*, compared to *Trigonectes*, that is the extension of the male pectoral fins. This may be evaluated as too limited for a genus diagnosis, notably for 2 groups of allopatric phylogenetic populations replacing vicariantly each other and this is the present author's opinion that they should only be systematic subunits, notably to gather ("lump") their similarities. The name of the species would be hence *Trigonectes quiii*.

However, present Neotropical systematics (Costa, 1998) tend to split a lot, compared to past strategies (e.g., Parenti, 1981) and they recognize valid genera based on similar, small species groups. And to stick to the current consensus, the author has accepted with caution *Moema* as a valid



"unstable" genus (Huber, 2000, 2001-2003).

### Biotope:

Like other *Moema*, the new species shows preference for not large, stagnant temporary bodies of water (ponds, swamps, flooded areas, river islands) on a muddy bottom in the forest; dwells upper layers, near surface, in deep parts of the biotope; not very active in protected shadowed places (Huber, 2000).

According to Lance Peck, "Pools form in November, March is about mid-season with adult fish, pools begin to dry in May, in June most are dry or so, low water quality does not support life well and predation by birds and mammals (peccary) finishes the season. However, it varies from year to year and from pool to pool. Sometime in June there is no more water or fish. Early season collections yield about 60% females, mid season collection yields 60% males, late season yields 80% female, end of season yields 99% female; fish hunt near water edges but retreat to deep water at first sign of danger; months when the fish can be caught in the field: January to May; primary and secondary mixed forest; always in deep shade, only found in large seasonal pools with no inlet or outlets."

Growth: According to Lance Peck, "Within a pool the fish seem to all be the same age. But there is a different growth rate within individuals. In early season for instance we catch a few (2 or 3) completely adult fish, which seem to have grown at a very rapid rate, seemingly almost too fast for the time the water has been present. Within a few months all seem to be the same size." Comment: later offspring or slower grower may also have been swallowed by predators.

Physico-chemistry and description of type locality: According to Lance Peck, "Rain water with only dissolved organic compounds no sediment, acidic increasing as season progresses; temperature of air: 26-38°C, and of water, 26°C (on average), depth of water: 1 meter, pool bottoms taper gradually to 0 depth, type of bottom: mulm over sandy clay forest floor;

# Medusa

## Digital Water Testers

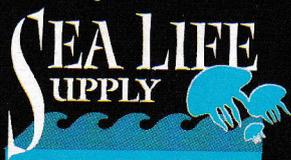
One meter tests for Ammonia, Nitrite, Nitrates, pH, Copper, Phosphate



- Gives accurate Digital Readouts in PPM
- No guessing with color cubes or color charts
- Display menus direct user through each test
- Alarm beeps when test is complete
- Uses SeaTest® and FasTest® reagents

Made in the U.S.A.

Distributed by:



Model CM-750

For a Dealer check our website or call 831-394-0828  
www.sealifesupply.com/medusa.htm

#

1

The Ultimate Light  
HAMILTON TECHNOLOGY CORP.  
1-800-447-9797  
See our color display  
(page numbers listed in  
"Ad Index" on last page)

many terrestrial plants (species survive and remain green throughout the inundation but many die and rot quickly) and no aquatic plants in the seasonal pools."

Sympatric species: Early season, *Aphyolebias rubrocaudatus*; later season: *Hoplosternum cf. pectorale*, *Hoplias cf. malabaricus*, *Erythrinus* sp. Note: different, rather polychromatic, populations of *A. rubrocaudatus* are always found with the new species but the new species is not always found within pools of *Aphyolebias*.

Predators: According to Lance Peck, "*Erythrinus* and *Hoplias* feed on everything including each other. They are very aggressive predators. *Erythrinus*, if kept together in a tank, will always end up a population of one. However, do they eat juvenile *Moema*? Maybe not. The individuals of *Hoplias* and *Erythrinus* are not present at first. Or at least not as adult or sizable fish. We don't really see these predators until near mid-season at which time the *Moema* are no longer juveniles."

This issue — which are probable predators of the killifishes, if any? — would be an excellent subject for someone to do a study on. These renown predators do not access the biotope directly because the biotope is not connected to any permanent water. According to Lance Peck, "Perhaps eggs are held over in the soil until next season? Natives say the fish bury into the mud until the next rains. But a lack of adult fish early season casts doubt on this. But maybe a few adult fish do and reproduce with first rains? Both species, especially *Erythrinus*, are capable of land travel. Besides, *Erythrinus* are strong and resist death. When placed on land they travel rapidly and efficiently in search of water. If kept in an uncovered aquarium, they exit and 'walk' away towards the river. So perhaps the predators migrate from pool to pool, hatch from resistant eggs, hibernate in mud, and/or travel as fry from pool to pool in fur of mammals."

These observations should be correlated to Brosset's regarding the aggressive mimicry by the Characid Fish *Erythrinus erythrinus* towards *Rivulus agiliae* in French Guyana: there, *Erythrinus* juveniles exhibit the

R.W.CARELLI CO

Your natural REEF source

Marine Fish, Hard and Soft Corals, Invertebrates, Clams and Coral Sand

Daily shipments transhipped directly from collectors.  
GUARANTEED live delivery overnight to your door.

Largest Selection of Premium  
**LIVE ROCK**  
from the South Pacific at the lowest prices

WEEKLY SPECIALS of Quantity Discounts

1 Box - Special Price ~ 30 assorted  
small, hard & soft corals from the South Pacific.

- Hard-to-find Stony Corals
- Exclusive Overseas Supply Network
- Aquacultured Corals
- Public Aquarium Inquires Welcome
- Distributor Pricing Available
- Pleasing Your Reef Tank Needs
- Show Size Availability
- Specializing in Transhipping
- Thousands of Satisfied Customers
- Since 1995

• Receive Our Weekly Availability List via Fax •

Wholesale Only 800 558 6642

PHILIPPINES → PALAU → FIJI → TONGA → COOK ISLANDS → VANUATU → POHNPEI → BALI

POHNPEI → BALI → PAGO PAGO → JAKARTA → AUSTRALIA → RED SEA → HAWAII → SRI LANKA

FIJI → TONGA → SOLOMON ISLANDS → VANUATU → WESTERN SAMOA → COOK ISLANDS

# Famous Cyclone® & Delta Star® Chillers by Aqua Logic



- \* Celebrating our 10th year Anniversary
- \* Space age titanium chilling coils
- \* Ozone friendly R-134a non-cfc refrigerant
- \* Quiet efficient trouble free operation

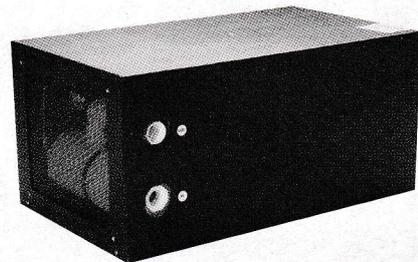
## Accept No Substitutes

### Cyclone®

### Delta Star®

Remote titanium coil w/ 5' flexible line

In-Line Helixal Coil - Very Efficient



HP	Amp	Cyclone Size	Delta Star Size
1/6	2.9	15x12x11	19x12x11
1/5	3.4	15x12x11	19x12x11
1/4	5.4	15x12x11	19x12x11
1/3	7.2	19x14x11	23x14x11
1/2	9.5	19x16x13	24x16x13

©2000 • Aqua Logic, Inc. • San Diego, CA • Phone (858) 292-4773 • Fax (858) 279-0537 • www.aqualogicinc.com

characteristic pattern of the supracaudal ocellus of female *Rivulus* to attract the male and swallow it.

#### Behavior:

*M. quiii* prefers to live in tribes like *Rivulus*; annual development: both sexes dive, like *Cynolebias et al.*, into substratum to lay each egg; aggressivity between males; straight, not loose posture in life, unlike *Rivulus*. Like *Rivulus* sp., *M. quiii* is capable of and does travel by land to change water bodies (Huber, 2000).

According to Lance Peck, "Fish are good jumpers and can cover a good distance quickly when out of water; very strong and recover from dry land experiences; position in water of the new species vs. the sympatric Killifishes: active early morning and late afternoon, midday spent beneath leaf cover on bottom, near edges of pool; in aquarium shows active feeding behavior at night feeding on small fishes; on the contrary, *Aphyolebias rubrocaudatus* is active during daylight and goes beneath leaf cover at night; the two species which occupy the same water bodies have opposite behavior habits. The bigger *Moema* does feed on the smaller *Aphyolebias* (in an aquarium); the two fish have very

similar behavior but since the bigger *Moema* does feed on the smaller *Aphyolebias*, opposite time schedules allow both to occupy the same small body of water.

According to Lance Peck, "Both *Moema* and *Aphyolebias* species live near edges but retreat to deeper water when approached from the shore. However, if approached from the water side, both species will take cover into leaf litter along the shore. Even to the extent of almost leaving the water. Refuge is always taken below leaf litter."

#### Distribution:

*M. quiii* is only known from the type locality and from one other location along the Madre de Dios, 20 km North East of the type locality.

The genus *Moema* is a species flock of large to very large size, with a large range in Amazonian lowlands of Northern Brazil and its belts in Venezuela, British Guyana, Bolivia, Peru, Ecuador (at least), along the North-South (Madeira-Orinoco) and West-East (Amazon) axis. The new species lies at its western most part of range. It is northerly replaced in the Iquitos area in Peru by the "regular" yet undescribed phenotype and

southerly by *M. pepotei*. Easterly it may be replaced by *M. staECKi* or another unknown component. The extension of its range, apart from the Puerto Maldonado area, is unknown.

#### Derivatio Nominis:

The species name, *quiii*, is a noun in apposition and is proposed by the discoverer Lance R. Peck, a biologist, animal photographer and exporter, based in Puerto Maldonado, as a dedication to his wife Belinda who was given the name "Qui i i" by an Ese eja shaman friend years ago.

According to him, "The name is derived from the Ese eja word "Qua' i i" which means hummingbird (picaflor). However, "Qui i i" (with a twist of sound) is the name for the "hummingbird of the water."

The story in more details deserves to be reported, for ethnological reasons (even if the records of epilepsy have obviously no scientific basis and Killifish are routinely eaten

Surf, Click, Save

UltraLifeDirect.com

in Africa by locals).

The reader should remember that this vernacular language is not a language of words, it is of sounds, very subtle sounds created by humans as a language.

The Tambopata native group of Ese eja has now been reduced to less than 30 mixed families. The language is oral only. Words are invented when an unknown object is encountered. Words are created in a descriptive manner. Only one man, Roberto Masias Sehue — the co-discoverer of the species, is accurately fluent in both Ese eja and Spanish and among the families, he is the only individual who cares to carry on the dialect. The older members refuse to speak the language and the younger ones don't want to learn it. Roberto Masias Sehue assisted in the compilation of a Spanish/Ese eja dictionary in 1980 (Lexico Ese-eja — Espanol, Espanol — Ese-eja, by Maria C. Chavarria Mendoza). According to him, "The author of the dictionary did not hear the delicate sounds of the language and would not/could not spell the words correctly. She omitted the sound of the letter Q from the language. Her spelling of the word for hummingbird is 'Kua' i i,' but the difference between Q and K is important and in fact the sound is represented by the Spanish word 'Qua' i i,' not 'Kua' i i'."

Now the change from "Qua' i i" to "Qui' i i": Roberto Masias Sehue explains the word is the sound of an echo. The audio call of the hummingbird is like an echo thus the trailing "i" sound. So when the hummingbird echoes, the sound transforms into the water world and changes to "Qui' i i."

Just as hummingbirds have strong spirits according to the forest people, so do the "big red shuyu" (our killies, there), and according to natives, one should never eat killies because they possess the "madre de epilepsy" (spirit of epilepsy). If you eat them you will have seizures. This is reported to have happened one year when the people were very hungry and so went out to gather the plentiful fish and feasted on them. Everyone had seizures and many people died. The fish have never been bothered since and have no specific local name

Pronunciation of the name (in English): "Kwee e e" (in French and Spanish: "Kwi i i", in German:

"Kui i i"). Common name: hummingbird killifish.

### In The Aquarium:

Like other *Moema* sp., the species is annual, incubation in dry peat being in the order of 6 to 8 months, with sexation being reached at the age of 4 weeks and breeding at 6 weeks (Brousseau, 2002 and personal comm.); it is difficult to keep, as is the case with other *Trigonectes* and *Moema* species, because of the frequent fights between males and consecutive wounds, even if minor, and because of their short lives, rarely more than 10 months in artificial conditions (and much less in nature!). Community tanks are not advised with smaller fish because of the large size (and mouth!) of the new species and because of its predatory behavior towards the "gentle" *Aphyolebias* sp.

### Thanks:

This work would not have been possible without the generous observations and collections in the field by Lance R. Peck and Roberto Masias Sehue, without additional field collections by Jesus Masias Palsa, without the logistic support by Pascal Buffard (Paris), without the aquarium care at Gone Wild Peru SAC in Puerto Maldonado by Belinda Peck and Elizabeth Raine, without the advices on the manuscript by Jacques Daget from Paris MNHN and by an anonymous reviewer, without the kind help by Martine Dessoutter, Rémi Ksas and Patrice Pruvost in MNHN premises and without the kind support for types deposit by Bill Eshmeyer and David Catania (CAS), Oliver Crimmen and Tony Gill (BMNH), Hernan Ortega (MUSM) and Dario Mandelberger (MNHN). All are warmly receiving our best thanks.

This paper is kindly dedicated to Dr Roger Brousseau, an internationally renown Californian aquarist, specialist of annual neotropical killifishes and innovative writer on killifish breeding behaviors, for his extra-ordinary welcome in San Francisco, last year with my son Nicolas, and assistance to visit the Death Valley and its *Cyprinodon* marvelous inhabitants.

### Bibliography:

Brosset, A. 1997. Aggressive Mimicry by the Characid Fish *Erythrinus erythrinus*. *Ethology*,

103: 926-934, 2 figs.

Brousseau, R.D. 2002. South American Annual Killifishes (Cyprinodontiformes, Rivulidae), Ed. 2.1.0. Privately published book, available through:

[www.geocities.com/dr\\_rog](http://www.geocities.com/dr_rog)

- Costa, W.J.E.M. 1993. Sistemática e Distribuição do Gênero *Moema* (Cyprinodontiformes, Rivulidae), com a Descrição de uma nova Espécie. *Revta. Brasil Biol.*, 52 (4) (Nov. 1992): 619-625, 8 figs. Costa, W.J.E.M. 1995. Über die Systematik von *Trigonectes* und *Moema*. D.K.G. (*Deutsche Killifisch Gem.*) J., 2 (2): 21-25, 4 figs.
- Costa, W.J.E.M. 1998. Phylogeny and Classification of Rivulidae revisited: Origin and Evolution of Annualism and Miniaturization in Rivulid Fishes (Cyprinodontiformes: Aplocheilidei). *J. Comp. Biol.*, 3 (1), December: 33-92, 37 figs., errata corrigenda.
- Huber, J.H. 1992. Review of *Rivulus*. *Ecobiogeography - Relationships. Cybium Suppl., Soc. fr. Ichtyologie Publ.*: 586 pp., 40 pls., 85 figs, 8 tabs, 13 maps.
- Huber, J.H. 1995. Nouvelles Collections de Cyprinodontes paraguayens, avec Description de 4 Espèces Rivulines inédites et Redécouverte d'une Espèce à la Localité typique jusqu'alors indéterminée. *Assoc. Killiphile Francophone de Belgique, Killi Contact*, Aug. 23 (2): 24pp.
- Huber, J.H. 1998. A Comparison of Old World and New World Tropical Cyprinodonts. A parallel Outlook of similar and distinctive Characteristics regarding Distribution, Evolution, Ecology, Behavior, Morphometrics. *Soc. fr. Ichtyologie Ed.*, Paris (Oct. 10): 109 pp., 17 figs.
- Huber, J.H. 1999. Updates on the Phylogeny and Systematics of the neotropical Cyprinodont Genus *Rivulus* and its allied (Cyprinodontiformes, Rivulinae). *Cybium*, 23 (1): 29-52, 1 fig., 3 tabs.
- Huber, J.H. 2000. Killi-Data 2000. Updated checklist of taxonomic names, collecting localities and bibliographic references of oviparous Cyprinodont fishes (Cyprinodontiformes); in French, English, German and Spanish. *Cybium, Soc. fr. Ichtyologie Ed.*, Paris.: 538 pp., figs.
- Huber, J.H. 2001 - 2003. A global Website dedicated to Oviparous Cyprinodontiformes or Killifish, with a Data Base on all known Taxa (files *Moema*, *Moema pepotei*, *Moema staecki*: 2001). Killi-Data online: <http://www.killi-data.org>
- Parenti, L.R. 1981. A phylogenetic and biogeographic Analysis of Cyprinodontiform Fishes (Teleostei, Atherinomorpha). *Bull. Amer. Mus. Nat. Hist.*, 168 (4): 335-557, 99 figs., 3 tabs., maps.
- Peck, L. 2001—2003. A global website dedicated to the biology, natural history, digital cinematography, aquarist groups collection and commercial exportation of live fish from Madre de Dios department (Aquarium section). Gone Wild Peru: <http://gonewild.net>
- Wildekamp, R.H. 2003. A World of Killies. Atlas of the Oviparous Cyprinodontiform Fishes of the World. Vol. 4 *Amer. Killifish Assoc. Publ.*, in print. 

Visit Killi-Data website:

[www.killi-data.org](http://www.killi-data.org)

Access to "guest" section simply with your e-mail.

Access to "member" section (database) after registration process in "guest" section.

To see an example of the database in "guest" section, click on SAMPLE.

Twice a year newsletters, plus Killiflashes immediately after important publications (new species!), upon free subscription.