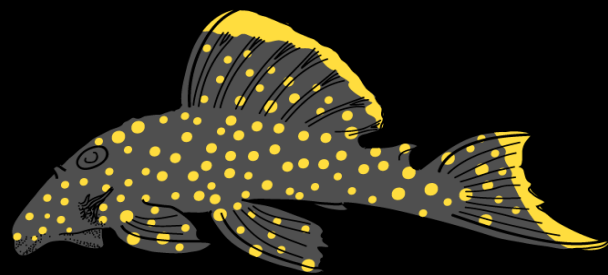


Journal of the Catfish Study Group



June 2016

Volume 17, Issue 2



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Cover image: *Cetopsis bathyphilus*. Photo: M. Sabaj





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Editorial

Welcome to the second issue of the 2016 journal. Many thanks to all our sponsors, subscribers and – especially – our contributors.

The Summer issue includes the first of what will hopefully be many articles from a regular CSG conventioneer and keen pleco breeder based in The Netherlands – Jacqueline Bennett-Leaver. Mark Walters lets those of us that missed the 2016 convention know all about this year's event and what to expect at the 2017 convention next March. Catfish guru Steve Grant has written a fantastic piece on some very interesting and poorly-known banjo catfishes of the genus *Amaralia* – a banjo that pleco breeders should be especially interested in!



Continuing a series of articles concerning catfish natural history and biology, I have written an introduction to the ways in which catfishes interact with their environment through their senses and mentioned some of the special adaptations that make them among most advanced animals on the planet. I've also added a short interview I conducted with the Godfather himself, Dr. John Lundberg!

As always, welcome to our new subscribers and members. I hope you find something new and interesting in these pages, and that you recommend us to your friends and colleagues.

Thanks,

Michael

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From the Chair

The annual convention is the pinnacle of the Catfish Study Group calendar and is always an event to look forward to, enjoy and then reflect upon. This year's event was, as always, organised and delivered professionally and effectively by the hard working committee and especially the convention manager – Ian Fuller.



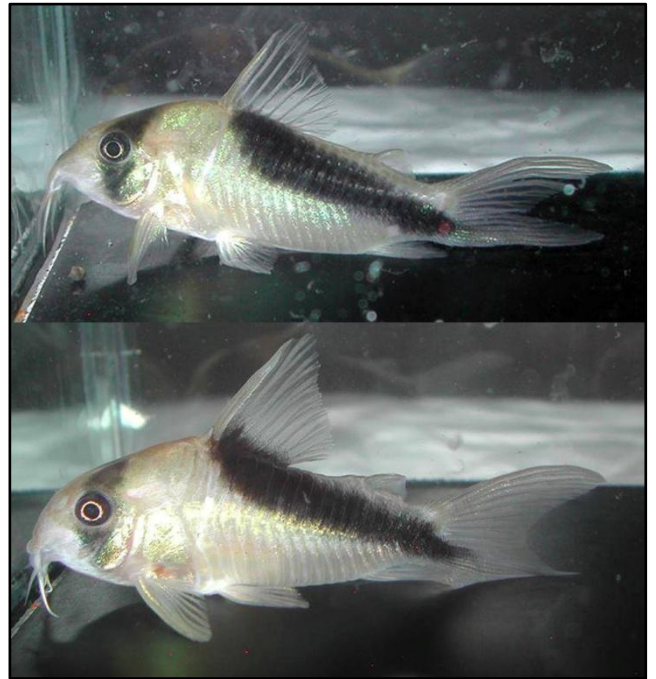
2016 was the last convention to be solely organised by Ian who has now retired from committee duties to concentrate on his packed itinerary of Corydoradinae interests! Ian leaves the event in good hands with the new convention committee and with plenty of forward planning in place, with 2017 and even 2018 speakers lined up. The club owes Ian a debt of gratitude for his tireless efforts to make the convention the foremost catfish event, which has been running now for nearly 40 years!

Ian has been at the forefront of club organisation since joining the committee in 2000 as Chairman which he served until 2010 before being elected President. Ian also formalised the role of Convention Manager in the same year to maintain his involvement in the committee. The positions Ian has held do not do justice to the enormous effort he has made in securing speakers for the conventions, identifying top class facilities and keeping the delegates well catered for – and not just at the bar!



Ian has also worked tirelessly in his role as Chairman and President to encourage members to join the committee, line up top class monthly meetings and to secure sponsorship to fund the clubs activities. As a consequence, the CSG has grown from a UK club to an international organisation. I would like to extend the thanks of both the committee and all of our members to Ian and wish him the best catfish success for the future!

After the convention, Ian found the time to deliver a well-received CSG event in May. 'Coryfest' wowed attendees with a display of over 40 species of *Corydoras*, most of which were undescribed and have not been seen before in the UK. What struck me was the quality of Ian's corys, with each one a show quality fish in its own right.



The event was supplemented by sales tables offered to CSG members for no fee and over 20 species of Corydoradinae and many Loricariidae were offered at bargain prices.

I'm looking forward to the upcoming events in the CSG calendar, including the Summer lectures by Steve Grant and Richard Smith, and a visit to the Castleford Aquarist Society Catfish and Loach show and auction in July.

Mark

chairman@catfishstudygroup.org

***Amaralia oviraptor* Friel & Carvalho, 2016 - the pleco-egg eating banjo catfish, with comments on potential trophic morphology and ecology**

By Steven Grant



Fig. 1. *Amaralia oviraptor* Friel & Carvalho, 2016. Paratype in life. Photo: S. Grant

Back in the early 2000's I came across John Friel's PhD thesis (Friel, 1994) on banjo catfishes; a family of catfish that have always fascinated me. In the thesis I was fascinated to read the findings of fish eggs in the stomachs of *Amaralia* banjos, and stunned to see the pictures of egg masses removed from the stomachs of the two species (one of which was undescribed at the time; from the Paraná-Paraguay River basin).

In 2014 I went to Pier Aquatics in Wigan, England. This shop is famed for obtaining rare and unusual fishes, including catfishes that I have never seen available anywhere else. The owner, Neil Woodward, had received a small number of specimens of an *Amaralia* species in a shipment from Paraguay. This immediately got my attention as I knew that they could not be *Amaralia hypsiura* (Kner, 1855) as that species is restricted to the Amazon basin. I recalled the undescribed species from the Paraná-Paraguay

River basin and knew that the chances were that these were live specimens of the undescribed species, and as such were the first live ones ever seen in an aquarium.

Thanks to Neil I was able to contact the exporter, Agustin Villanucci, who provided me with exact catch location information. This confirmed they were the undescribed species. I arranged with Neil, and Mark Sabaj of the Academy of Natural Sciences Philadelphia (ANSP), to obtain the specimens for science. I was able to send a fin clip for DNA purposes and the largest of the specimens was preserved and sent to ANSP. Thanks to Neil, Ian Fuller and Eric Bodrock we were able to facilitate the remaining two specimens to ANSP, sent live, so that they could be studied for a while.

These three specimens were important as they were used in the type series of the new species description of *Amaralia oviraptor* Friel & Carvalho, 2016, becoming paratypes ANSP 197190. Not only did they become part of the type series, one of them was cleared and stained so that the morphology of the skeleton could be studied and compared to *A. hypsiura* (see figures 3-7 in the description); all three were x-rayed and along with the holotype the results were used in the description; one was used for DNA sampling, the results of which were



Fig. 2. *Amaralia hypsiura*. Photo: S. Grant.



Fig. 3. *Amaralia* sp. "Venezuela". Photo: S. Grant.

published in the paper; and one of them was also pictured alive in the description.

Differentiating Amaralia

Friel and Carvalho (2016) found numerous characters that help to separate *Amaralia* from other aspredinids but a lot of them are difficult or impossible to use when studying live specimens. For aquarists, the easiest physical characters to use are that in *Amaralia* the dorsal fin is small and set very far back along the body, and there are large undulating tuberculated ridges along the back, in-between the dorsal fin and the caudal peduncle. The egg eating behaviour is so far known only in *Amaralia*.

Differentiating *A. hypsiura* from *A. oviraptor* is relatively easy if one knows the origin of the specimens, as any from the Amazon basin will be *A. hypsiura* and any from Paraná-Paraguay River basin will be *A. oviraptor*. Physically there are three differences between the two described species but only one is of use to aquarists: in *A. hypsiura* there are two dorsal fin rays, whereas *A. oviraptor* has three.

There is a possible third, undescribed, species that is supposedly from Venezuela (fig. 3). It is not clear whether these are a colour form of *A. hypsiura* but they can be differentiated from non-Venezuelan *A. hypsiura* by large pale areas



Fig. 4. *Amaralia* moulting. Photo: S. Grant.

in the rays and membranes of the pectoral (near base of spine), ventral, anal, and caudal fins.

All three species exhibit the ability to slough their skin mucus. Mucus sloughing (or moulting) in *Amaralia* was captured in a photograph of mine in May 2010 (fig 4). It is not known for definite why they do this but it is likely to be in response to stress or poor water conditions, as this is usually the case in their distant relatives, the erethistids.

Egg eating (oophagy)

In 1992 Friel announced findings of the examination of the gut contents of twenty three *Amaralia* specimens (seventeen of *A. hypsiura* and six of what would later be named *A. oviraptor*, and not from the same sample). Friel found that one had a single scoloplacid catfish specimen in its stomach, and fifteen had empty stomachs in striking contrast to the stomachs of other aspredinids which always contained at least some detritus and invertebrates (aquatic insect larvae and terrestrial insects). Seven specimens (including both species) had masses of eggs in the stomach (fig. 5) The eggs were similar in appearance to those of loricariid catfishes and in one case ingested embryos could be positively identified as loricariids. These findings led Friel and Carvalho to later give their new species the specific name *oviraptor*, which is a combination of the Latin *ovum* (*ovi*), meaning egg; and *raptor*, a robber or plunderer, commonly used term for a predator, here referring to the peculiar dietary preferences. They consider them to be trophic oophages, meaning their position in the food chain is the specialisation of the feeding on eggs (including embryonic ones) of other species.



Fig. 5. Preserved specimen of *Amaralia* with stomach contents dissected (*A. oviraptor* above, *A. hypsiura* below). Photos: J. P. Friel. Reproduced with permission.

Roberts (2015) was present when a small specimen of *A. hypsiura* measuring 41mm SL was caught in shallow water near the shore of the Rio de Las Piedras, a tributary of the Rio Madre de Dios in the Upper Amazon of Peru near Puerto Maldonado. The specimen had a full stomach and when dissected its contents consisted of a uniform oval mass of partially digested orange coloured yolk.

This is fascinating as there is proof that all species of a genus of what one would assume is a benthic, supine, detritivorous and insectivorous catfish is oophagous, potentially specialising in eating the eggs of other fishes, and possibly just loricariid catfishes. I and other aquarists have kept *Amaralia* in the aquarium and reports exist of their spawning in captivity (fig. 6). No aquarist has reported oophagy in the aquarium but this is possibly due to the right circumstances and conditions not being present. It would be interesting to keep *Amaralia* in an aquarium with easily-spawned loricariids, e.g., *Ancistrus*.

Unlike most aspredinids *Amaralia* can be notoriously difficult to feed in the aquarium and this is probably as a result of their natural feeding behaviour. When imported their stomachs are usually totally empty and sometimes they will not eat and eventually die of starvation. However, they will sometimes eat bloodworms, chopped earthworms, and a frozen mixture of blended uncooked prawns, cooked mussels and various vegetable matter. This is sometimes only if the food is dropped on their snouts or just in front of them, albeit there is video evidence of foraging feeding by Smith (2015) and I have personally witnessed this behaviour in other specimens. Richard Smith kept his specimen of *A. hypsiura* for some time, fed on the blended mixture, and it only died due to an unfortunate encounter with a *Rhamdia*.

The aquarist who spawned them has had his since May 2014. Roy Blackburn had a pair of *A. hypsiura* and they eventually ate bloodworms, tubifex and earthworms, getting quite fat in the process. However, after about two years they inexplicably stopped eating and died of starvation. I consider that this usual problem of getting them to eat or maintaining them eating over long periods of time does lend weight to them being obligate oophages in the wild. However, the fact that they will sometimes eat food other than eggs is seen by some aquarists as them being opportunistic or facultative oophages, not obligate. An obligate oophage means that they have evolved to feed more or less exclusively on fish eggs; opportunistic means they only eat fish eggs when the opportunity presents itself; and facultative meaning to feed primarily on fish eggs but also take a wide variety of other food items as well.

To explore this hypothesis I have looked for other examples of obligate feeders that may have accepted other foods in captivity. Condé (1986) describes attempts at keeping *Chaetodon meyeri* Bloch & Schneider, 1801, which is considered to be an obligate corallivore (coral feeder) in the wild. A juvenile specimen was kept in a tank with three species of stony corals. It immediately began feeding on one of the species but after three weeks was eating chopped mussels equally as much as the coral. It would later browse on small anemones as well as eating a complete

mussel a day. Shinri Takama, a Japanese aquarist, has successfully kept five species of *Chaetodon* for many years that in the wild are obligate corallivores, specifically eating stony corals. He has kept them with no corals, but has fed them successfully on a species of saltwater clam.

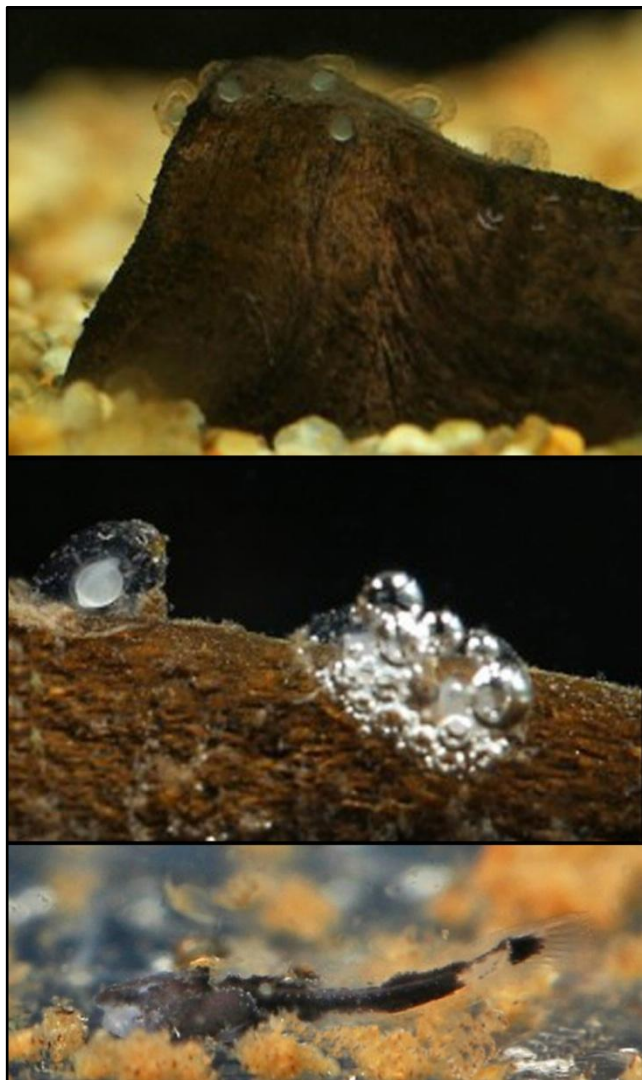


Fig. 6. Eggs and juvenile *A. hypsiura*. Photos: Ben Lee. Reproduced with permission.

The Tanganyikan cichlid *Eretmodus cyanostictus* Boulenger, 1898 is considered to be an obligate scraper of epilithic (growing on the surface of a rock) algae in the wild (Yamaoka, 1991). Their mouth and teeth appear to have a morphology fit for this purpose, but in the aquarium they will eat a broad range of prepared and live foods.

Some fish that are considered obligate piscivores in the wild have also been known to eventually accept dead fish, or even foods that are not fish, such as insects. The Needlefish,

Xenentodon cancila (Hamilton, 1822) is a good example of this.

The Wimpel Piranha *Catoprion mento* (Cuvier, 1819) is considered to be an obligate piscivore (piscivore can include live fish, parts of fish, eggs and fry). The majority of their diet in the wild is fish scales making them more specifically an obligate lepidophage (scale feeder), only tending to eat small fish when the opportunity arises (Janovetz, 2005). Again the jaw and teeth have evolved to primarily dislodge and eat scales yet in the aquarium the vast majority of specimens will eat chopped prawn, mussel, lancefish and other meaty foods (Ford, 2016).

Another lepidophage is *Plecodus straeleni* Poll, 1948. This Tanganyikan cichlid primarily eats scales but as per Nshombo (1991), has also been known to take chunks off catfish (which have no scales), but has also been observed to eat the eggs of the cichlid *Cyathopharynx furcifer* (Boulenger, 1898). There are reports from fishkeepers that in the aquarium they can sometimes be weaned onto prepared foods, even eating flakes.

Trophic morphological adaptations

All the fishes discussed above have morphology of the teeth and/or mouth that enable or assist them in their eating habits and Janovetz (2005) goes into detail about the kinematics and biomechanical nature of the feeding strike in a predatory characin.

The detailed discussion in Friel & Carvalho (2016) on the morphology and synamorphies of *Amaralia* does not provide any obvious examples of *Amaralia* having any unique morphological features among the Aspredinidae that would lend them to obligate oophagy. Having said this, the size and texture of fish eggs would not necessarily necessitate the need for peculiar anatomical or biomechanical features when eaten on their own or in small clusters, with no other factors in play. However, it may require, depending on which eggs are eaten and how and when they are eaten, different anatomical features and biomechanical action of the jaw/mouth so as to enable them to quickly



Fig. 7. *Amaralia* sp. "Venezuela" buried in sand. Photos: S. Grant.

ingest either large clusters of eggs or smaller chunks of clusters, whilst reducing the time susceptible to attack by any brooding parent.

There is very little research on the feeding mechanisms of catfish, but what is known is that, due to having a dorsoventrally-flattened cranium, suction feeding is more difficult than for laterally-depressed fishes (Adriaens, 2003). Yet, this method is deployed by many catfish species. Smith (2015) and personal observations show *Amaralia* to be suction feeders in the aquarium. Most aspredinids have a compressed head and body due to their benthic and sometimes fossorial (living in the substrate) existence. This will have a limiting effect on the kinematics of a quick extension of the jaws to suck in prey. However, this in itself has not stopped catfishes of the genus *Chaca* Gray, 1831 (with related or alternatively convergent morphology) from being strike predators using suction. *Chaca* do however have different jaw and suspensorium morphology which will attribute to greater suction power and a larger buccal cavity capacity, but they are obligate piscivores in the wild so they need these adaptations.

I have looked at the width of the mouth (when measured in the closed position) in relation to other aspredinids. Whilst *Amaralia* appear to have (at the highest range) proportionately wider mouths than the Hoplomyzontinae (Stewart, 1985), and *Pseudobunocephalus* (from examination of aquarium specimens) they are proportionately no wider (when closed) than some species of *Bunocephalus* (see Carvalho *et al*, 2015; Cardoso, 2010), and are not as wide as *Xyliphius* (see Taphorn & Lilyestrom, 1983). *Xyliphius* appear to need wide mouths with wide spaces in-between the jaws, to facilitate filtering of substrate for food items.

One feature that *Amaralia* share with only one other aspredinid (*Pseudobunocephalus*) is that of the placement of some of the bones in the neurocranium i.e. the supraoccipital does not contact the frontal. It is unclear what role, if any, this anatomy has in the biomechanical operation of the mouth. I initially hypothesised that it may provide greater flexibility of the opening of the mouth by way of greater displacement of cranial elements, so as to assist in greater suction power / kinematics when sucking in prey (eggs or small fish). Friel (1994) hypothesized that *Pseudobunocephalus* and *Amaralia* are not closely related genera (within Aspredinidae), so considered this character-state to have convergently evolved. *Pseudobunocephalus* are very small and as such will need as much biomechanical advantage as possible to eat their foods, so it could be that this character is related to opening the mouth as wide and as quickly as possible, to capture prey. However, M. Hardman (personal communication) pointed out that, typically, the neurocranium is not a kinetic structure because of the implications it would have on the brain and spinal cord, and it is the jaws and/or suspensorium (the chain of cartilages and bones, suspending the jaws from the neurocranium) that are usually adapted for specialized feeding modes. This is certainly the case in *Chaca* and *Asterophysus* Kner, 1858 which have very long and flexible maxillae (bones in the upper jaw) which appear to aid in the mouth being opened very wide to accommodate prey. Hardman suggested that the unusual formation of the neurocranium in *Amaralia* may not necessarily have an adaptive explanation.

Two morphological characters reported for *Amaralia* (Friel & Carvalho, 2016) were the absence of a dorsally expanded dentary (bone in the lower jaw) near the symphysis (the junction of each side of the lower jaw) and the reduction

in the number of branchiostegal rays (bony rays supporting the gill membranes behind the lower jaw). I hypothesise that these characters may assist in an increased kinematic force or speed, by way of a more flexible and therefore quicker expansion of the mouth. Certainly in Smith (2015) this fast suction power with large pieces of food can be seen near the end of the video, when another catfish attempts to steal the chunk of food hanging out of the *Amaralia*'s mouth. Investigations into the kinematics and myology (muscles) of the head and jaw of *Amaralia* would be beneficial.



Fig. 8. Ventral view of *Amaralia oviraptor* showing the adducted maxillary barbels and caudal fin morphology. Paratype in life. Photo: S. Grant.

Another possible difference between *Amaralia* and other aspredinids is the large soft abdominal area in relation to the standard length of the body (measured from the insertion of the pectoral fin to the insertion of the ventral fin). This is based on live specimens that I have kept or photographed. The soft abdominal area in *Amaralia* is the largest when compared to nine other *Bunocephalus* species; much larger than three species of *Pseudobunocephalus* and two of *Pterobunocephalus*, and almost double that of two *Xyliphius*. The soft abdominal area can balloon to a very large size after filling up on fish eggs (see Roberts, 2015: fig. 1). This may be in a trophic morphological character so as to enable as much of a potentially scarce food resource to be consumed as possible. The reduced and posteriorly placed dorsal fin may also be to enable more room in the body for food, as the sub-dermal supporting structures of the fin may have reduced too.

I have also noticed that the maxillary barbels of *Amaralia* are relatively short but also very thick when compared to other aspredinids. They can also tuck them underneath the dorsolateral outline of the head so that the ends are relatively protected (fig. 8). They do this when they are touched by anything they consider to be a threat. As (partly) described in Roberts (2015) they have the ability when threatened to curl their body into ball like shape, so much so that at first he thought it was a seed when it was handed to him by the fisherman. I have often witnessed this behaviour when I have picked specimens up with my hands or a net. Not only do they tuck their barbels in and curl their post-dorsal body towards the head, but the unbranched principal caudal fin rays are sometimes pulled under or over the pectoral fin spine at an angle of approximately 90 degrees (measured by the upper lobe in relation to the caudal peduncle). When tightly curled, the s-shaped procurrent dorsal caudal fin ray (present on the dorsal and ventral part of the fin) is used to anchor it in place on top of the pectoral fin spine (see figs. 2 & 8).

These s-shaped rays are unique to *Amaralia* (Friel & Carvalho, 2016) and for the first time their function is explained here. The shape and connection of the upper hypural and ural half centrum bones of the caudal fin (see fig. 6 in Friel & Carvalho, 2016) may also facilitate the caudal fin being tucked under/over the body at an angle. The smooth or weakly serrated outer edge of the pectoral fin spine of *Amaralia* may be to enable the caudal fin to be anchored against the pectoral fin spine without causing damage to the caudal fin. In addition, the ventral fin that is exposed on the side not covered by the post dorsal skeleton curl can be adpressed against the body, presumably to reduce the chances of being bitten off or damaged (figs. 2 & 8).

As mentioned by Roberts (2015) and witnessed many times over the years by the author due to handling live aspredinids, this body curling behaviour can sometimes happen in other aspredinids, notably *Bunocephalus verrucosus* (Walbaum, 1872), but also catfishes from other families, such as the erethistins. However, the curling is usually short lived and is

not behaviourally or morphologically the same as described above for *Amaralia*. Roberts (2015) witnessed a specimen of *Amaralia* lying upside down for six hours.

Trophic ecology

As outlined above, there are some unusual and sometimes unique morphological characters that may have evolved, some confirmed, some hypothesised. The question is whether they have evolved for trophic specialism, solely for non trophic associated predator avoidance / defensive behaviour, or simply due to genetic influences.

It is prudent to consider where specimens of *Amaralia* have been caught so that one can consider how they may behave and capture their prey. Villanucci (personal communication) caught *A. oviraptor* at three different sites and each time this was at the mouth of small shallow streams as they entered bigger rivers. They were

caught in the mud of the small streams and this was in contrast to the rivers that they fed which usually had a sand substrate. The specimen in Roberts (2015) was collected in shallow water near the shore. The numerous type specimens of *A. oviraptor* appear to have been caught in the smaller parts of streams, rivers, rivulets, and in small and pools, but some non type specimens of *A. hypsiura* were caught on the banks of main channels of large rivers. The colouration and flattened form of *Amaralia* would lend itself to be a benthic fossorial catfish, and certainly I have observed them on many occasions burrowing under the sand substrate that they were provided with in the aquarium, with just their mouth and eyes (fig 7), and some of the ridges along their back showing (fig 7). The darker colour of *Amaralia* and information from Villanucci would suggest that they favour mud substrates or perhaps sand substrate that has darker coloured detritus, so that they are camouflaged more effectively. Any dark brown

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to black fish moving along a clear sand substrate during daylight hours will be easy to spot by predators such as other fish or wading birds, but also by the brooding parents of any eggs. Obviously, when burrowed (as described above) or at night they would not be as visible.

In my experience of over 25 years in keeping aspredinids in the aquarium, most species will burrow in sand, so this fossorial behaviour is not unusual in *Amaralia*. Therefore this cannot be, in itself, behaviour that has evolved in order to facilitate trophic specialism.

It is undeniable that *Amaralia* eat the eggs of other fishes but one must ask how they achieve this. It seems unlikely to me that during daylight *Amaralia* would attack the clutch of a brooding cichlid, as the chances of being badly wounded or killed by an agile fish with a protractible jaw, would be high, notwithstanding the potential defensive adaptations discussed above. It could be possible for them to attack broods during the night and use the defensive adaptations if attacked. Any cichlid or aggressive fish faced with a motionless brown/black coloured shape that does not resemble a fish could soon lose interest. As the evidence from the stomach contents points to them being loricariid eggs, I think it is more likely that they prey on loricariid eggs.

The diverse family Loricariidae have different methods of nest sites and brood care which is relevant when trying to determine the prey of *Amaralia*. A wealth of information is available in Evers & Seidel (2005), Seidel & Evers (2005) and Suzuki *et al* (2000) about how loricariids can lay eggs in hollowed logs/branches (e.g. *Rineloricaria*, *Ancistrus*), under stones (e.g. *Ancistrus*), in crevices or caves (e.g. *Hypancistrus*), in burrows (e.g. *Hypostomus*), on leaves (e.g. *Sturisoma*), and some even carry the clutch of eggs on their lower lip or abdomen (e.g. *Loricaria*) or on a raft formed by a leaf (e.g. *Pseudoloricaria* and some *Loricariichthys*). Some, such as the Hypoptopomatinae and *Rhinelepis* lay their eggs on the substrate and practice no brood care, whereas most practice some brood care by either guarding the eggs or carrying them with them as outlined above. Evers & Seidel (2005) state that some

loricariids, such as *Pseudohemiodon*, completely burrow under the substrate even whilst carrying a clutch of eggs.

If one combines the known ecology of *Amaralia* with that of the breeding behaviour of the Loricariidae one can hypothesise how the eggs are taken and from which genera. The first candidates would be those who practice no brood care (e.g. *Otocinclus*, *Parotocinclus*, *Rhinelepis* - with the last one only being in the same basins as *A. oviraptor*) as by doing so *Amaralia* would not be at risk from a brooding parent. Eggs laid on the substrate could be eaten at their leisure, whilst obviously trying to avoid predators. The chances of eggs being laid on top of the mouth of a burrowed *Amaralia* would be small, so if they are feeding on unguarded eggs on the substrate this would require foraging behaviour, which as outlined earlier, has been observed in *Amaralia*. It is also possible that *Corydoras* eggs may also be eaten in this manner.

The second candidates are those who spawn inside logs, branches, crevices and under stones. In the author's opinion this is unlikely because there would be difficult for the depressed form and benthic dwelling *Amaralia* physically getting into such areas. In addition to this it would be almost impossible for *Amaralia* to physically eject a brooding parent in a cave/crevice. Any aquarist who has tried to remove a brooding *Panaqolus*, *Hypancistrus*, *Peckoltia* etc from a spawn site will attest to their commitment to guarding the eggs. They lock their pectoral and dorsal fin spines in place to form a plug in the cavity (observed in the wild by Power, 2003) and usually have the distal part of the body and caudal fin adorned with odontodes. It seems even less likely that *Amaralia* could enter a burrow guarded by a *Hypostomus* or *Megalancistrus*. *Rineloricaria* are physically easier to eject but they tend to spawn in very narrow enclosures and therefore impossible for *Amaralia* to get inside.

The final group, are those that carry the eggs around with them, which tends to be the medium to larger loricariinae. There are a large number of different genera and species that are

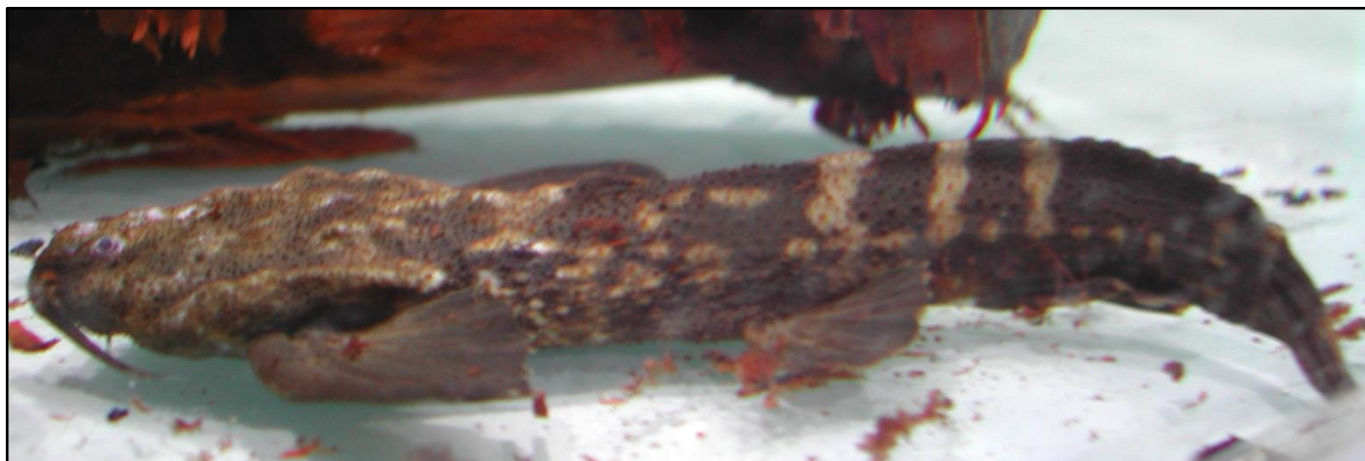


Fig. 9. *Amaralia hypsiura*. Photos: S. Grant.

also present in the known basins for *Amaralia*, some of them being: *Loricaria*, *Hemiodontichthys*, *Loricariichthys*, *Pseudohemiodon*, *Pseudoloricaria*, *Limatulichthys*, *Paraloricaria*, *Brochiloricaria* (with the last two only being in the same basins as *A. oviraptor*). Some of these are known to inhabit, and indeed show preference for, muddy and sandy substrates and lentic environments (Evers & Seidel, 2005; Suzuki *et al*, 2000; Zardo & Behr, 2015) so it is very likely that *Amaralia* will encounter egg carrying loricariins. Captive *Loricariichthys platymetopon* do not exhibit aggressive brood-defence and abandon the mass of eggs when in danger; the male reclaims the egg mass when the threat of brood predation ceases (Dei Tós *et al.*, 1997). This information could show that *Amaralia* may lay burrowed under the substrate in wait for an egg carrying loricariin to pass by or burrow near them, and strike out at the eggs, using the potential morphological adaptations to the mouth and stomach discussed earlier. In addition to or as an alternative, *Amaralia* could actively forage and approach egg carrying loricariins, forcing them to temporarily abandon their brood so that they can eat some or all of the eggs. The latter may be more effective at night and certainly the small eyes of *Amaralia* point to it possibly being a nocturnal predator. Brooding fishes are also more likely to be found in the shallower parts of the water column during the night, where *Amaralia* tend to be caught. The peculiar defensive mode of sustained body curling could be a response to the parent returning or could simply be defensive behaviour if attacked by a predator.

Roberts (2015) hypothesised that the body curling (or tail bending as he called it) behaviour may be to mimic a seed, which may facilitate prey capture, or possibly for predator avoidance. Whilst I agree with the possible reasons for this I do not consider that they are mimicking seeds.

Another potential hypothesis against obligate oophagy is whether fish eggs are available across the whole year so as to enable *Amaralia* to have a year-long food source. Breeding season for one southern South American *Loricariichthys* species was found to be October/November through February/March (Zardo & Behr, 2015); another to be September to February; and *Rhinelepis* December to February (Suzuki *et al*, 2000). Whilst this does not cover the whole spectrum of species used as potential food source for *Amaralia*, and there may be differences in the breeding season for potential prey of the Amazonian basin, there will undoubtedly be periods, which may last several months, where no eggs are available. Some may point to this as being evidence that they cannot be obligate oophages. However, many South American fish species experience extremes in food availability, some even going for six months without eating. Fishes enduring food deprivation have been observed to decrease their gut length, intestinal fold and microvilli length, and digestive enzyme activities in order to cope with no food for long periods (German *et al*, 2010). This capability, along with the supine nature of non feeding *Amaralia*, the high nutritional content of eggs, the ability to gorge themselves on large amounts when the opportunity arises, and the possibility of occasionally supplementing their diet with fish fry or

miniature catfishes, disproves this hypothesis (in my opinion).

Summary

Based on the information discussed above, I consider that *Amaralia* are obligate oophages.

Acknowledgements

Thanks to Dr. John P. Friel for allowing use of his images and the information in his work. Agustin Villanucci for catching and providing information on the specimens. Neil Woodward, Dr. Mark Sabaj, Ian Fuller and Eric Bodrock in helping me with the paratypes of *A. oviraptor*. Pete Liptrout, Bolton Aquarium, for advice and information on feeding behaviours in fishes. Dr. Michael Hardman for advice on the potential reasons for the structure of the neurocranium in *Amaralia* and *Pseudobunocephalus*. Benjamin Lee for use of his photographs on spawning of *Amaralia*. Rob Johnston for sourcing the Venezuelan *Amaralia*.

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Dealing with a silent assassin: endocrine disruptors in freshwater aquariums

By Jacqueline Heijmen Bennett-Leaver



Healthy colony of *Hypancistrus zebra*. Photo: J. Heijmen Bennett-Leaver

My story begins in early 2014. I was doing very well at breeding different kinds of loricariids and several species of *Corydoras*. I was using an old set up, a breeding rack which held seven tanks filtered through a central biological filter or sump. The whole system comprised about 1500 liters of water. My commitment to breeding fish was high and so was my maintenance; water changes three times a week and good food twice a day.

It all started with my *Hypancistrus* sp. “zombie” (L070). Instead of spawning every four weeks like clockwork, they began to skip a spawn every now and then. I didn’t think anything of it at the time, but after six months or so I started to notice the fry struggling to hatch and survive their first few days. Prior to this, I had found the species to be easy to spawn and raise in my central system. My other catfishes were still spawning normally, so I assumed the problem was with the zombies, maybe due to their age and past productivity. Still, there were some fry surviving and growing on.

I am a very patient aquarist, but after a year of steady decline the zombies were spawning every so often but all the fry died within 6-8 days. I also started to notice that some of the other loricariids were beginning to perform poorly, and I rarely added a new entry to my spawning log. Although they seemed healthy and showed no loss of appetite or condition, at least 75% of fish in the central system had decreased or stopped spawning altogether. The lack of activity was disappointing, but I love my fish and I wasn’t too upset because they still seemed healthy enough. However, time passed and it became increasingly clear that the problem wasn’t going away, and I began to suspect a silent assassin was at work prevent spawning and interfering with fry development.

Six months later, things took a decided turn for the worse. Ever-decreasing spawns and fewer and fewer fry left me with nothing to write down on my little calendar. At this point, I started to get worried as it was obvious the problem was only affecting my centralized breeding system. If



Hypancistrus sp. “zombie” (L0170), and *Panaqolus* sp. L397 male incubating eggs (right). Photos: J. Heijmen Bennett-Leaver



Infertile eggs from *H. sp.* "zombie". Photo: J. Heijmen Bennett-Leaver

I did get an occasional spawn, the pale eggs were not fertilized. This set my alarm bells ringing: how could different fish that have been breeding for years all lose fertility at the same time? Surely this couldn't be the problem. Did I really have to switch all my breeding groups for new fish?

Meanwhile, fish in separate aquaria were doing fine and I was breeding fish in those tanks and raising them successfully without any problems. I accepted this was a real problem and I started asking people in the hobby for their thoughts and advice. It is very hard to try and explain the situation, the length of time it took to get to this stage, and then to convince people the fish were otherwise healthy. At first I got many good tips on how to breed loricariids, but I found it hard to believe that a system that had proven successful in the past had somehow lost its mojo, or that I had suddenly become incapable of breeding fish. So I kept searching for more leads.

I got some useful tips from my good friend Geoff Haglund in New Zealand. Geoff described a problem called "old-tank syndrome" where soluble minerals and salts become depleted in the water and, eventually, the fish itself. As my breeding set up was quite old but functional I gave it a shot, and added oyster shell to my filters on Geoff's advice. This allowed a small but steady release of calcium into the water to stabilize my pH. As we all know, altering water parameters and seeing any effects on the fish, takes time. So another 6 months passed by, sadly without any improvement in spawning,

and I began to think my problem was not related to electrolytes.

The last species to stop spawning were my *Hypancistrus zebra* (LO46) and *Sturisoma festivum*. The *Sturisoma* gave me a clue about to how the silent assassin worked; they spawned as normal but then the eggs turned white within 24 hours and fell off the glass. The last LO46 spawn performed poorly and six months later the fry were still only 2cm in total length. Then, on the 9th of July 2015, Reef to rainforest media published an article that caught my attention; "Chemical in plastic bags lethal to aquarium fish" - a press release via Haereticus Environmental Laboratory. A week later, Martin Moe published "Coral Excerpt: Endocrine disruptors; on finding invisible pollution in my backyard" and the information in these two articles got me thinking.

I had reviewed all my husbandry techniques and tried to isolate different things and think about how they might be somehow causing the problem. My fish house is in a small wooden building with only limited insulation. To keep them warm and save on heating bills in winter, I cover the tanks in the breeding rack with plastic bubble-wrap. I mentioned it to some of my friends in the hobby, and asked them if they thought this could be a problem. At first, nobody considered it to be a problem for fresh water fish and I would have to have a massive amount of plastic to reach levels that would affect my fish. It wasn't really something people thought of as being a silent assassin... until I showed a picture of one of my tanks and the bubble-wrap insulation. I had been using this material for several years and replaced it each year. The bubble-wrap I had at the time was past its best and there were holes that had probably been disintegrating into the water for several months...

At this point, my morale had sunk to a very low level. I was upset and desperately in need of an answer to why I went from breeding most of the species I kept to none of them. Each time I went to the fish house I felt a sense of dread and came close to giving up the hobby, but a little voice inside my head didn't let me.



Fish house in summer (left) and winter (right) showing the use of plastic bubble-wrap. Photos: J. Heijmen Bennett-Leaver

I started to learn more about endocrine disruptors. These chemicals affect normal biological processes that are regulated by hormones, and the systems involved in reproduction and early development are especially susceptible to them at very low concentrations. According to Mo (2015), these effects can interfere with reproductive organs and disrupt development and increase egg and larval mortality. From that point on, I became increasingly sure this was my problem.

I took some fish with me to a good friend who owns a fish store in Holland. He looked at my fish under the microscope, and noticed some fungus. I treated the fish with FMC by Zoolek (malachite green, methylene blue and formaldehyde) and decided to completely rebuild the fish house and replace the tanks and all plastics in contact with my fish. That was October 2015.

Two months after the rebuild, my fish started spawning again. The first eggs were still bad and didn't survive, but I expected the females and possibly the males would have to cycle their old eggs and sperm to flush out the toxin from the bubble-wrap. It took another cycle before my zombies gave me their first weak but fertile eggs again. I took the spawn and incubated them myself. Still about 75% of the eggs died but I managed to raise some fry from this spawn. At

last I had some juveniles swimming around my tank after two-and-a-half years of battling this sinister and invisible problem. Around the same time, the *Sturisoma* started spawning again and I could see that with every spawn the eggs were becoming more fertile and survival was improving. Slowly but surely all the fish started to spawn again - much to my delight. Currently, I have no issues and am back to breeding loricariids like nothing happened.

For me this was one of the most eye opening and very testing experiences I have ever had to deal with in the fish house. I will never let any bubble-wrap come near my fish house ever again. It may be a simple solution to cover up



Degraded bubble-wrap covering aquarium. Photo: J. Heijmen Bennett-Leaver.



Pleco eggs and fry once again surviving and thriving in the fish house. Photos: J. Heijmen Bennett-Leaver.

some of your fish tanks but it will cost you big time. Meanwhile I have been in contact with some more people who have had the same problem. It is nothing to be ashamed of if you

never knew, but let this story be a very real warning. Do not let any soft plastics come in contact with your aquarium water. I wish you all happy fish breeding!



Things that go *grunt* in the night: an introduction to sense and sensory systems in catfishes.

By Michael Hardman



Cetopsis oliverai (Cetopsidae) haunt the darkness in search of their prey. Photo: M. Sabaj.

Doctors recommend six-to-eight hours of restful sleep if we are to remain healthy and lower our stress. If he heeds the doctors' advice, the average British male spends roughly 25 years of his life asleep.

Some fish sleep in the same way we do. When the lights go off, they head for a quiet corner and lie still for several hours. Their heart rates slow, colours fade and their gills pump less frequently.

But in the same way some taxi drivers and take-away chefs are busy during the small hours, many fishes work the night shift. Most *nocturnal* fishes are lurking predators hoping to stumble over a sleeping victim or spring an ambush from a dark corner. However, the camouflage of night also works as a defensive weapon and many fishes emerge in the early evening for a full nights grazing free from the threatening glare of a fish-eating bird.

Most fishes are active during the day (*diurnal*). With a few exceptions, catfishes buck the trend and are mainly nocturnal. What are the benefits of being nocturnal? And why are catfishes so good at it?

Catfishes are sensitive animals. I don't mean that they are easily upset; I mean that they intimately explore their environment like an over-caffeinated night watchman. They rely on sound, smell, touch, electricity and, to a much lesser extent, their sight to monitor the whereabouts of prey, predators, competitors and potential mates.

Listen very closely

Most fishes hear at least as well as birds and mammals and, like us small bones inside their heads (the inner ear) stimulate the parts of the brain that process sound. Catfishes have



One of the loudest of all catfishes, the jaguar cat (*Liosomadoras oncinus*) uses a well-developed swim bladder as a loudspeaker and a microphone. Photo: M. Hardman.

additional bones that connect the gas-filled swim bladder to the inner ear. In this way, pressure waves (sounds) that hit the gas in the swim bladder create a little tremor that the bones pick up and transfer to the inner ear. The bones that make up these connections are very variable, and we're not really sure why.

Many catfishes make their own sounds to intimidate or stimulate a potential mate. I keep quite a few driftwood cats and suckermouths and regularly hear their handbags during territorial disputes. By rotating or withdrawing their pectoral-fin spines in their sockets, they can make surprisingly loud grunts. Other cats vibrate their swimbladders to create a drumming sound and *Pimelodus* even has a way of deafening itself while it does it so that the inner ear does not get damaged.

Although few aquarists are privy to them, several *Corydoras* species are known "sing" to each other when they are spawning. What's more, the song is different depending on the listener; rival males sing threatening songs to each other whereas they serenade an ovulating

female. Unfortunately, the rather high frequency sounds cannot be heard without dedicated hydrophones but every time my *Scleromystax barbatus* spawn, I imagine they are putting on a corydoradine interpretation of *West Side Story*.

All in good taste

If he'd let you count them, inside Oz Clarke's mouth you would find approximately 10,000 taste buds. The channel catfish has twice as many taste buds in its mouth, and *twenty* times



Corys (like *C. duplicareus* shown here) communicate with sounds they make by grinding their pectoral spine in its socket. Photo: M. Hardman

as many over its entire body! Some folks have described channel cats as "swimming tongues".

While wine-connoisseur Clarke clearly has a refined palate, catfishes have developed the sense of taste to an unparalleled degree. Their taste buds are concentrated on different parts of the body (barbels, fins, lips, throat) and they use them to gather information about where the food is and whether or not they should eat it. Physiologists have figured out that amino acids (the molecules that are strung together to make proteins) are the main chemical that catfishes are zeroing in on when they taste something.

Smell you sooner

But catfishes only use their taste for feeding. Their sense of smell, which is also exquisitely developed, is used to locate food as well as potential mates, predators and competitors. At the front of the head, paired scent organs sit within small pits. Holes at the front and back of the pit let water through like an underwater tunnel. Scent is a more sophisticated sense and all the information is processed in dedicated and

usually very large paired parts of the brain called the *olfactory lobes*.

Eyes in the back of their heads

Like in most other animals, the visual pigments of catfishes adjust to low light levels so that more of the short wavelength light is picked up. Pupils are dilated to let more in and in the suckermouths, the special iris flap contracts to gather what light remains. During the day, this flap is relaxed and the pupil becomes a thin crescent. Physiologists believe that because of their crescent-shaped pupils, suckermouths can see in front of them (to search for food) and behind them (to check for predators) at the same time.

Other catfishes such as heptapterids (e.g., *Pimelodella*, *Rhamdia*), loricariids (e.g., *Ancistrus*) and trichomycterids (e.g., *Ituglanis*, *Trichomycterus*) have moved into caves and live quite comfortably without light. These underground ecosystems tend to balance on a knife edge and can be easily disturbed by fertilizer or pesticide spills that make their way into the system from above.



Like most plecos, *Baryancistrus xanthellus* has an iris flap that controls the amount of light entering the eye. Photo: M. Hardman.

Who's afraid of the dark?

There are lots of catfishes that have gone the extra step and left the light altogether. Half a kilometer underneath San Antonio in Texas, ictalurid catfishes called *Satan* and *Trogloglanis* spend their lives in total darkness, feeding on amphipods, worms and other animals that have shifted to a life underground. Occasionally, they are pumped to the surface and found in Artesian wells.

As well as living underground, catfishes are found deep in the water column. *Bathybagrus tetranema* (Claroteidae) lives 50-100m deep in Lake Tanganyika where it roams the dark in search of lost cichlids. *Bathybagrus* is a very strange catfish because it only has four barbels and, like some claroteids found in the Congo River rapids, its eyes are covered with thick skin.

Most catfishes live in water much shallower than *Bathybagrus*, but because the Amazon and Orinoco rivers carry so much sediment, light penetrates little more than a meter down in these whitewater rivers. At the bottom of these rivers, 15-50m deep, there is no light but catfishes abound with cetopsids (*Cetopsis*), aspredinids (*Hoplomyzon*), doradids (*Leptodoras*), trichomycterids (*Sarcoglanis*) and suckermouths (*Planiloricaria*) living on foods washed down from above.

Shifting sands

As well as catfishes that live deep in lakes, underground caves and river channels, another

group have the same small eyes and lack of pigment that give them that characteristic piggy look. Several trichomycterids (vampire or parasitic catfishes) spend their days buried 10-50 cm down in the sand. But at night, members of *Pygidianops*, *Typhlobelus* and *Sarcoglanis* emerge like zombies from the grave to scour vast sandbars for invertebrates, detached scales and other edible animal parts.



Biologists know that sand-dwelling catfishes such as *Pygidianops* sp. (Trichomycteridae) are abundant and widespread but otherwise we know very little about them. Photo: M. Sabaj.

So, given that catfishes have invaded underground ecosystems, gone deep in the river channel or even into the substrate, several catfish lineages do not need light to complete their life cycles. All the cats that have shunned the light have become depigmented, small eyed and small bodied. Even those that do live in the light have developed wonderfully sensitive and acute sensory systems other than sight. Even though many of the most beautiful catfishes don't show themselves until after lights out, I hope that thinking about them in this way helps frustrated aquarists appreciate their pets for more than just their good looks.



Like many fishes that shun the light, *Sarcoglanis simplex* (Trichomycteridae) has lost its pigment and is rather small (20-30mm) as an adult. Photo: M. Sabaj.

Q&A expert: Dr. John Lundberg, Curator of Ichthyology, The Academy of Natural Sciences in Philadelphia.

By Michael Hardman



Q: Your Calhamazon project led to some amazing discoveries. Do you think there is still a lot to learn about deep channel fishes in South America?

A: Chances are very good that there are several yet unseen species of fishes in the deep channels of the Amazon and other big rivers of South America. The Calhamazon project focused on the mainstem of the river and lower reaches of major tributaries in Brazil. Especially in the remote tributary rivers coming off the Andes, and the Guiana and Brazilian Shields, the channels are scarcely known. Beyond baseline discovery of species, there is almost nothing known of growth and reproduction, migrations and food webs involving channel fishes. The channels of the vast Paraná - Paraguay system have never been explored.

Q: Catfishes that live underground or deep in rivers tend to look alike. Do you think their common features are adaptive or are they simply due to the consequences of development and growth in the dark?

A: These features do not appear instantaneously in the development and growth of an individual fish. An argument can be made that reduction and loss of eyes and pigmentation are adaptive, so too a reduction in maximum body size. Eyes, pigments and body mass are energetically costly to make and maintain. In a lineage facing permanent darkness, reduced food resources and vigorous hydrodynamic conditions, premiums would be placed on genotypes and phenotypes that save energy (for reproduction) as long as some other necessary biological functions are not compromised.

Q: In places, the Congo River was recently estimated to be five times deeper than the Amazon. If you could run a trawl through those channels, what would you expect to find?

A: I doubt it but that really needs to be tested. Our trawl samples taken below about 30 m in the Amazon and Orinoco rivers caught diminishing numbers of fish and species. It looks as if the really deep waters may be nearly fishless.

Q: Ichthyologists often suggest that one of the reasons behind the global domination of catfishes is their nocturnal lifestyle. Do you agree? If any, what other factors do you think might be behind their success?

A: Nocturnal and crepuscular life habits certainly could have opened largely under-exploited food and space resources for the early subgroups of catfishes. Then as their lucky descendents found themselves in new waters they would be preadapted to continue that dark lifestyle. But a glance at catfish diversity shows them to be very adaptable in setting up successful lines in high mountain streams, shallow seas, the surface waters of rivers, deep lakes, subterranean waters, and moist leaf litter near forest streams.



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CSG Convention 2016

By Mark Walters



Convention delegates. Photo: I. Fuller

The annual CSG convention stuck to its well proven formula of three days of informative lectures from amateur aquarists, scientists and professional fishkeepers. The list of speakers was like the line up for a United Nations convention with talks from renowned catfish addicts from across the globe.

The usual attractions at the Kilhey Court Hotel provided plenty of opportunity for chat amongst the delegates whilst viewing the display tanks, deciding which fish to purchase from the sales tanks or simply enjoying a few beers in great company.

In between talks, attendees sauntered off to the local aquarium stores who always support the CSG convention, including Pier Aquatics and Aqualife. The staff at these world-renowned shops pulled out all the stops to ensure their tanks were brimming with rare and unusual catfish from both the wild and local breeders.

The event was further supplemented by the numerous trade exhibits and representatives from our sponsors and the aquatic press who all appeared to enjoy the event.

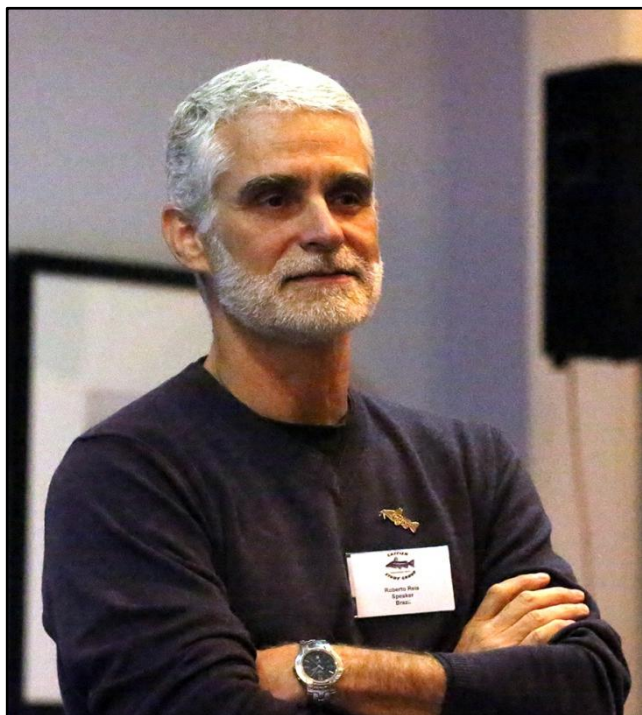
Display Tanks

The displays were themed to encourage discussion from some of the catfish experts on-

hand, with a specialist display of seven *Scleromystax* species including *barbatus*, *kronei*, *lacerdai*, *macropterus*, *prionotus*, C113 and CW038. These cool-water Corydoradinae are enjoyed by a few specialist keepers and to see so many varieties on display was probably a first.

The other display tank was set up with numerous Loricariidae including *Hypancistrus* and *Panaqolus*. The latter were two species of dubious identification and were exhibited deliberately to provoke discussion with a few of our German friends who enjoy these species!

The large cube display was filled with catfish originating from the Rio Orinoco system, to provide an example of the diversity of a typical South American river system. Species on display included *Baryancistrus demantoides*, *B. beggini*, *Ancistrus macrophthalmus*, *Peckoltia lujani* and *Panaqolus maccus*. Other species which hail from this system include: *Hemiancistrus subviridis* – ‘Green/Blue Phantom’ L200, L128, *Guyanancistrus guahiborum* – ‘Orange seam’ L106, *Hypancistrus debilitera* – ‘Columbian zebra’ L129, *Hypancistrus furunculus* – L199, *Hypancistrus contradens* – ‘Orinoco angel’ L201, *Hypancistrus lunaorum* – L339, *Leporacanthicus triactis* – ‘3 beacon’ L091,



Dr. Roberto Reis. Photo: I. Fuller.

Leporacanthicus cf galaxias – ‘Vampire plec’ L240, L241 and *Panaque nigrolineatus* – ‘Royal panaque’ L190.

Sales Tanks

As has become another regular display is the bank of sales tanks with numerous, mainly tank bred, species of rare catfish on offer to delegates. Fish were brought to the convention from Europe and North America, mainly of South American Loricariidae and Corydoradinae. Some of the L numbered loricariids available at very low cost included: L066, L309, L208, L397, L398, L346, L260, L340 and others I’m afraid I don’t recall! Some of the species simply haven’t been seen in the UK for general sale and to find tank bred *Hypostomus* sp. L346 was a real treat.

The Talks

I won’t go into detail of the talks. I expect most of the members interested enough in the specific talks will have actually attended the convention in person!

The usual format of a single Friday evening talk was changed this year to accommodate four UK aquarists who were each giving their first formal presentations to such an audience. Yorkshire aquarists Andy Moore and Jamie Horne presented their experiences breeding *Hemiancistrus cf. subviridis* L128 – the blue phantom, and *Synodontis lucipinnis*

respectively. Chas Godfrey and Richard Smith presented some of their experiences enjoying the wildlife of South America and collecting catfishes from Peru and Bolivia. The presentation of such varied information in relatively short talks provided plenty for discussion during the rest of the evening.

On Saturday afternoon we heard from our international speakers starting with Roberto Reis from Brazil. Roberto is involved in many phylogenetic studies of South American catfish families and we could soon see the rewriting of many of our well known genera through the work of his department. The realisation of the many thousands of species still to be described was quite an eye-opener for the interested delegates.

From South America to North, as Eric Bodrock entered the stage. Eric was also a speaker at the CSG Convention in 2012 and this year presented further experiences from his 40 years of catfish breeding. As expected some top tips were gleaned by the audience on ways to encourage catfish to breed.



Eric Bodrock. Photo: I. Fuller.

The scheduled ‘ask the expert’ forum was cancelled due to a lack of questions from the floor. The committee will look at ways to fill this slot in the future. Delegates were very pleased to receive a bonus talk on the Saturday night from German *Panaqolus* supremo Andreas Tanke. Andi has recently revamped his fish room with the latest automation to facilitate water changing and filtration. Again, his willingness to



Regina Spotti. Photo: I. Fuller.

share his experiences was great, divulging plenty of ideas for the audience to adopt in their own fish keeping.

The evening was finished off with Eric and his partner Regina Spotti presenting a double-act of their sometimes conflicting approaches to fish husbandry.



Benny Hubel-Hansen Photo: I. Fuller.

Sunday always proves to be a busy day with four talks, shop tours and then dismantling the various tanks and stands, all this on top of a late Saturday night to manage! The first talk was from Danish aquarist Benny Hubel-Hansen – a specialist in keeping and breeding corydoradines. Again, Benny imparted his many years of experience for the eager audience to hear. I have since been using his techniques to help *Scleromystax* eggs to hatch.

Regina was invited to do the traditional ‘non-catfish’ lecture and educated the audience on some of the native fauna of North America which she has kept and bred. The second lecture from Roberto continued on a phylogenetic theme with the latest on research into the variation and speciation of South American catfish.



Daniel Konn-Vetterlein. Photo: I. Fuller.

The day was rounded off by German aquarist and explorer Daniel Konn-Vetterlein. Daniel has his feet in both Europe and South America, where his adopted home is Bolivia. A recent trip with CSG members Richard Smith and Steven Grant yielded many new and unusual species from this little-fished country. The discoveries included the first *Aspidoras* species outside of Brazil – a real surprise for all involved in the adventure.



Carvings presented to convention 2016 speakers: *Scleromystax kronei*, *Acanthicus Adonis*, *Liosomodoras oncinus* and *Otocinclus cocama*, by Brian Walsh. Photos: I. Fuller.

Following presentations, prize draws and thanks to all those involved in the organisation of the convention, the event was closed and the


hard work of packing up started – see you again in 2017!



CSG diary dates 2016

Date	Event contact or presenter	Venue
19 June	Summer lectures and sale with Richard Smith and Steve Grant	Derwent Hall, Darwen BB3 0DQ
10 July	Away day: Castleford AS Catfish & Loach Show with Mark Walters	Lock Lane Centre, Castleford WF10 2LW
18 September	Annual Open Show with Brian Walsh	Derwent Hall, Darwen BB3 0DQ
16 October	Focus on Loricariidae with Mark Walters	SW England, TBA
20 November	Autumn auction with Mark Walters	Derwent Hall, Darwen BB3 0DQ
11 December	Christmas meeting with Brian Walsh	Derwent Hall, Darwen BB3 0DQ

Further information at our [online events page](#) and [Facebook group](#)!

A close-up photograph of two snails on a green leaf. The snail in the foreground is larger and has a dark, textured shell with a prominent spiral. The snail in the background is smaller and has a lighter, smoother shell. Both snails have their heads and antennae extended. The background is a soft-focus blue and green, suggesting an outdoor setting.

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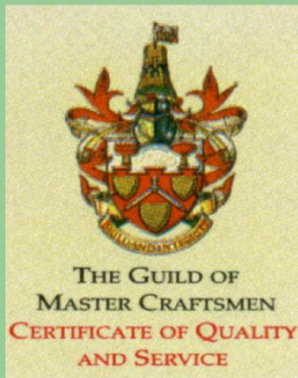
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