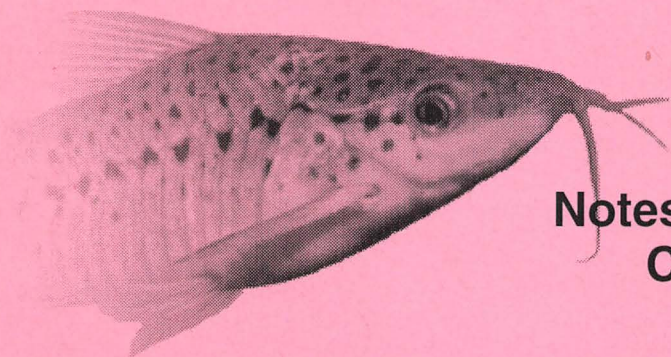


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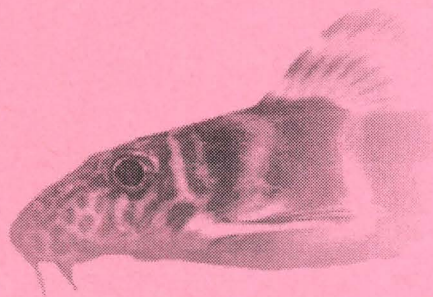
The Journal of the Catfish Study Group (UK)

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By Ian Fuller

Volume 2 Issue Number 3
September 2001

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Dear Members

Hello again, time for another Journal and nearly the end of year two and the second CSG Open Show right upon us. The results of the Open Show will be in the December issue of Cat Chat. I hope that the entries for the Show increase because last year it was badly affected by the fuel crisis and people who normally enter their fish could not attend.

I nearly ran out of articles for this issue. Meet the Member is an interesting snippet but why is it so difficult to get people to tell us how they started and what they keep. We all have a tale to tell. At the meetings some of you can talk the legs off a donkey! How about putting pen to paper? My job is to make it look good, correct the spellings (sometimes) and so on and I promise I wont

tell Ian that you can't spell Korydoras!!

I don't have any articles for the next issue at this moment in time, I would hate to send out the front and back covers, adverts and just the Open Show results in the next Journal. I only edit the journal and organise the articles and pages but I need something to do it with.

Articles and pictures can be sent by e-mail direct to <bill@catfish.co.uk> or by post to

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ACKNOWLEDGEMENTS

Front Cover: Designed by Kathy Jinkins.

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2001

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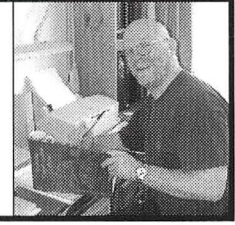
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From the Chair



Welcome to our third 'Cat Chat' this year.

It hardly seems more than a couple of days since the last issue.

I have been fairly busy in that I have been out with the display stand to two major aquatic functions; the first, 'Aqualife 2001', was held in July at the National Motorcycle Museum near Birmingham. It was a basically a trade organised affair, but to say it was impressive would be an understatement. Most of the names we know in the trade were there, Aquarian, Hagen and Tetra to name but three. All put on fabulous displays and over the two days that the show ran, there were thousands of people passing through the doors, many of them making enquiries about the workings of the CSG (UK). Hopefully this will have a positive effect on our future membership.

In contrast, the second visit I made was to the Yorkshire Festival held in Bradford. This was also a two-day event, only this time it was a purely a hobbyists affair. The event itself was well organised and run by the dedicated people of the Yorkshire Federation. The turnout from the public however was poor to say the least, maybe it is time to have a re-think about the way we present the hobby to the general public.

Having said all that, today (16th September) is our own Open Show and auction. We will soon see the results of all our efforts, which I will make a full report on in the next issue.

The **June** meeting was given to our president, Trevor Morris, who gave us an in-depth talk on the diverse and interesting group of catfishes that belongs to the family Doradidae. This he enhanced with some live specimens, along with a series of excellent slides. The usual discussions followed.

The **July** meeting was a sudden change from the advertised Open Forum. Due to moving house, Pete Liptrot brought his scheduled August talk forward. He was going to talk about catfish habitats but after his recent visit to 'Aquarama' in Singapore, he changed the format and gave us a very informative and light-hearted insight into how things in the fish world are being done in the Far East. Several discussions followed from Pete's observations over there, especially when he mentioned the practice of injecting fish with fluorescent dyes. I strongly feel that we should give notice and boycott any shop that sells such fish. He also brought some Japanese books, which aren't yet in England.

August saw the return of yours truly to fill in the gap left by Pete. The situation concerning the room not being dark enough for showing slides has now been resolved, thanks to Brian Walsh supplying us with some suitable blackout material. I decided to give a second showing of my Corydoras Species talk, which everyone seemed to enjoy.

Well they said they did!

Ian Fuller

Forthcoming Events

21 October 01

Table Show 'L'numbers
Discussion and Open Forum

18 November 01

Autumn Auction

9 December 01

Quiz & Annual Hot Pot

2002

6 January 02

Mini Convention

Speaker - Michael Hardman

All are welcome and entrance is

FREE

20 January 02

AGM

CATFISH STUDY GROUP

(UK)

Sunday 18 November 2001

Autumn Auction

Starts at 1300 hrs

at

**St Elizabeth Parish Hall
Bolton Road
Aspull
Wigan**

Booking in from 1030 hrs on the day

Pre-book by telephone on 01942 248130

Canteen

Tea, coffee, cold drinks, hot food sandwiches, cakes.

Rules:

Items for the fishkeeping hobby only.

All Electrical Goods must have a Name and Telephone number on them, together with the condition of the item i.e. Spares, Working Order, Faulty etc..

All plants and fish to be auctioned should be in clear plastic bags, or jars large enough for them. Large fish may be offered in plastic containers/buckets. Fish should be identified (Common or Latin names). 'Painted' fish will not be auctioned.

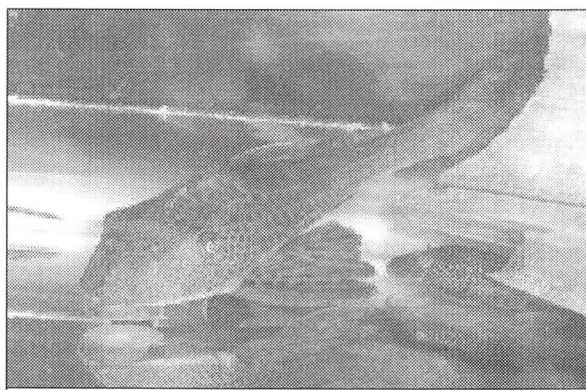
There is a 15% commission to the Catfish Study Group on all sales. Payments to vendors will be made at the interval or at the end of the Auction.

The CSG is in no position to accept responsibility for the condition of any item sold at the auction or to exchange any item purchased. If in doubt, bid for an item 'as seen'. The vendor's name will be available to the purchaser, in the event of a problem, on the day only.

Notes on the members of the genus *Cochliodon* (Siluriformes: Loricariidae) from Venezuela

R. Shane Linder

In a 1984 study, Craig Lilystrom reviewed the species of the genus *Cochliodon* recorded from Venezuela. Lilystrom determined that *C. cochliodon* (Kner, 1854) is not present in Venezuela and that *C. pospisili* Schultz, 1944 is a junior synonym of *C. hondae* (Regan, 1912). In the paper, the author also described the new species *C. taphorni* from the Essequibo drainage. This leaves Venezuela with three described species: *C. hondae* from the Maracaibo basin, *C. plecostomoides* from the Lake Valencia, Orinoco and Rio Tuy drainages and the new species *C. taphorni*.



Cochliodon plecostomoides Rio Tinaco, Cojedes State

Distinguishing *Cochliodon* from *Hypostomus* can be very difficult. In fact, Armbruster has suggested that *Cochliodon*, *Hypostomus*, *Isorineloricaria*, and *Aphanotoulus* may all be inseparable. Traditionally, *Cochliodon* is distinguished by its fewer teeth (less than 20 on each jaw), which are spoon shaped. *Hemiancistrus* can also be confused with *Cochliodon*, but they have much finer teeth.



Hypostomus plecostomus Rio Guarico, Guarico State

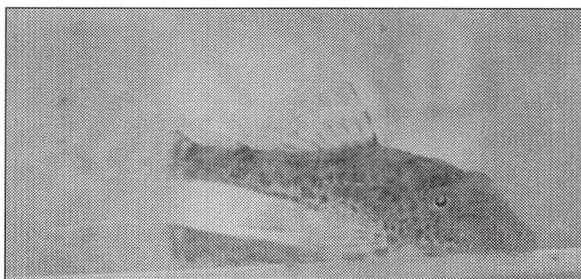
Unfortunately, most photographs in the aquarium literature do not include close ups of the pictured loricariids dentition.

Colour patterns are also rarely helpful in differentiating *Cochliodon* species from each other or other genera. While collecting in the Rio Tinaco Cojedes State, Venezuela, I collected several *Cochliodon* and threw them back because I thought they were just common

Hypostomus plecostomus. Luckily, I retained one specimen of four inches from the collecting trip. I placed it in a tank with a four inch *Hypostomus plecostomus* from the Rio Guarico and then, with the fish side by side, I was easily able to determine that the Rio Tinaco loricariid was in fact *Cochliodon plecostomoides*.

All Venezuelan *Cochliodon* species are an overall brown colour with darker spots. The spots are smaller in diameter from the dorsal fin base forward to the snout. The overall brown coloration of the body is very variable depending on the substrate color, water clarity, and the fish's mood. In *C. taphorni*, the lower caudal lobe is noticeably darker than the upper. Unstressed and over a neutral brown substrate, *C. hondae* shows a base body colour of yellow-brown while *C. plecostomoides* is a darker red-brown. By comparison, *H. plecostomus* in the same setting is a gray-brown with light vertical stripes below the dorsal fin, before the adipose fin, and at the caudal peduncle. As with *H. plecostomus*, all three Venezuelan *Cochliodon* have 1, 7 dorsal rays.

As aquarium residents, *Cochliodon* are great choices. They are less aggressive than most *Hypostomus* and show better deportment since, for some strange reason, they nearly always



Juvenile *H. plecostomus*, Rio Zuata, Miranda State

hold their dorsal fin fully erect. Provide lots of driftwood and a varied diet consisting of fresh vegetables, algae wafers, and occasional frozen meaty foods (e.g. bloodworms and brineshrimp). In closing, I would like to thank Lee Finley for pointing out and providing Lilystrom's paper as well as Norbert Flaugger who was my guide and companion while collecting *Cochliodon* in the Rio Tinaco.

***Cochliodon* species recorded from Venezuela**

C. taphorni Lilystrom, 1984

Range: Rio Cuyuni, Essequibo drainage, Bolivar State

C. hondae (Regan, 1912)

Range/Habitat: Piedmont of the Lake Maracaibo basin where it is normally found amongst submerged wood.

C. plecostomoides Eigenmann, 1922

Range/Habitat: Piedmont and Llanos of the Orinoco drainage, especially in the states of Cojedes, Portuguesa, Barinas, and Apure. Also found in the Lake Valencia drainage and the Rio Tuy system. Lilystrom commented 15 years ago that this species may not exist any longer in these last two drainages due to their high levels of pollution. Despite intensive collecting in the Rio Tuy system, I have yet to encounter this species there.

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Feeding My Loricariids

by
Martyn Youell

When feeding courgette or cucumber to my *Pecoltia* sp. I have noticed an interesting habit. The fish approaches the food item so as to face it diagonally. It will then swim forcefully forward and pass its pectoral fin spine over the food item (I suspect that the reason behind this behaviour is to roughen the surface of the courgette to make consumption more efficient). This act is performed repeatedly and often with enough violence to dislodge the strip of lead which I push through the food item to make it sink!

I feed this fish Nutrafin catfish tablets, Nutrafin spirulina tablets, vegetables (peas, courgette, cucumber), flake and Promin granules. I supplement this with roughly four weekly feedings of frozen or live food such as earthworms and prawns.

On a recent visit to a local aquatic outlet, the subject of feeding Loricariids arose. Before I explain the interesting theory of the owner of this shop, I should add that he is a former vet and very reliable when giving advice of a scientific nature. The theory goes as follows; plant matter of terrestrial origin is almost useless as a food source because it contains cellulose, which is allegedly indigestible to fish.

Cellulose is a chemical, which confers rigidity and therefore support to a plant. Due to the fact that the surrounding water supports aquatic plants they, it is suggested, contain less cellulose than terrestrial plants.

Some points of discussion are given below:

- Many Loricariids inhabit rivers which are subjected to periodical flooding and it seems wrong to assume that they would not have evolved to take advantage of an explosion of foods of terrestrial origin entering their environment
- Do fruits and vegetables such as peas and courgettes contain high levels of cellulose?

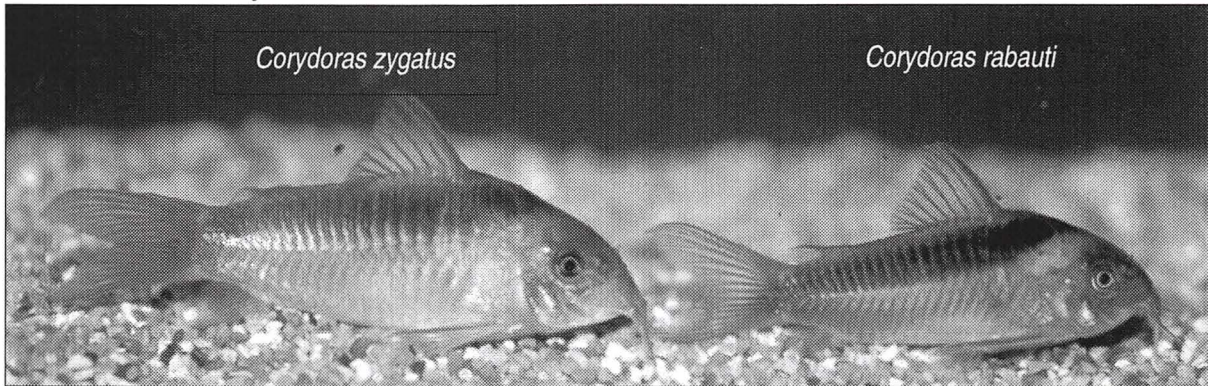
As I previously mentioned, I feed my *Pecoltia* Nutrafin Max Spirulina tablets that claim to contain spirulina, an algae of aquatic origin. Therefore, this food is suggested as an excellent source of nourishment for the primarily algae-eating Loricariids. I will be extremely interested to hear other hobbyists' views on this subject.. **Thoughts and replies to the Editor for the next Journal please.**

Corydoras Look-a-likes

By

Ian A. M. Fuller

Twenty years after I first spawned and raised the two look-alike species *Corydoras rabauti* La Monte, 1941 and *Corydoras zygatus* Eigenmann & Allen, 1942 there is still a great deal of debate as to which one is which. Here I will try to eliminate all doubt.



Corydoras zygatus

Size: mature adults

males 65 mm females 70 mm

Colour pattern:

Body light reddish tan, lighter on the belly. A dark broad dark grey band extends posteriorly, from the centre of the head just below the dorsal fin spine, along the dorsal scutes to the caudal peduncle and does not pass either into the caudal fin or onto the ventral scutes. There is a metallic green sheen covering the dark band. There is in most specimens a break in the band, which occurs on the scute adjacent to the dorsal fin spine.

There is a light pink/orange patch below the band just above the eye.

Corydoras rabauti

Size: mature adults

males 45 mm females 50 mm

Colour pattern:

Body reddish tan, lighter on the belly. A dark broad dark grey band extends posteriorly, from the centre of the head just below the dorsal fin spine and along the dorsal scutes to the caudal peduncle. From where it extends across and down into the ventral scutes, then into the lower caudal fin. The band has a matt appearance with very little if any metallic overlay. There is a bright orange patch below the dark band and above the eye, positioned in line with the dorsal fin spine.

The first point to establish is the fact that we are indeed looking at two distinct species, when the type specimens were examined, the differences between them were very small and the debate was whether in fact they were one and the same species. I spawned *Corydoras zygatus* on 21st April 1980 and then three months later on 23rd July my *Corydoras rabauti* spawned. Here I must say that I had not set out to prove anything, other than that I could successfully induce *Corydoras* species to breed. I had at that time successfully spawned and raised sixteen species, keeping detailed notes on all of them, especially the patterns of the developing fry. This was something that had interested me from my very first *Corydoras* spawning, the tiny fry of *Corydoras pygmaeus* were so

different from the adults I thought it would be something worth keeping notes on.

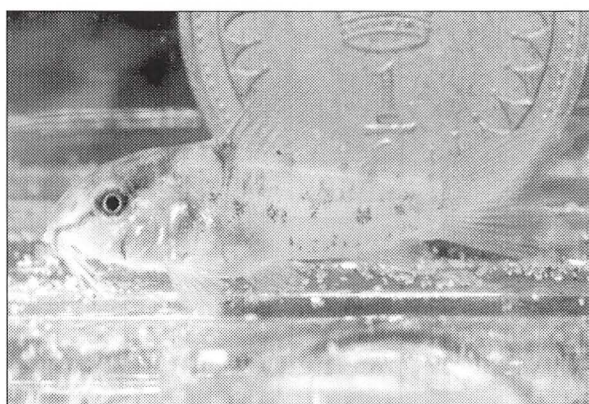
The fry of *Corydoras zygatus* at 6 –7 weeks looked very much like many other species of *Corydoras* that I had spawned. It was not until the *Corydoras rabauti* had spawned that I saw a dramatic difference between the developments of the two groups of fry. The *Corydoras rabauti* fry were a stark contrast to those of *Corydoras zygatus*. Several specimens of fry from each spawning, along with an adult female from each spawning group were preserved and sent to Dr's Nijssen and Isbrücker for examination. Their conclusion was that they were indeed two distinct species having almost identical adult colour patterns.

So how do we tell these species apart, with some difficulty I may say? Having kept both species for more than twenty years, I have become quite adept at separating them. The biggest setback is that they are usually imported together, although they come from different localities, because of their colour pattern similarity they are very often mixed together at holding stations prior to being exported.

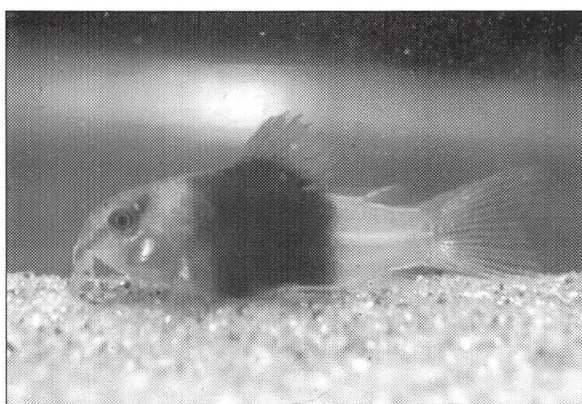
There is also another area where these two species differ; this is in the eggs that they produce. A single female *Corydoras zygatus* can produce in excess of 600 eggs in one spawning session. A *Corydoras rabauti* female on the other hand only produces up to 100 eggs. There is also a difference in egg size and the number laid at a time. *Corydoras zygatus* lays 1.0

mm diameter eggs and produces them in groups of 4 – 12 at each mating. *Corydoras rabauti* lays eggs that are nearly twice the size at 1.75 mm diameter but only produces 3 – 6 at each mating. The sites favoured to deposit their eggs by each of these species also vary. *Corydoras zygatus* prefer to deposit their eggs on solid objects near to the surface of the water; *Corydoras rabauti* however like to lay their eggs in a variety of places and at all depths, mostly they favour fine leaf plants such as Java moss, or the fine roots of plants like Java fern.

Originally there was another species involved, *Corydoras myersi* Miranda Ribeiro, 1942 this proved to be a synonym of *Corydoras rabauti*, although I still see the name being used today.



Corydoras zygatus at 6 – 7



Corydoras rabauti at 6 – 7 weeks

MINI CONVENTION

As previously mentioned, Michael Hardman, a long standing member of the NACG, is returning to the UK over the Christmas period. He has offered to give us a talk during his stay but his only available Sunday is the 6 January 02. We obviously are not going to pass up this opportunity and we have decided to hold an extra meeting to coincide with Michael's visit. For those of you who attended the NACG Convention when Michael gave a talk, you will remember what a good, well structured and interesting presentation he gave.

To be held at St Elizabeth's (our normal meeting place).

6 Jan 02

- 1000 Doors open
- 1100 Introduction by Chairman , Ian Fuller
- 1110 Audio/Slide presentation by Brian Walsh
- 1125 Introduction of Michael Hardman by President, Trevor Morris
- 1130 "Evolutionary Relationships of North American Catfishes (Siluriformes: Ictaluridae)."
by Michael Hardman
- 1230 Lunch
- 1330 An informal Slide Show and Talk by Michael on some of the fish collecting trips that he has been on in Peru, Guyana, Venezuela and Thailand. He has enough slides to go all day.
Tea breaks hourly or thereabouts.

Talk times are approximate but the day should close roughly between 4 & 5 pm in time for work on Monday.

Convention 2002

Speaker Profile — Oliver Lucanus

By Peter Liptrot

Oliver Lucanus was born near Munich, Germany and he has been living in Canada, since the late 80's, having emigrated there as a Teenager.

He started keeping fish at the age of 6, and his first fish was a Bullhead catfish, so he started on the right lines!

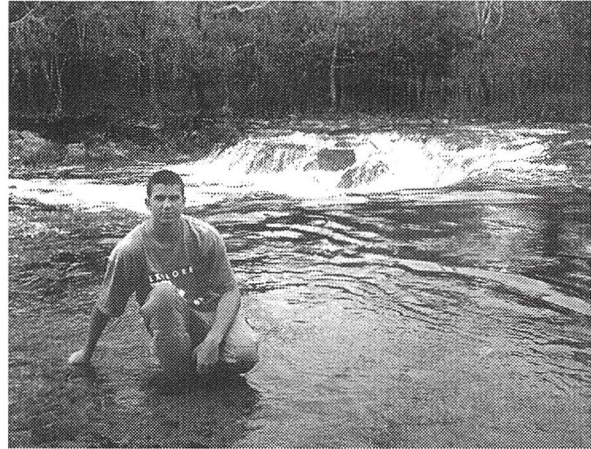
He will have had 25 years of fishkeeping experience by the time the Convention comes around, and has already packed more into these years than many people do in a lifetime.

He is an accomplished photographer and has had many of his images published in books, magazines and on the Internet. He has written numerous articles for magazines around the world, including TFH (where he had a regular column profiling new imports) and Aquarist & Pondkeeper (now Today's Fishkeeper). He has a passion for all freshwater fish and this has led him to travel extensively across the tropical regions of the world searching for rarely seen, or new species, in the company of some equally passionate people from both the trade and the hobby.

He now has a large wholesale facility in Canada from where he sends fish worldwide, specializing in large show specimens for Public Aquaria which few other people have the knowledge or resources to handle.

Although he has a fascination for all aquatic life, he has a special affinity for catfish and his list of 'favourites' shows his desire for the unusual. Two of them are particularly unusual, they have not as yet been seen in this country as far as is known, and they are very infrequently seen on any lists and then only at high prices.

The first of these, *Conorhynchus conirostris*, is probably the least typical member of the *Pimelodidae*. It is a superb silvery coloured long snouted fish from the Rio Sao Francisco in Brazil, with short barbels and no teeth as an adult. A Catfish less like most other Pims could hardly be imagined.



The second, *Asterophysus batrachus*, is an *Auchenipterid* or Driftwood catfish but one that could only be appreciated by the true enthusiast. It has a body like an overweight Zamora Cat but the head is like nothing other than a deep sea Gulper Eel! It has a gape that extends almost back to the pectoral fin base. A 9" fish was found with a 7" Characin in it's stomach. Not a community fish then!

From the *Loricariidae*, the vote goes to *Hypancistrus zebra*, as he has visited the Xingu to see them being collected, and *Lasiancistrus tigrinum*, for it's striking colour pattern.

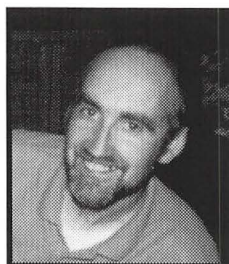
Out of Africa comes the highly prized *Synodontis granulatus*, the rarity and colour pattern making this a favourite amongst many others.

He has been known to express a desire to have a pond full of *Urinophilus*, better known as the *Candiru*, for punishing those who displease him (an advance warning to any hecklers?).

Bottom of the list come any of the colour injected fish.

He doesn't feel that nature requires any supplementation, and he has seen more of nature than most of us and so is well placed to give this opinion.

He is well known elsewhere as a speaker on numerous topics and so the Committee feels that securing him for this Convention is a real coup.



MEET THE MEMBERS

Allan James

of <allan@scotcat.com> fame

My first experiences in keeping fish was when I was at Primary School and I was always trading any old clothes with the Rag & Bone Man (street trader for all you young ones!) who used to come round the streets. He always had Goldfish in bags just hanging behind him in his cart. I always went for, what my Mother called the ugly ones, Black Moors. Maybe that was a pointer for later years for my fascination with catfish. No one realized then that it was quite cruel to keep goldfish in such confined quarters.

In the forthcoming years, football and then later, girls took up most of my spare time and I quickly put fish to the back of my mind.

I dutifully got married and had two young sons and was busy plying my trade as a Joiner after starting up business on my own. One customer whom I was working for had a tropical tank in his dining room and I was always commenting on it. "Get yourself a second-hand tank and I will set it up for you" said he. Well it was sooner said than done and I was a proud owner of a 24" x 12" x 12" fish tank with guppies, black widows, silver tetra's and a favourite Red-Tailed black shark. My wife phoned me at my work one day "your guppies have had babies" I downed my tools and rushed home to see this wondrous happening. Naturally the fry had to have a tank of their own and so the adventure started those twenty years ago in earnest.

I bought many books (which I am still doing) and was greedy for knowledge. This led me to join the Greenock & District Aquarist Society which is a 20 minute ferry ride, twice a month to meet and listen to all these knowledgeable people. Of course in those far off days you had to get there early to get a seat - changed times indeed. I then started to show fish and was learning quickly what a good fish should look like. I then won my first and the clubs first Best in Show with a catfish, *Pseudomystus stenomus*, which used to be, *Leoicassis stenomus*. I won in total 4 Best in Shows and countless tickets with this fish. I was starting to get hooked on catfish! I still have a photograph of the fish on my wall.

Looking through my fish magazines I spotted an advert for the Catfish Association of Great Britain and promptly joined. I would wait eagerly for the newsletters to pop through the letterbox. It was about

this time in the mid-eighties that I also joined the Northern Area Group of the Association and started to travel down to the auctions, which were then held in Wigan. I then made which I thought was my first mistake. I filled in a form which was sent out to the NACG members and one of the questions was - 'Would you be willing to do a talk for the NACG?' - I just wrote 'yes' thinking that they would never ask somebody from so far away. Well they did! That's when I panicked but I needn't have worried. I was put up for the night at the secretary's (Dick Thompson) house and the next day I was taken on a tour of all the fish shops in the area. In the evening I was introduced by the Chairman, Trevor Morris, and made most welcome. I quickly relaxed in the atmosphere and found out that all they wanted to do was talk about catfish - my kind of people.

In 1989 I then took another significant step and joined up for my Judges training course with the Federation of Scottish Aquarist Societies and achieved "A" class Judge standard in 1998. This is one part of the hobby I do enjoy because I am able to study and investigate fish, which is probably why I was given the post of Technical Officer to the Judges Panel two years ago.

I have taken up many other hobbies since keeping fish; Photography because I had to take pictures of my own fish for my talks around the clubs; Computers. In 1998 I started my own website <www.scotcat.com> which has grown steadily since and built up a steady following around the world. As of 1st Sept 2001, my HTML (website computer language) skills have improved greatly and I now have a much better version of the website.

Over the last 20 years I have bred over 50 different species of fish including, Cichlids, Characins. Gobies, Killifish, Livebearers, Goldfish, Anabantids and around 20 different species of Corydoras and Aspidoras and it still gives me a thrill when "they spawn for you".

Last but no means least, I accomplished my ambition of catching my own fish in the wild by travelling to the Peruvian Amazon last year with my fellow members of the Catfish Study Group and my fishhouse has catfish that I caught with my own fair hand, fantastic! Hopefully this wont be my last trip before my legs give out!

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SPERM DRINKING BY FEMALE CATFISHES: A NOVEL MODE OF INSEMINATION

Masanori Kohda, Masayo Tanimura, Miyako Kikue-Nakamura & Satoshi Yamagishi

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Key words: Reproductive behaviour, *Corydoras aeneus*, T-position, Egg fertilization, Ventral pouch, Callichthyidae, New mode of sperm delivery

Synopsis

We report on unique reproductive behaviour and a new mode of egg insemination in a small catfish *Corydoras aeneus* (Callichthyidae). A male courts a female by presenting his abdomen to her. Before releasing eggs, the female attaches her mouth to the male's genital opening and directly drinks his sperm. The sperm pass through her intestine and are discharged together with eggs into the 'pouch' formed by her pelvic fins. Thus, eggs are mixed with fresh non-dispersed sperm in an enclosed space, ensuring effective insemination. This mode of insemination is novel to fishes, but is likely not restricted to catfishes of the genus *Corydoras*.

Introduction

A variety of reproductive behaviours is exhibited by catfishes (Axelrod & Burgess 1986, Sato 1986, Burgess 1989, 1992) which include species of various sizes and food habits (Burgess 1989, 1992). Small catfishes of the genus *Corydoras* (Callichthyidae), consist of more than 120 species occurring in South America (Matsuzaka 1993). These are popular among aquarists, and their reproductive behaviours have been observed in aquaria by many authors (Sakurai et al. 1985, Burgess 1987, 1992, Matsuzaka 1993).

Most species of *Corydoras*, observed hitherto, exhibit a unique reproductive behaviour, so called 'T-position' where the female attaches her mouth to the anal region of the male (Burgess 1987, 1992, Sakurai et al. 1985, Matsuzaka 1993). The female releases eggs into a pouch formed by her pelvic fins located near the anus, and carries them to e.g., deposition sites. Despite numerous observations of spawning behaviour, how eggs are inseminated is still unknown. *Corydoras aeneus* is one of the most popular catfish in aquaria. In this paper, we report on the reproductive behaviour of *C. aeneus*, and examine how its eggs are inseminated.

Reproductive behaviour of *C. aeneus*

Methods

Corydoras aeneus is a small catfish (6 cm in maximum total length). We obtained 150 fish from a commercial breeder. Males and females were kept in different tanks (70 l) and were fed artificial food (Tetramin). Water temperature was kept between 23-24°C. One female with a large abdomen and two males were put in a 40 l aquarium constructed of one-way mirrors. So we could observe reproductive behaviours. After one female had deposited eggs, she was replaced by another female with an enlarged abdomen.

Results

During courtship behaviours, males usually followed the female and frequently presented their abdominal

Fig 1: An ethogram of reproductive behaviour of *Corydoras aeneus*:

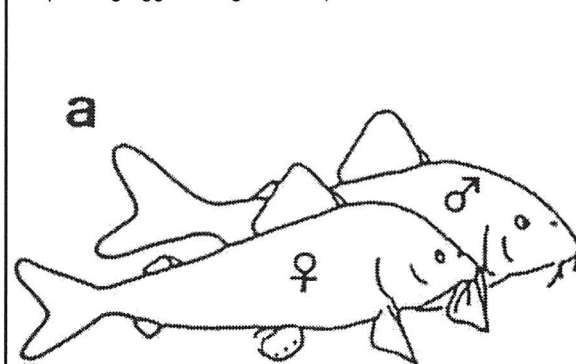
a and b - A male presents his abdominal side to a female.

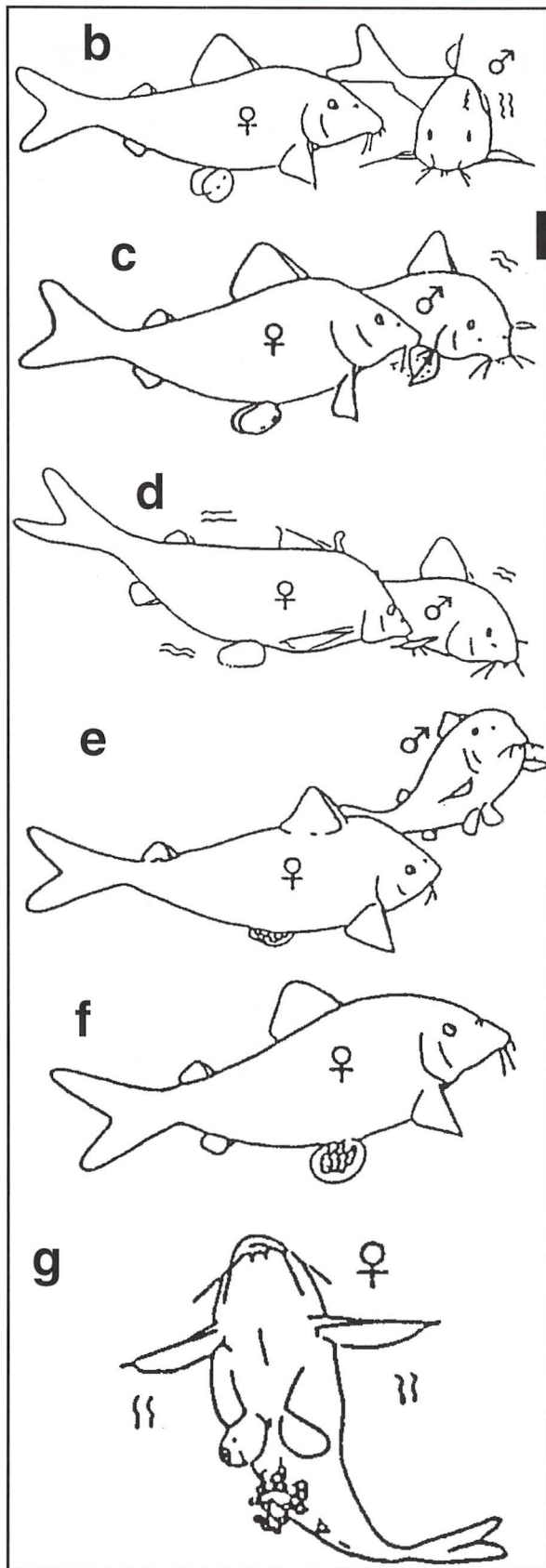
c and d - The female attaches her mouth to the male's anal region in T-position.

e - She deposits eggs into her pelvic pouch, just after the mouth attachment. Then she is stationary on the bottom.

f - She swims and looks for an egg deposition site.

g - She deposits eggs alone (the figure shows a female depositing eggs on a glass wall).





sides to her (Fig. 1a, b). She usually ignored the presentations, but occasionally attached her mouth to the male's anal region (Fig. 1e). This mouth attachment in the 'T-position' continued for 5.9 sec (± 1.4 SD, n = 51) (Fig. 1d), while the male would

ejaculate. From the beginning of the attachment, the female closed her gill covers tightly for 7.1 sec (± 1.6 SD, n = 51). The duration of closed gill covers was the same (18 cases of 51) or longer (33 of 51) than that of the mouth attachment in each event. Concurrently with the mouth attachment, the female made a 'shell-shaped' pouch with her ventral fins. Soon after releasing her mouth attachment (0.6 sec later, n = 37), she deposited one clutch of 30.2 (± 11.1 , n = 41) eggs of 1.5 mm in diameter into the pouch. Then she usually remained stationary at the bottom for 94.6 sec (± 24.8 SD, n = 55), during which the eggs were retained in the pouch (Fig. 1e). Then she swam and carried eggs inside her pouch and deposited them by herself (Fig. 1@ g). After about 5.5 min, she repeated this sequence during 2-3 h, 17.2 times (± 5.2 SD, n = 17). Eggs were attached in a single layer usually on a small area (ca. 3 cm in diameter) of the glass wall. Deposited eggs were not guarded.

Experiments on the egg insemination

Several hypotheses have been proposed as to how eggs are inseminated in *Corydoras* (Sakurai et al. 1985, Burgess 1987, Matsuzaka 1993). These fall into three categories: insemination occurs (1) by sperm spread in the aquarium at various times after spawning; (2) on the egg attachment site by sperm there discharged from the mouth of the female held from the time of T-Position, and (3) inside her pouch by sperm coming from a male in the T-position. To confirm how eggs are inseminated, 3 experiments were conducted in a 40 l aquarium.

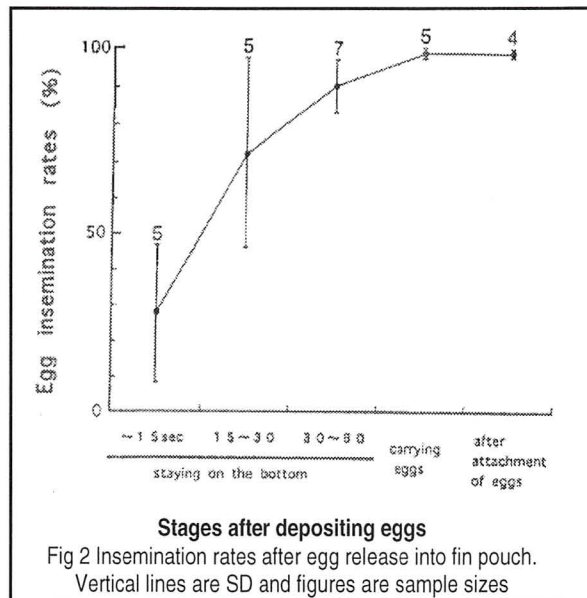
Table 1: Colouration of young of an Albino female mating with albino (A) and normal males (N)

Sequence of mating	Colour of males	Colour of young	
		Albino	Normal
1	A	12	0
2	N	1	14
3	A	12	0
4	N	0	15
5	N	0	2
6	A	5	0
7	N	0	10
8	A	25	0
9	A	2	0

Experiment: Whose sperm inseminates eggs

Methods

We examined whether or not eggs Of one clutch are inseminated by sperm obtained during a single anal site attachment. An albino female (albinism is caused



by a recessive allele at a single locus) was mated with two males (an albino and a normal type) in an aquarium, and the phenotype of the young one week after hatching was examined. If hypothesis 1 is correct, young of both phenotypes will appear within a clutch.

Results

The female mated with both albino and normal males (Table 1). When the albino female attached to the anal area of the albino male, all 56 young from 5 clutches demonstrated the albino phenotype. in contrast, when the female attached to the normal coloured male, 41 of 42 young of 4 clutches were all normally coloured. This indicates that all eggs of one clutch were inseminated by sperm of the mate at that time, and rejects hypothesis (1).

Experiment 2. Timing of egg insemination

Methods

To examine the timing Of the insemination, eggs were collected at various times after release. The collected eggs were held in another aquarium with appropriate conditions. On the next day, it could be distinguished whether embryos were developing normally. Dead eggs were considered as unfertilised.

Results

About 25% of the eggs were inseminated within 15

sec after release into the pouch (Fig. 2). After that, the insemination rates increased. When the female brought eggs to the deposition site in her pouch, as many were inseminated as those attached on the deposition site. This clearly indicates that eggs are inseminated inside the pouch, while the female is stationary on the bottom, and rejects hypothesis (2).

Experiment 3.. How sperm arrive inside the pouch

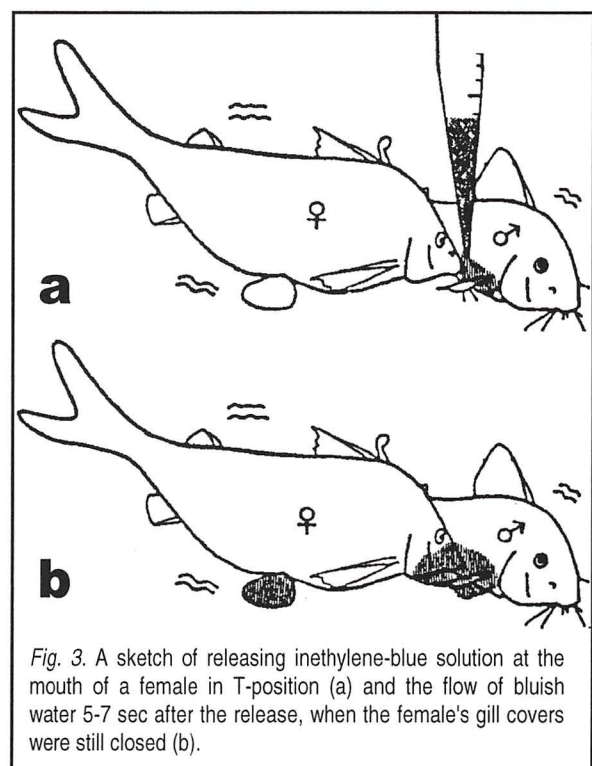
Methods

The results of the two experiments support hypothesis (3) that eggs of one clutch are inseminated in- side the female's pouch with sperm of the respective mate. Possible means of passage of the sperm from the genital pore of a male to the female's pouch are: (1) sperm flow or swim along the outside of the body of the female and arrive inside the pouch, or (2) sperm are swallowed by the female and pass through her intestine and are discharged into her pouch (an incredible scenario but conceivable), or both (1) and (2).

To examine the passage of sperm, in still water aquaria, 0.2~0.4 ml of diluted methylene-blue solution was deposited by a pipette at the mouth of a female which was just in the 'T-position' (Fig. 3a), and the flow of the blue water was observed.

Results

After 4.2 sec (± 0.8 SD, n = 22) of the release of the solution, blue water appeared from her anus and was



funnelled into her ventral pouch (Fig. 3b)! During the time that the gill covers were closed (about 7 sec), the blue solution did not flow from her gills. The blue solution remaining around the mouth of the female did not reach the abdominal area (Fig. 3b). Eggs were released 1-2 sec after the appearance of the blue water from the anus, and were inseminated at high rates ($87.6\% \pm 12.7$ SD in 16 clutches). The flow of the blue water clearly indicates that the female drinks sperm together with some water from around the anal region of the male and discharges this into her pouch.

In some cases, after gill ventilation of females started again, the blue solution streamed from the gill posterior openings of the females, but moved backward ca. 30' along the body and the colour was much fainter than the blue in her pouch. 'Re blue water did not flow along the female's body and did not arrive in her pouch.

Discussion

The reproductive behaviour of *Corydoras aeneus* includes a female's mouth attachment to a male's anal region in the T-position and releasing eggs into her pouch formed by ventral fins, as in congeners (Sakurai et al. 1985, Burgess 1987, Matsuzaka 1993). The flow of the blue water strongly indicates that while the gill covers of the female of *C. aeneus* are closed during the T-position, she directly drinks the sperm together with some water, which is transported quickly through her intestine and discharged into her pouch. Eggs are released just after the discharge of sperm and will be inseminated inside her pouch, while she remains still on the bottom. Although fishes exhibit a variety of reproductive behaviours (Breder & Rosen 1966, Balon 1975, 1981, 1990, Baylis 1981, Gross & Shine 1981), this mode of egg insemination in *C. aeneus* is novel among fishes, and perhaps in the animal kingdom.

Let us consider the timing of some reproductive behaviours of the *C. aeneus* female. A female usually attaches her mouth to a male's anal region for 6 sec, and the duration of drinking sperm and water while closing her gill cover is ca. 7 sec (Fig. 1). If a female drinks water for a longer period, the sperm in her pouch will be diluted by additional water from her anal region. On the other hand, shorter periods of drinking would not be long enough to transport sperm into her pouch. An interval of 7 sec of drinking sperm would probably result in an optimal density of sperm in the pouch. The female was stationary on the bottom for 70--120 sec after egg deposition. During this time eggs in the pouch

were inseminated. The duration of this stationary period is probably an optimal length of time required for maximal insemination of her eggs.

The water containing sperm swallowed by the female passes through the intestine very quickly. How can females accomplish such a unique performance? *Corydoras* use intestinal breathing in which they gulp air and pass it through the stomach to the end of the intestine (Burgess 1987). *Corydoras aeneus* also frequently do intestinal breathing (Kohda & Tanimura personal observation). This ability of swallowing and passing air would facilitate the evolution of the behaviour of the fast drinking and passing water through the intestine. The reproductive behaviours of more than 20 species of *Corydoras* reported hitherto include the T-position and releasing eggs into the pouch (Sakurai et al. 1985, Burgess 1987, Matsuzaka 1993). This similarity of behavioural patterns suggests that insemination by sperm after passage through a female's intestine could be common in fishes of this genus. Three characteristics of *Corydoras* may be preconditions for the evolution of this unique mode of insemination: (1) a short gut of benthivores (in *C. acneus* gut length is 5.4 cm (± 0.4 SD, $n = 21$)); (2) the location of their pelvic fins beside the anus; and (3) their frequent swallowing of air for intestinal breathing. The three preconditions are widespread among other small catfishes (Burgess 1989), suggesting that this mode of insemination may not be restricted to the genus *Corydoras*. Indeed, the T-position is observed in some small catfishes other than *Corydoras* and other than Callichthyidae (Burgess 1989, Kanda & Minoguchi 1990).

Unfortunately, we have little information on the reproductive ecology of *Corydoras* in natural habitats. We predict that eggs mixed with active sperm in the narrow space of the pelvic pouch would ensure a high insemination rate even in a turbulent stream which is one of the common habitats of *Corydoras* (Burgess 1987, 1992, Matsuzaka 1993).

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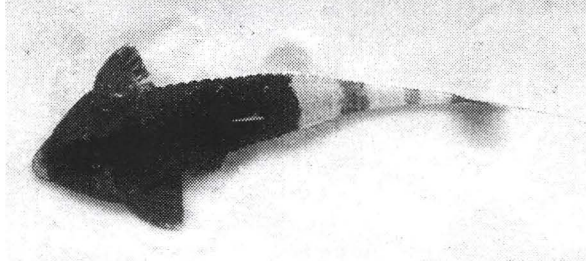
Collecting *Pseudhemiodon apithanos* on the Rio Itaya

By Oliver.Lucanus

The confluence of the Rio Itaya and the Amazon mainstream is not far south from Iquitos (Peru) so it is one of the rivers that is easy to collect in a day trip from the city. About 4 hours by boat upstream the muddy banks give way to some beaches at Pena Blanca.

At night fishermen collect *Disceus aiereba* and *Potamotrygon motoro* on this stretch of the river. Both of these stingrays have become popular in the aquarium trade of late and there are several teams of fishermen at work on any given night, except full moon when the added light makes catching stingrays impossible.

The water is typical whitewater with a pH of 7.2, 27°C and soft. Seeing your hand just six inches below the surface is difficult. The fishermen catch rays with a large beach seine held at the ends and centre with six foot wooden poles. All of them wear rubber boots to protect themselves against the feared barbs of the stingrays. The Rio Itayas banks are teeming with mosquitoes and catching rays is not always easy, so the fishermen get between 2-12 rays in a night. This night is lucky and we have 8 *D. aiereba* and one *motoro* after just 3 hauls. Also in the net are large



numbers of the *Prochilodus* and *Curimata* type characins that are commonly found over sandy bottom. There some young *Crenicichla lugubris*, plenty of *Biotodoma* and countless grey *Pimelodus* and *Callyophysus* catfishes. Nearly all of the other fish are of no interest to the aquarium market and the fishermen return them to the water. Only the rays and *Biotodoma* are lined up on the beach in shallow vats.

Later, at dawn the fishermen begin to fish another area at the end of the beach where the low water levels have caused a small lake to form, connected to the main stream by a narrow channel. The lake's bottom can be seen in the somewhat clearer water. The bottom is covered in leaf litter from the surrounding forest. Here the fishermen look for the fish they call "*Loricaria chameleon*". According to the fishermen, the species is rare and in fact most of the sand dwelling loricariids they catch here are the more common round headed *Planiloricaria*. After three hauls with the net there is much celebration when the fishermen capture the first *Pseudhemiodon apithanos*. About six inches in length the fish has a dark black body and white tail. By the time the fish is taken out of the net, placed in a shallow tub and carried over to the beach it has changed colour. In less than two minutes the fish has turned completely black. In fact each specimen caught in the lagoon (we would catch six this night) exhibits a different pattern of white and black and has turned completely black within minutes after capture. One fish is even carrying a bundle of eggs in its mouth! The fishermen are less excited than I am about their find saying that the stingray collecting pays much better and even though they have known about the fish for years it is rarely collected, for this reason.

P.apithanos turn out to be less sensitive than other sand dwelling *loricaria* and none of the animals die of "red stomach" - the haemorrhaging disease that kills many newly collected sand dwellers even before they are shipped abroad. Now 8 healthy fish have moved into an empty 180 gallon tank waiting for me to add sand so they can change to new colours.....it seems the bare glass stresses the animals, which are all solid black.

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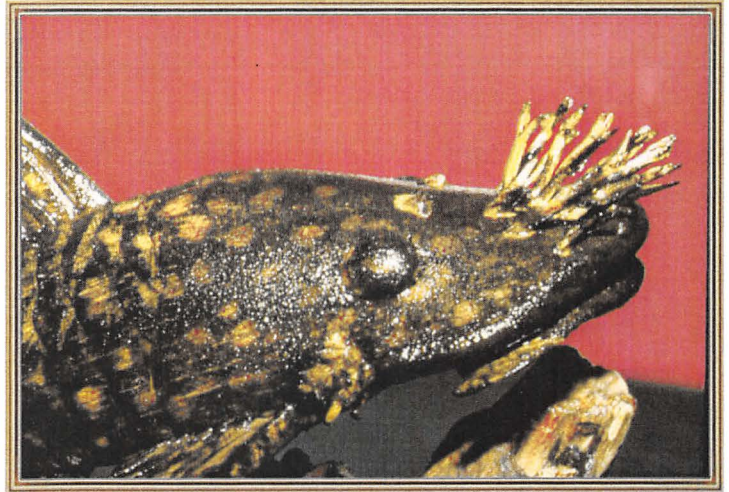


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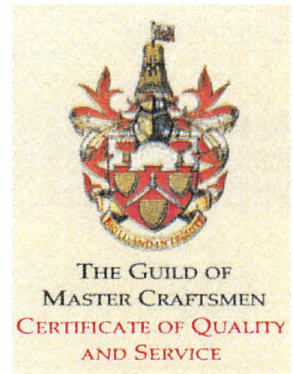
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