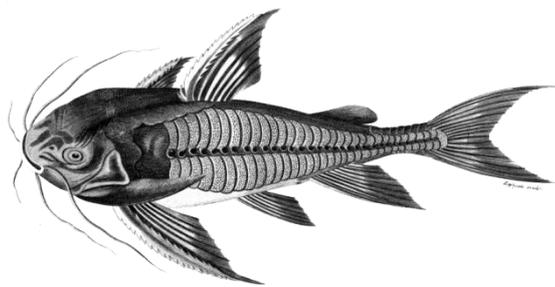


Journal of the Catfish Study Group



September 2015

Volume 16, Issue 3



UK import round-up: Africa

DIY auto top-up

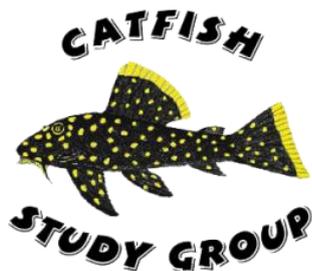
Hypostomus plecostomus

Collecting in Peru

CSG Auction: November 15

Catfish anatomy

2015 CSG Open Show and Auction



September 20th 2015

Derwent Hall

George Street, Darwen

Lancashire BB3 0DQ

showsecretary@catfishstudygroup.org



35 Catfish Classes

1. *Aspidoras*
2. *Brochis*
3. *Corydoras* group A - up to 55 mm SL. (females)
4. *Corydoras* group B - over 55 mm SL. (females)
5. *Corydoras* Types - C & CW- numbers and unidentified species*
6. *Scleromystax*
7. AOV Callichthyidae
8. Aspredinidae
9. Auchenipteridae
10. Bagridae
11. Doradidae
12. Loricariidae - Up to 130 mm SL
13. Loricariidae - Over 130 mm SL
14. Loricariidae - L & LDA up to 130 mm SL
15. Loricariidae - L & LDA over 130 mm SL
16. Mochokidae - Up to 130 mm SL
17. Mochokidae - Over 130 mm SL
18. Pimelodidae - Up to 100 mm SL
19. Pimelodidae - Over 100 mm SL
20. AOV Coldwater catfish
21. AOV Catfish - South American
22. AOV Catfish - African
23. AOV Catfish - Asian
24. Pairs - Corydoradinae
25. Pairs - Loricariidae
26. Pairs - AOV South American
27. Pairs - AOV African
28. Pairs - AOV Asian
29. Breeders - Corydoradinae
30. Breeders - Loricariidae
31. Breeders - AOV South American
32. Breeders - AOV African
33. Breeders - AOV Asian
34. Family Class - Pair & Breeders team of same species
35. Breeders Master Class - one entry = three separate species of juvenile fish

Show Rules (CSG 2010)

Fish will be judged according to the Catfish Study Group show size guide

1. Fish will be exhibited in clear, flat-sided containers, the smallest of which will be 100mm x 100mm x 100mm. Jars will not be accepted. Exhibitors are requested to label their show tank with the Latin and/or Common name of the fish.
2. Gravel/sand is allowed. Aeration may be used.
3. Show tanks must be of sufficient size to allow fish to swim and turn. Exhibitors may be **DISQUALIFIED** if the fish is poorly presented, in poor or cramped conditions. Fish will not be fed on the show bench.
4. Breeders teams will consist of four fish, minimum age three months, maximum 15 months. Date of birth/hatching and name of species must be shown on tanks.
5. Entries may not be moved, or interfered with once judging has commenced, except by order of the Judges or the Show Secretary.
6. **DEBENCHING** is not allowed until the Show Secretary makes the announcement, except by prior arrangement with him.
7. The show organisers reserve the right to **RE-BENCH** any fish into their appropriate class.
8. **PHOTOGRAPHY** of entries will be permitted after judging is completed.
9. Time will be allocated to allow viewing of the Judges' decisions.
10. The Judges decisions are final. Judging sheets will be displayed in the hall.
11. Any complaints, comments, etc., should be directed to the Show Secretary.

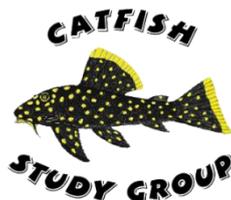
Whilst every care will be taken, the Catfish Study Group will not be held responsible for the loss of or damage to fish, equipment, or persons.

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Cover image: *Xyliphius melanopterus* Photo: D. Konn-Vetterlein





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Editorial

Welcome to the third issue of our journal. After a busy summer, I was delighted to spend some time learning and writing about catfishes, and seeing some colleagues and friends contribute some fantastic articles and images for publication in the journal.



Through social media, I've learned that some members would like to know more about catfish anatomy, and the journal seemed like a great place to help budding morphologists get a toe-hold in the field. This is something I wish I knew more about, and it's good to get some more use out of my library. I've written a piece introducing catfish anatomy and their variation from the outside in, and hope to continue the series looking at the skull, girdles and other systems in turn.

Daniel Konn-Vetterlein and I have brought attention to a recent study that deals with a fish we have misunderstood for 200 years! We also have articles from regular contributors Mark Walters on his experiences developing an automated water top-up system, and the first in a series from Ian Fuller on his recent collecting trip to Madre de Dios in Peru.

Finally, welcome to our new subscribers and members. Journal subscriptions help to fund group activities and events during the year, so please encourage your colleagues and friends to join the CSG and subscribe to the journal. If you have any suggestions for how to continue improving the content and format of the journal, please contact me via email.

Thanks,

Michael

editor@catfishstudygroup.org



From the Chair

First, a warm welcome to the newest member of the CSG Committee, 'Mr Wrasse' - otherwise known as Richard Smith.



Many know Richard through his amazing artwork, translated into stunning aquatic designs on T Shirts and banners.

I know him as someone who keeps his fish in the best environments possible. Richard has entertained us on social media for years with short movies in which he shows us how he hand feeds home-made foods to woodcats and doradids, enabling him to keep tricky species like *Amaralia* and *Spinipterus* in outstanding condition.

Richard's role on the CSG is to use his interactive and creative skills to help promote the club on all media platforms, with eye catching posters and regular posts.

There has been a lot going on behind the scenes and I want to thank the rest of the committee for their support in keeping up this momentum, sometimes in the face of adversity. You will be aware that membership is now free, we have the journal available in print and electronic formats, we have consolidated our social media sites and rebuilt the website.

The journal continues to improve, attracting contributions from both the scientific community and serious aquarists. We continue to deliver our traditional events (auctions, the Convention and Open Show) and look forward to meeting old and new members there.

We have seen a three-fold increase in membership and plenty of other indications that we are preparing the club well for the future.

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I encourage all members to support the hard work of our volunteer committee members by recommending the group to your fishkeeping friends, attend our events, contribute to the journal, participate in our lively facebook group and get in touch if you would like to contribute in any way.

Although we have seen a lot of changes, we still follow the core objective to further the study of catfishes and this is evident through the content of the journal, the success of the convention and continued support for our other

face-to-face meetings with catfish fans. We have some exciting events planned including the 2016 Convention.

I hope you enjoy this issue of the journal and continue to benefit from your membership of the CSG. Next stop – the Open Show on September 20th!

Mark

chairman@catfishstudygroup.org

The true identity of *Hypostomus plecostomus* (Linnaeus 1758)

By Daniel Konn-Vetterlein and Michael Hardman

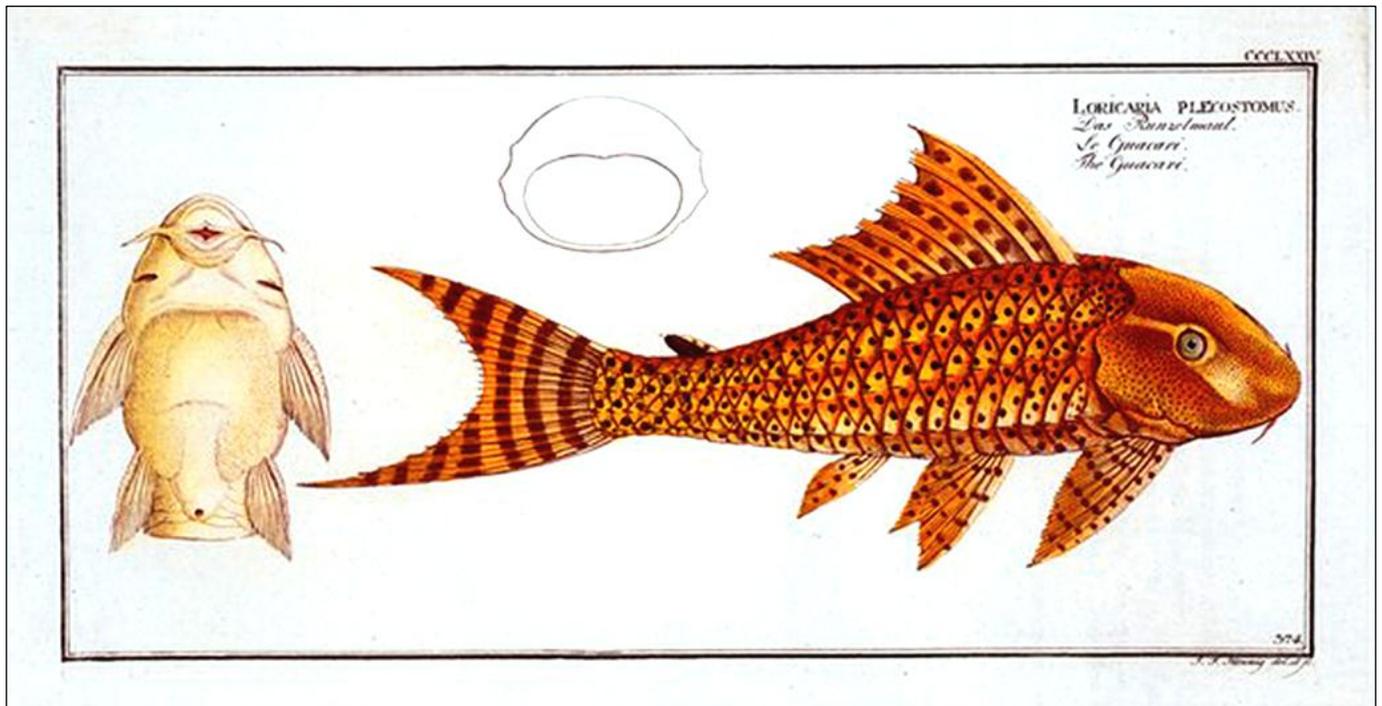


Fig. 1. Illustration of *Loricaria plecostomus* in Bloch (1794). Credit: New York Public Library, digital collections

Every catfish enthusiast knows the name. Most retailers have the label on their tanks. And many aquarists think they have the fish hiding in their tank: *Hypostomus plecostomus* (Linnaeus 1758). In the hobby, *H. plecostomus* is assigned to an increasing number of species belonging to *Hypostomus*, *Pterygoplichthys* and even *Ancistrus* (Fig. 2).

Hypostomus plecostomus is considered the type species of *Hypostomus* by default. This makes it the most important species since it establishes the characteristics of the genus, and helps us to decide if a newly-discovered pleco belongs to *Hypostomus* or not. However, the name did not always have this special status. Genera, like species, must be described and in order to establish a new genus, a taxonomist

must specify a type species – usually one that is a good example or the single species they have described it for. Bernard Germain de Lacépède (1756–1825) described *Hypostomus* for *H. guacari*. Later taxonomists realized that the name *H. guacari* applied to the same species described by Carl Linné (a.k.a. Linnaeus; 1707–1778) 45 years earlier as *Acipenser plecostomus*. So, strictly speaking, *Hypostomus guacari* is the type species by monotypy, but because it is a junior synonym of *H. plecostomus*, we should look to that species to understand *Hypostomus* and the species it contains.



Fig. 2. A typical pleco misidentified as *Hypostomus plecostomus*. Photo: Creative Commons.

An illustration in Bloch (1794) of “*Loricaria plecostomus*, Le Guacari, Das Runzelmaul” shows a bulky fish with a light-brown base colour with dark spots on the body and fins, becoming smaller on the head, and forming bands in the caudal fin (Fig. 1).

The history of *Hypostomus plecostomus* and its treatment by ichthyologists over 200 years was recently reviewed by Weber et al. (2012). These authors also investigated its identity based on museum specimens as well as fresh samples collected in the Guianas. They emphasize the misuse of the name, and point out that if identifications and reports were correct, *H. plecostomus* would occur from Trinidad in the north, throughout the Orinoco and Amazon basins and as far south as the Paraná. Most plecos have smaller ranges than this, so it seems unlikely that the distribution is correct.

But why has the mistake been repeated by so many ichthyologists? The reason is that, like many species described in the 18th and early 19th centuries, the characters that diagnose *H.*

plecostomus were unknown. And if you don't know what *H. plecostomus* is, anything that corresponds to its vague definition can be assigned that name. This is a common problem in systematics and, in the absence of a revision to fix a new diagnosis, many authors quoted older papers and over time earlier mistakes were inherited and the mess became perfect.

Boeseman (1968) made the first attempt to fix the mess and, assuming the Linnean types of *Acipenser plecostomus* were lost, he selected a new specimen (a *neo-type*) on which to re-describe the species according to modern standards. However, several years later, Fernholm and Wheeler (1983) came across some specimens in the Naturhistoriska Riksmuseet in Stockholm that might correspond to the lost types of Linnaeus! In taxonomy, if types that were assumed lost turn up unexpectedly, they trump any neotype that has since been established and any treatment the species has received. Armed with the original syntypes of *H. plecostomus*, Weber et al. (2012) began a thorough investigation of the species.

Using morphometrics and genetics, Weber et al. (2012) compared the Linnean syntypes with hundreds of preserved specimens from 15 nominal (i.e., named) species of *Hypostomus* that occur in the Guianas. In their redescription of *H. plecostomus*, one of the Linnean syntypes was selected to serve as the lectotype. A *lectotype* is chosen to provide a single name-bearing specimen for the name (*Hypostomus plecostomus*).

Early ichthyologists often received specimens sent from the tropics as a sort of mixed bag, which might contain several specimens collected from different locations but not labeled. Back then, it wasn't necessary to select a holotype when describing a species, so two or more specimens were preserved and curated as a *syntype series*, all of which were considered representative of the species.

As you can probably imagine, this led to a lot of confusion and several different species could sometimes be found in a single syntype series! Lacépède (1803) and Shaw (1840) thought Linnaeus' syntype series of *Acipenser plecostomus* was one of these mixed bags and described *Hypostomus guacari* and *Loricaria*



Fig. 3. Freshly caught *Hypostomus plecostomus* in the field. Photos: Ingo Seidel

flava, respectively, leaving three syntypes in the jar. When they analyzed their data, Weber et al. (2012) found evidence for two distinct species represented by museum specimens and names of *Hypostomus* in the Guianas. These similar species are *H. plecostomus* and *H. watwata* Hancock 1828.

When they checked the Linnean syntypes, they found that both *H. plecostomus* (one specimen) and *H. watwata* (two specimens) among them, so Weber et al. (2012) made the single specimen of *H. plecostomus* the new lectotype.

By comparing the lectotype to their fresh specimens and extensive data set, Weber et al. (2012) managed to figure out which of their samples corresponded to *H. plecostomus*, and thereby redescribe the species accurately and precisely. In addition to the museum specimens, they included two pictures of freshly-caught specimens on which we can see the coloration (Fig. 3). Like Bloch's illustration (Fig. 1), the body is spotted with those covering the head being smaller, and the caudal fin has several vertical bars. Furthermore, the abdomen is covered with dark blotches.

The genetic data confirmed that *H. plecostomus* is a fairly widespread species, occurring in the lower parts of most Guianese rivers. Specimens collected from adjacent rivers are slightly different, so we can assume that *H. plecostomus* is a somewhat variable species and we shouldn't look for strict characters in coloration.

Weber et al. (2012) diagnosed *H. plecostomus* from other species in the Guianas in terms of its teeth. It differs from the *H. cochliodon* group (*H.*

macushi and *H. taphorni*) by having viliform teeth (vs. large spoon-shaped teeth), and from other Guianese species by having a short roughly rounded crown with a lateral cusp about half as long as the main cusp. *Hypostomus plecostomus* is also characterized by the presence of a preanal plate, and from its most similar species (*H. watwata*) in having an *azygous* (i.e., unpaired) plate connecting the posterior part of the supraoccipital with the pterotic-supracleithrum. This might not be easy to see in live specimens.

Rather than the elongate fish we associate with the name, *H. plecostomus* is more like *Cochliodon*, being a bulky fish with most of its mass in the front half. But, looking at the teeth it's easy to tell that the species belongs to *Hypostomus*; they are not spoon shaped and are much thinner than in *Cochliodon*. The species is quite attractive and would likely make a good addition to a low-flow high volume set up with lots of wood and caves.

Given that very few fish are exported from the Guianas, it's unlikely that you will come across *H. plecostomus* in your local fish shop, but specialist importers might get them from Essequibo collectors in Guyana. It would be great to see *H. plecostomus* in our tanks, and get to know the fish that has emerged from a 200-year old taxonomic nightmare!

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Weber, C., R. Covain & S. Fisch-Muller. 2012. Identity of *Hypostomus plecostomus* (Linnaeus, 1758), with an overview of *Hypostomus* species from the Guianas (Teleostei: Siluriformes: Loricariidae). *Cybium* 36(1): 195–227.



UK Import roundup

A selection of new or rare catfishes recently imported to the UK.



Synodontis longirostris Photo: Pier Aquatics

In the 1980s and 1990s, African catfishes were a common sight in UK importers. Political instability, civil wars and an unstable global economy conspired to cut off their supply to the aquarium industry. In response to the demand, fish breeders in Eastern Europe began hormone-induced spawning programs with the few individuals left in captivity. They also experimented with hybrid forms to supply the demand from Western Europe, Japan and the US for these popular and beautiful cats.

Over the past decade, UK importers have seen African exporters vanish with their pre-payments and no hope of their recovery. If they receive anything at all, the fish are often not the species that were promised or are packaged so poorly that they require extensive rehabilitation before they are fit for sale. Clearly, importing fish from Africa is not for the faint-hearted, but the rewards can be fantastic.

Against the risky backdrop and a long history of disappointment, Neil Woodward of Pier Aquatics in Wigan has beaten the odds and imported a shipment of incredible catfishes from the Congo basin. They landed less than two months ago, but after some much-needed and expert care in quarantine, they're over the worst of it and available again to UK aquarists.

The long-nosed squeaker (*Synodontis longirostris*) is found throughout the Congo River (Poll, 1971). This species is a powerful fish that can reach at least 66 cm in the wild (Gosse, 1986). A 500–1000L aquarium (pH 6.5–7.5, 24–27 °C, 100–250 µS/cm) with smooth stones, branchwood and strong filters should be considered a minimum setup. Squeakers are generally good feeders and quickly adapt to captivity, taking tablets, pellets, granules, flakes as well as frozen and live foods.





Chrysichthys thonneri Photo: Pier Aquatics

Grunter cats (Claroteidae) are an important component of the African freshwater fish fauna, but are poorly represented in aquaria. Their centre of diversity is the Congo basin, where they have undergone adaptive radiations in the river as well as the loosely-connected Lake Tanganyika.

While not as colourful as Squeaker cats (Mochokidae), gruntes such as *Chrysichthys thonneri* are handsome species that conform to the true “catfish” mould that many of us think of when we hear the word.

Thonner’s grunter (*C. thonneri*) is reported to reach 50 cm in the wild. They should be treated as any large, softwater species and given a varied diet. They are omnivorous, but will take small fish if given the opportunity.



Chrysichthys punctatus Photo: Pier Aquatics

One of only a handful of claroteines that has some pattern, the spotted grunter (*C. punctatus*) is a dwarf (max. 15 cm) species suitable for the more modest aquarium. They occur in the middle and lower Congo in large schools.

Once settled, *C. punctatus* is an attractive species that likely has some interesting secrets to reveal about the behaviour of gruntes. This species also has a peculiar trait; caudal-fin rays that look like they have been steamrolled. I’d love to hear from anyone that keeps this species and has any ideas about their strange tails.



Synodontis nummifer. Photo: Pier Aquatics

Another rare squeaker, *Synodontis nummifer* is a smaller (<20 cm) species found in the middle and upper Congo. This species undergoes an impressive colour change during its lifespan, sometimes confused with *S. decorus* as a juvenile, and *S. congicus* as an adult. An interesting species for the medium-sized aquarium. Care for as you would any riverine squeaker cat.



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- Gosse, J.-P. 1986. Mochokidae. Pp. 105–152. In: Daget, J., J.-P.-Gosse & D.F.E. Thys van den Audenaerde (eds.) Check-list of the freshwater fishes of Africa (CLOFFA). ISNB, Brussels.
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An introduction to catfish anatomy: body, fins and skin

By Michael Hardman



Fig. 1. *Pseudecheneis sulcatus*. Photo: H.-H. Ng.

Given that you're reading this, I must assume that you (like me) love catfishes and the many shapes and sizes they come in. With well over 3000 species now described (and many more still waiting to receive their scientific names), anyone with an interest in the natural world can't help but be impressed by the incredible diversity and distribution of these wonderful animals.

While it's easy to become overwhelmed by catfish diversity, I think it helps to remember that they have all descended from a common ancestor and the different families and species we see today have evolved on a basic plan; a sort of catfish blueprint if you like. This blueprint is the basic scheme by which catfishes are put together, and we can see the blueprint in their

skeletons, muscles, nerves, intestines and all their other lumps and bumps.

I've been lucky enough to study catfishes at an advanced level in some fantastic labs and taught vertebrate anatomy and evolution at the University of Illinois. This has given me an understanding of catfishes inside-and-out, and I often feel that many aquarists are missing some of the most fascinating things about them because they only spend time looking at these animals when they are alive and swimming around their tanks.

With preserved specimens, we can start peeling back the layers and understanding catfishes and their diversity more completely. When we start comparing them, we see things that are similar and things that are different. This is the basis of comparative biology and the

main job of systematists working in natural history museums and universities around the world.

Similarities come in two kinds. The first (*homologies*) are due to their inheritance from a common ancestor and help us reconstruct evolutionary history. Other similarities are due to evolution creating the same structure on at least two separate occasions. For example, two or more catfishes might have *convergent* morphologies because they live in similar habitats, eat the same foods or breed in a particular way. Evolutionary convergences can sometimes tell us about adaptation and how evolution works to create more diversity.

Just to hammer it home, all plecos have a sucker-like mouth because their ancestor had it, and we can say the sucker-like mouths of plecos are *homologous*. However, plecos are not the only catfishes with sucker-like mouths and several genera of Mochokidae (i.e., *Acanthocleithron*, *Atopochilus*, *Atopodontus*, *Chiloglanis* and *Euchilichthys*) also have them, and which they likely inherited from a common ancestor. The occurrence of suckerlike mouths

in plecos and some mochokids (Fig. 2) is an example of evolutionary convergence (*homoplasy* or *analogy*) and we can study them to discover generalities about how catfishes use their mouths to feed and attach to surfaces, as well as how evolution works.



Fig. 2. *Atopochilus mandevillei*. Photo: S. Grant.

Jargon

Morphology, like most disciplines in biology, has a lot of terminology to deal with. In order to describe and discuss them, we need labels that

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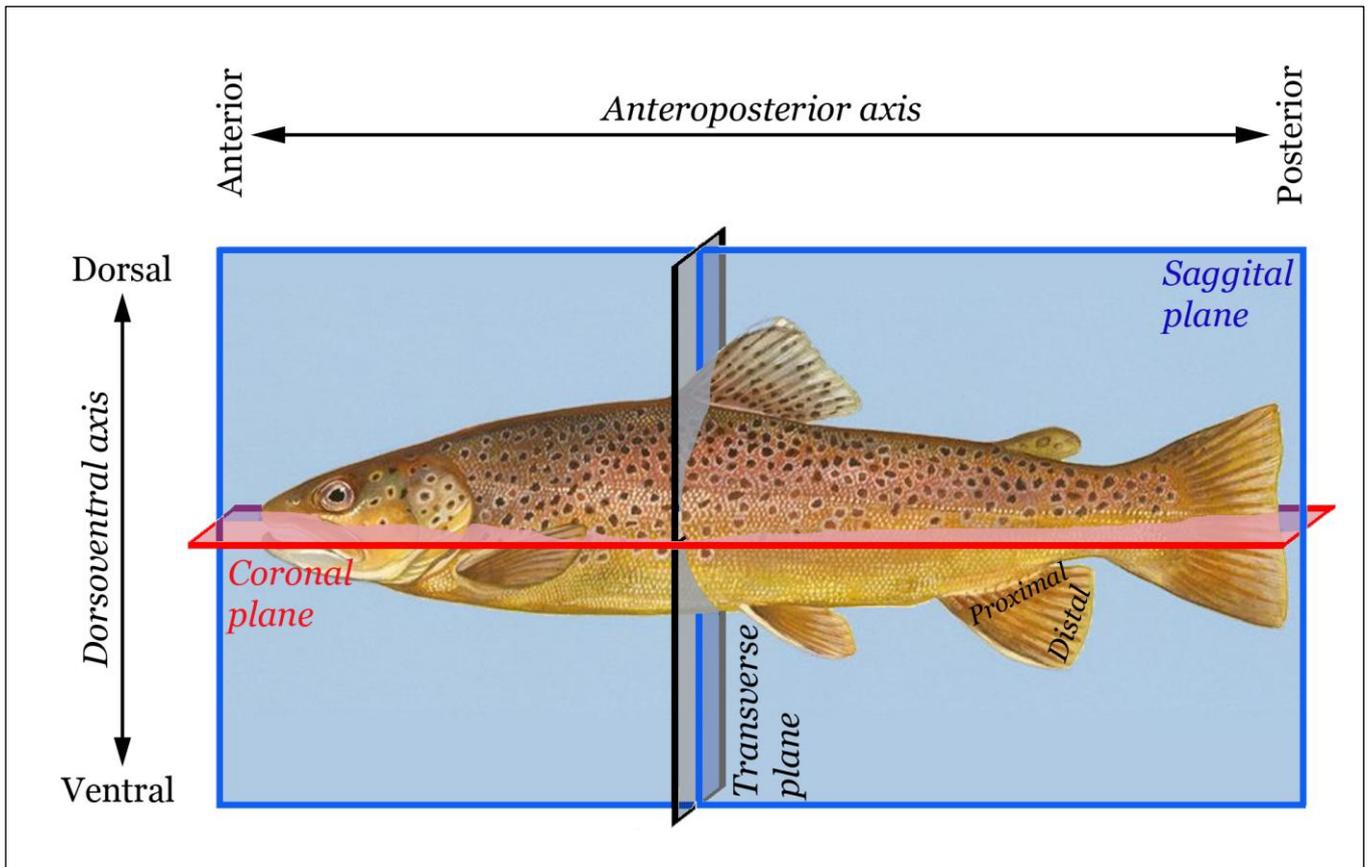


Fig. 3. Anatomical axes and planes. Base image: Creative Commons.

apply to the different anatomical parts and their features. Given that the anatomy of animals like catfishes is complex and confusing, and that morphologists sometimes understand things in different ways, things can get very heavy and confusing for the non-specialist.

I'll try to keep technical terms to a minimum, but sometimes there are no other words available and it can be more confusing to try and describe things with more familiar ones. I'd also like to introduce some basic anatomical terms that help us navigate around the fish and talk about it. Learning some Greek and Latin can help to understand how the words are formed and what they likely refer to. But remember - they're just words so don't get intimidated by them. You'll pick them up.

Let's start with the biggest part of catfish anatomy - the body, its shape, regions and obvious structures. This will help us to start thinking about 3-D objects like catfish and making sense of them.

A different point-of-view

Body shape can tell us a lot about the lifestyle

of a fish. Many are shaped like squashed cigars and these kinds of fish (e.g., trout, minnows and mackerels) are built for sustained swimming and can be found in the midwater. Cowfish, eels, angelfish, pike, flounder, seahorses and needlefish all lie on the outskirts of fish body shapes and give us some idea of the diversity of form. Within catfishes, we can find examples of slim and elongate fish (e.g., parasitic and glass cats), midwater cruisers (e.g., whale cats), ambush predators (e.g., *Chaca*), waterfall climbers (e.g., *Astroblepus*) as well as generalist brutes like channel cats and claroteids.

If we had a set of preserved catfishes on the lab bench, a good way to compare their body shapes would be to imagine putting each of them through a band saw at the same location on the body. Let's say from left to right sides of the fish just in front of the dorsal fin, and then comparing the outlines of the cut surfaces. Technically speaking, we would be looking at *transverse sections* made at the *dorsal fin origin* and we would notice that a section taken from a glass cat (*Kryptopterus*) would be different from those taken from a flounder cat (*Pseudohemiodon*) or a channel cat.

As mentioned above, these differences are due to the physics of life in water and the fish lifestyles; *compressed* (side-to-side) fish like *Kryptopterus* typically inhabit midwaters while *depressed* (top-to-bottom) fish like *Pseudohemiodon* typically live on or in the substrate.

This is a very simple explanation of how shape is measured and analyzed, and any of you lucky enough to see Dr. Nathan Lujan's talk about the evolution of pleco jaws at the last CSG convention will be aware of just how complex shape analysis can be! We can make sections that split the fish into two very similar halves through a *sagittal plane*, two very different halves through a *coronal plane* through the *dorsoventral axis* (top-to-bottom), or at any point along the *anteroposterior axis* (front-to-back) through a *transverse plane* (Figure X). Each of these sections will give us a different perspective of the animal and allow us to compare them more easily and meaningfully.

If we think about structures that poke out of

the body like arms in humans and fins in catfishes, we notice they typically change along their length. We have complex jointed arms with shoulders, elbows, wrists and hands, while catfish have a spine that articulates in a socket and can be ornamented with serrae, odontodes,



Fig. 4. *Scleromystax macropterus* male with elongated dorsal and pectoral fins. Photo: M. Hardman.

venom glands and other lovely things that we need to describe and it helps to talk about these structures being relatively *proximal* (closer to

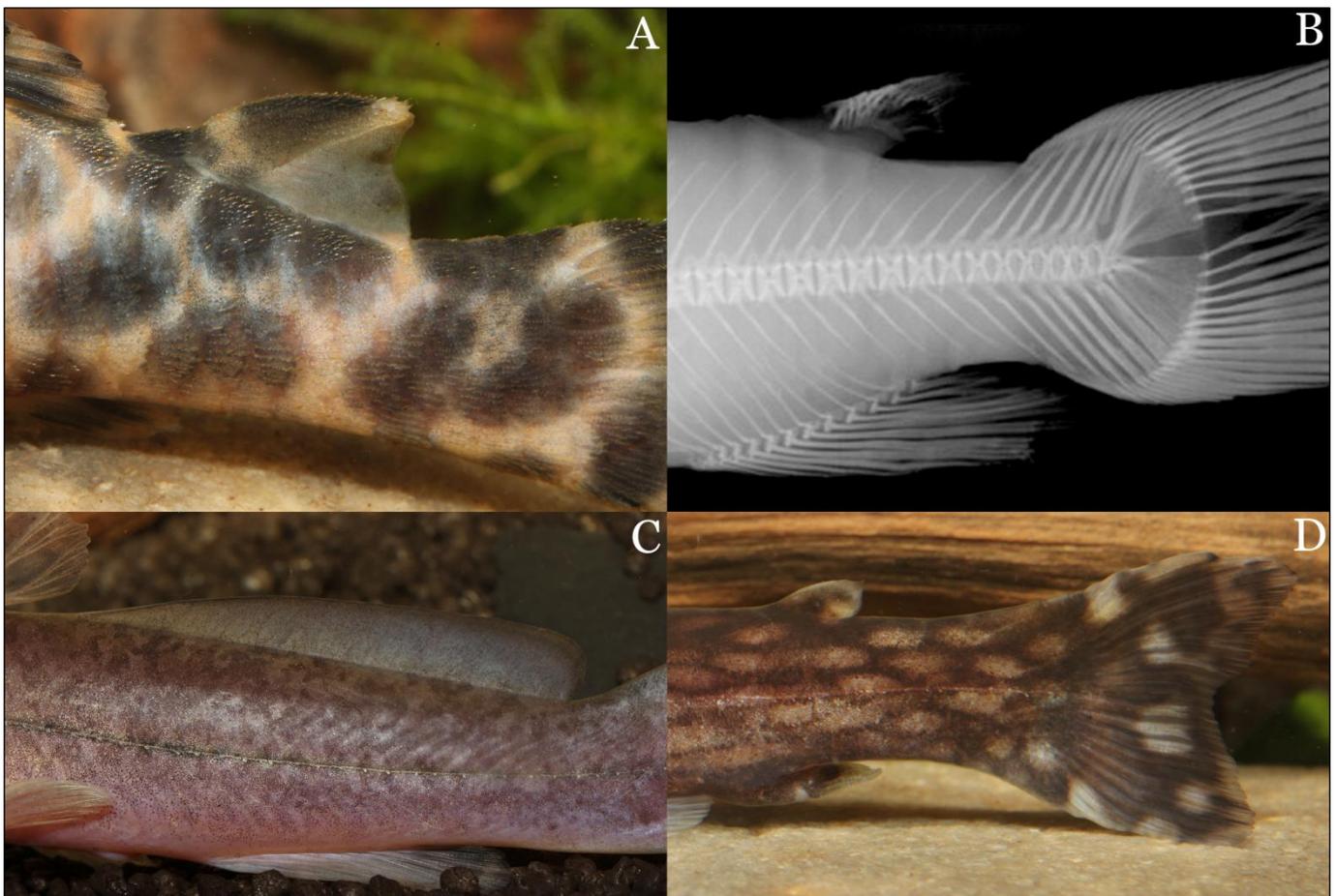


Fig. 5. Adipose fin diversity in catfishes: A. Hypostominae; B. *Clarotes*; C. Heptatperidae; D. Auchenipteridae. Photos: D. Konn-Vetterlein (A,C,D) and M. Hautecouer (B).

the body) or *distal* (further away from the body). We use proximal and distal to describe how fins, bones, muscles, barbels and other structures change along their length with reference to an imaginary core of the fish. For example, we can talk about *proximal* serrae being smaller and curving inwards in contrast to *distal* serrae that are larger and which curve away from the body.

Fins

Fins are obvious external structures that have undergone a moderate amount of evolution in catfishes. They are divided into two kinds. The *unpaired median* fins project from the sagittal plane and articulate more or less with the backbone. These are the dorsal, adipose, caudal and anal fins and, together with the backbone, comprise the *axial skeleton*. The *paired* pectoral and pelvic fins have their own girdles and comprise the *appendicular skeleton*.

All fins except for the adipose have their own set of muscles that operate to raise, lower, rotate or otherwise move the unbranched spine and the branched rays of each fin. In some catfishes, the spines and rays of the dorsal, caudal, pectoral and pelvic fins support extensions or filaments that might play a sensory role in some loricariines (e.g., *Spatuloricaria*) or help juvenile pimelodids (e.g., *Brachyplatystoma*)



Fig. 6. A venomous catfish: *Noturus miurus* (Ictaluridae). Photo: S. Grant.

ride downstream currents to the food-rich waters of the river delta.

All fins control roll and help to keep the fish the right way up in the water column. The pectoral and, to a lesser extent, the pelvic fins help midwater catfishes scull around in low-flow habitats, while the body and caudal fin provide the main forward thrust for active swimming and escape. Many catfishes can also lock their dorsal and pectoral fins in their sockets if they feel threatened and I have the scars to remind me to be very careful when handling them.

As many as 1625 species in 20 catfish families are believed to be venomous (Wright, 2009), most of which have venom glands at the base of the pectoral fin and use the spine to puncture the skin of a would-be predator (or ichthyologist) and press the venom into the wound (Fig. 6). Others have small bags of venom in the skin covering the dorsal and pectoral spines that burst open when the fin is plunged into something.

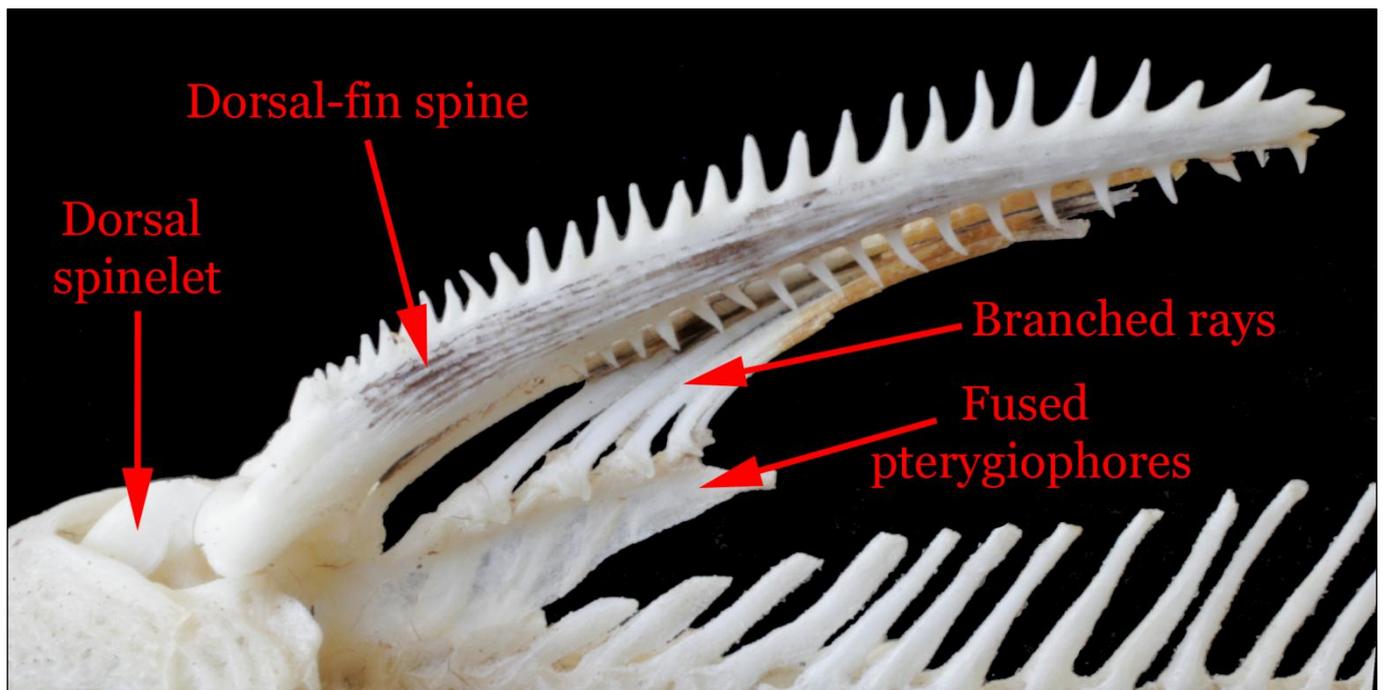


Fig. 7. Dorsal fin skeleton of *Liosomadoras oincinus*. Photo: M. Hardman

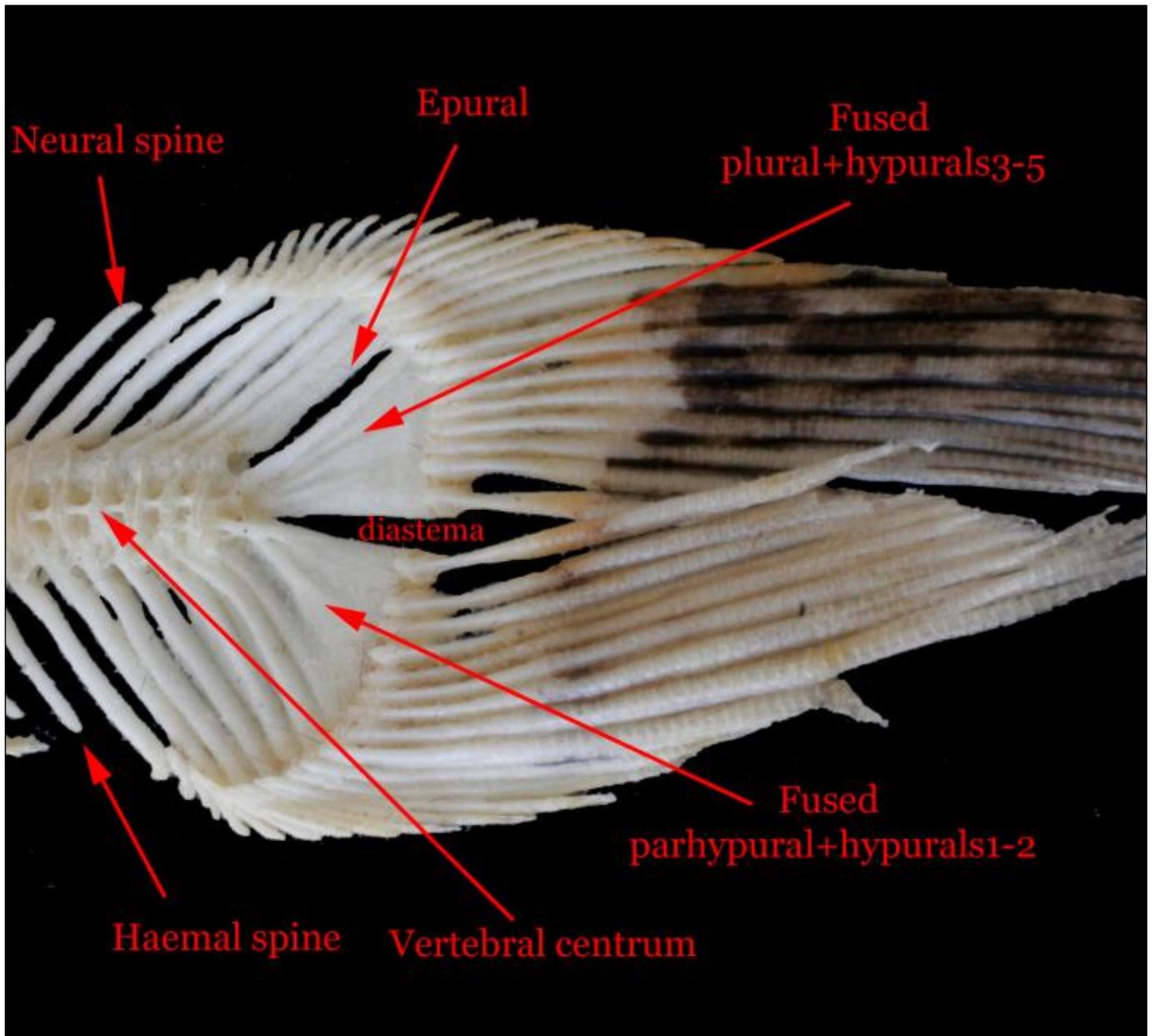


Fig. 8. Caudal skeleton of *Liosomadoras oncinus* . Photo: M. Hardman.

Because they are used for mainly defensive purposes, catfish fin spines are typically heavy, thick and bony structures that have been like that for a long time. Because of their heavyweight construction, fossilized pectoral- and dorsal-fin spines are quite common in deposits and much of what we know about the past diversity of catfishes is based on them and their anatomy.

Lots of catfishes use their pectoral-fin spines to create sounds. Many of us have heard the grunts and groans made by woodcats and doradids, and we now know that by rotating the spine in its socket, ictalurids, mochokids, silurids, malapterurids, plotosids, ariids, pangasiids, pimelodids, pseudopimelodids,

sisorids, bagrids, callichthyids, loricariids, aspredinids, heptapterids, and likely many others (Fine and Ladich, 2003) make sounds in this way.

Pectoral spines consist of a head and a shaft. The head has three points of articulation with the corresponding socket on the pectoral girdle; a *dorsal process*, a *ventral process* and an *anterior process*. If present, the dorsal process bears the ridges that make the sounds when rubbed against the socket wall, the anterior process is involved in the locking mechanism, and the ventral process serves to steer the spine during its movement.

In catfishes that have them, the dorsal spine is usually preceded by a small spinelet that locks

its big brother upright (fig. 7). In contrast to the pectoral spine, the dorsal spine is symmetrical and there are a matching pair of *anterior processes* on each side of the spine head, a single *medial process* in the middle, an *articular foramen* (hole) passing through the spine, and a pair of *dorsolateral articular surfaces*.

The adipose fin (fig. 5) occurs in catfishes with a single spine (e.g., most Loricariidae, Callichthyidae), lots of irregular bony elements (e.g., *Clarotes*, *Pardiglanis*, *Phractocephalus*), fatty tissue of different sizes variably supported by neural (dorsal) spines of the underlying vertebrae (e.g., Mochokidae, Pimelodidae, Claroteidae, Ictaluridae, Pangasiidae) or missing entirely (e.g., Aspredinidae, Cetopsidae, Loricariinae). The adipose fin is an interesting little widget that deserves an article of its own.

The caudal fin (fig. 8) is quite simple and sort-of-symmetrical; the upper lobe looks a lot like the lower one but there are exceptions to this general rule. There are typically several unbranched (I-shaped) rays that increase in size towards a main ray. After that, the rays are branched (Y-shaped) and decrease in length to the midpoint before increasing again out to the

unbranched rays of the lower (ventral) lobe. The base of the caudal fin is supported by a plate made of modified vertebrae, and each of the caudal-fin rays has its own set of muscles to spread them out or pull them in, and the main dorsal unbranched ray has some extra muscles to hold it up for display and swimming.

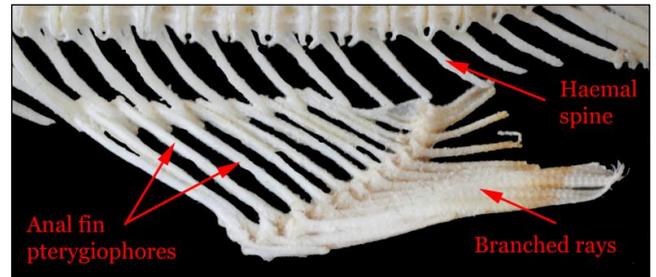


Fig. 9. Anal fin skeleton of *Liosomadoras oncinus*. Photo: M. Hardman.

The anal fin (fig. 9) is quite simple compared to the other fins, with a short series of unbranched rays increasing in length before they make way for a set of branched rays. The dorsal and anal fins are supported by special bones called *pterygiophores* that act as a cradle or bridge between the fin and the backbone and provide the surfaces for muscle attachment. In



Fig. 10. Detail of the snout and head of *Xyliphius melanopterus*. Photo: D. Konn-Vetterlein.

some groups, the anal fin has become elongated and even confluent with the caudal fin.

The pelvic and pectoral fins are quite similar, with a spine followed by several branched rays. As I mentioned above, these paired fins are supported by their own girdles and form the appendicular skeleton. In astroblepids, the pelvic fins have evolved to help the fish climb vertical but wet surfaces in and around waterfalls and high-gradient mountain streams.

Pelvic fins also play a critical role in corydoradine reproduction by forming a pouch into which the eggs and sperm are released and held before being plastered on a plant leaf or other surface.

Beauty is more than skin deep

The largest but most overlooked organ in animals is the skin and its associated structures. Arratia (2003) reviewed the research on catfish skin and explained that our knowledge is poor and focused on only a handful of species. However, we already know that catfish skin is complex, advanced, multi-functional and involved in protection, sensation, and the production of alarm chemicals and venoms. Furthermore, catfishes are literally covered in taste buds, and a 25 cm yellow bullhead (a close relative of the channel cat) can have over 175,000 taste buds scattered over its body (Caprio, 1987). In contrast, our mouths contain about 5,000. It's funny to think that even with all those taste buds, they are not in the least bit fussy about what they eat, biting on any foul-smelling stinkbait that gets cast their way.

I've already mentioned the venom glands that some catfishes have, so won't cover that here. One of the coolest systems to evolve in catfishes can be found in the holdfast organs of sisorids such as *Glyptothorax* (Fig. 11) and (especially) *Pseudecheneis* (Fig. 1). These washboard-like structures are formed by a patch of folded skin on the breast that help the fish stay in place in the fastwater mountain streams of South and Southeast Asia.

As aquarists, we're familiar with the body plates, odontodes and other defensive and offensive structures of armoured catfishes such as callichthyids, loricariids, doradids and amphiliids. Many catfish families are smooth-



Fig. 11. Detail of the thoracic adhesive apparatus in *Glyptothorax telchitta*. Photo: S. Grant

skinned and lack any obvious structures (e.g., pimelodids, ictalurids, claroteids, heptapterids, auchenipterids, bagrids, silurids, malapterurids, etc.) while others have developed large papillae (e.g., aspredinids) that likely have a sensory function (Figure.10).

The skin is also important in the reproduction of some banjo catfishes, where specialized structures called *cotylephores* (e.g., *Platystacus*) attach the developing eggs to the females belly so she can transport them around the variably brackish habitats they spawn in.

Hopefully, you now have a better appreciation for the external anatomy of catfishes and want to know more about their internal organs, skeleton and muscles. I haven't mentioned the sensory systems (eyes, nares, barbels, or lateral line, etc.) at all, but here's a start. Have a look at your own catfishes and think about their fins, barbels, eyes, skin and shape are matched to their natural habitat. They hold all the clues to the kind of aquarium they need and, possibly, how they will probably spawn.

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Go Wild Peru: part one

By Ian Fuller



Fig. 1. *Corydoras weitzmani* and habitat. Photos: I. Fuller.

This story actually started in 2013 when I was invited by Brian Perkins, one of our 2014 CSG convention speakers, to be the cory ‘expert’ on a fish-collecting expedition to the Madre de Dios region of southeast Peru. The following July, Jan Gundersen (Norway) Michael Barber (USA) and I made the trip to Peru and joined Brian Perkins (USA) and Felix Mamani (Peru) for a few weeks fish collecting around Puerto Maldonado.

The first week was very good and we visited lots of collecting sites and got to know the local fish fauna. In addition to tetras, cichlids and other catfishes, we caught 12 species of Corydoradinae, with *C. weitzmani* and *C. sp* CW016 ‘Teniente’ being the real prizes. Although the second week was less productive in terms of

fish, the trip had been a good experience and we packed our fish and belongings ready for the journey home.

However, things started to go awry when my traveling companion and I were refused permission to carry fish in our checked bags. Not a problem we thought, and returned the fish to the facility for inclusion in the main shipment we had arranged to follow us a week or so later. Unfortunately, the fish never arrived and I have since learned that the shipment was abandoned in Lima because a customs fee was not paid. We were deeply disappointed and a seed was planted in my mind to give future fish collectors a better experience.



Fig. 2. *Go Wild Peru* personnel: (left to right) Lance Peck, Felix Mamani, Ian Fuller, Michael Barber, Fernando Rosenberg. Photos: I. Fuller and L. Peck.



Fig. 2. Main base for Go Wild Peru. Photo: I. Fuller.

I contacted Felix and discussed the possibilities of starting a partnership with him in the fish collecting and ecotourism business, and I agreed to rent his facility. The property is a single storey two-bedroom house with a shower, WC, a large living room and a kitchen. Felix originally built the house with a basic fish-holding facility at the rear, with 20 large aquaria (180cm × 60cm × 45cm: 486L) placed on wooden staging.

Tropical heat, humidity and termites had taken their toll on the staging, and I remember thinking on my first trip that it would not be long before Felix had a big problem there. The aquarium facility and house would need to be renovated before I could use them, and this was my first stumbling block. Fortunately, I was in regular contact with Michael, who had been on the July 2014 trip, and he asked to join the project and help with the renovation work and investment of materials. I agreed and we planned a three-week trip with the first week being spent on the building followed by two weeks fish collecting.

We invited my good friend and co-author Hans-Georg Evers to join us for the second and third weeks, which he agreed to do. With Hans on the trip, we would surely learn a lot more about fish collecting and catch species that only people with as much skill and experience as Hans can find.

In 2014, I had the good fortune to meet Lance Peck of Gone Wild Peru. Lance is an American but now spends most of his time in Peru. His knowledge of the landscape, flora and fauna (especially fish) of the area is encyclopedic, and after some lengthy discussions he agreed to be

our main guide and travel advisor. Our team was assembled and it was time to head back to Madre de Dios!

Michael and I met in Lima and stayed at a local hotel before continuing our journey to Puerto Maldonado early the next morning. An overnight stay and transport to-and-from the airport in Lima is now offered as an addition to our travel packages. The flight to Puerto Maldonado stops at Cusco and we arrived in Puerto Maldonado late morning and were met by our landlord and partner Felix. After a short drive to the house, we dropped our bags and immediately started work surveying what we needed to do first in order to get the place up-to-snuff.

The first two days were spent getting to know the property, deciding on our priorities, shopping trips to town and liaising with Felix. We soon had a new fridge-freezer (for the beer), new crockery, cooking utensils, pillows and bed linen, and Felix arranged for craftsmen in Puerto Maldonado to build the furniture and other special items on our list.



Fig. 3. Newly renovated aquarium and quarantine facility. Photo: I. Fuller.

I soon learned that you can find pretty much anything in Puerto Maldonado, and if it's not on the shelf there's someone that can build it for you. Like everywhere else, you just need to know the right people and our man Felix knows them all. A couple of days later, work started renovating the kitchen, and the living room became a builders yard! At the same time, we started emptying and repairing the aquariums while taking the staging to pieces. In addition to the problems with rot and termites, the facility was built on a sloping gravel bed which needed an upgrade. We poured a concrete floor with a drainage channel and a pathway around the

house, and built a new rack with hardwood rails placed on concrete-block pillars (fig. 3).



Fig. 4. New outdoor sorting and packing bench. Photo: I. Fuller.

With the tanks renovated and in place, we connected a 120L/min air pump to a PVC cistern-ring to supply air to all the tanks. While we were at it, we installed an outdoor shower adjacent to the aquarium for clients to clean their gear and cool off after a hard day in the field (well, river actually). A power shower will be fitted in the main bathroom for normal use. New tiles in the kitchen were gleaming and the drawers and shelves had been ordered. We have also installed a tiled packing area on the outside wall between the house and aquarium, as well as extra lighting and power sockets (fig. 4). A

charging station in the living room will make sure that clients can keep their equipment ready for photography and data collection.

By the end of the first week, our hard work was beginning to pay off and things were taking shape. But, we had other objectives on our trip and were keen to get out collecting! Leaving the work in the capable hands of Felix and his team, we headed out with Lance to a local beauty spot along the main road that runs north to the border with Brazil. The area looked like a well-tended stretch of parkland where families take the kids at weekends. We were soon waist deep, wielding our nets in the fast moving water. The variety of fish we caught was incredible; an abundance of silver tetras, a couple of species of knifefish and several loricariid catfishes.

My target fish, as most of you will know, were corys and I soon caught my first – a very nice adult female of a new species! To say I was excited would be an understatement... but we only had one and I needed more. We spent the next few hours working the habitat along a 200m stretch and caught over 20 different species before getting into the corys again. We started to catch what we initially thought were *C. sp. CW40* and a deeper-bodied species similar to *C. sp. C120* (fig. 5, C).



Fig. 5. *Corydoras* species collected by Go Wild Peru personnel in local streams: A. *C. sp. CW100*; B. *C. sp. CW097*; C. *C. sp. NEW*; D. *C. sp. CW096*; E. *C. sp. C126*; F. *C. sp. CW062*; G. *C. acrensis*; H. *C. sp. CW039*; I. *C. sp. CW080* Photos: L. Peck (A) I. Fuller (B–G, I), and H.-G. Evers (H).



Fig. 6. Habitats and collecting techniques, Photos: L. Peck and I. Fuller.

Tired but ecstatic, we returned to base with our catch and put them straight into a simple but effective quarantine system. Depending on their size we put 10 to 20 individuals of each species into 6L plastic bowls. Fish collected at the same site are placed in bowls of the same colour. Each bowl has a tablespoon of salt added and a plywood cover is placed on top; the bowls can then be stacked to save space. The next day the fish are given a 90% water change and half a tablespoon of salt is added. On the third day, a 90% water change is made without the addition of salt. After the three-day quarantine, the fish are released into the main holding tanks (or single-specimen tubs for killifish) filled with high-quality well water. Lance developed this quarantine system when he was collecting fish for the aquarium trade and explained that it worked very well with no problems reported by his clients.

The rest of the week was spent repairing, rebuilding and installing aquaria. The concrete floor and path had now cured enough to walk on. The plan for this area is to have two banks of aquaria with a couple of local biotope set-ups

and a central space to relax and enjoy a cool beer, hold impromptu talks and watch the fish. The kitchen area was still pretty much like a bomb had gone off, but it was all taking shape nicely.

Late on Saturday morning Lance arrived with Hans. His initial response to what we were doing was very encouraging and, to celebrate the new venture, invited us all for pizza that evening. When he's not helping us or managing tourist groups, Felix is a taxi driver and later on Saturday evening, he took us into Puerto Maldonado to a great pizzeria where he joined us along with Lance and his wife (and fellow fish-collector) Belinda.

Puerto Maldonado lies at the confluence of the Tambopata and Madre de Dios rivers about 55 km from the Bolivian border. It's a vibrant city home to around 70,000 people, plenty of good restaurants and bars, and with basic and luxury goods widely available. The market is especially worth a visit; the sights and smells are something to savor, some of the fruit and vegetable and spice stalls are kaleidoscopes of

colour, and catfishes on the meat counters will have you drooling.

From the start, we wanted to make our guests welcome and comfortable. We decided to hire a housekeeper to keep the place clean and tidy, prepare evening meals, ensure that the self-service breakfast bar was well stocked and, if required, prepare packed lunches for day trips. We even have a good deal on an excellent local beer, which Felix can supply by the crate. Next door to our facility is the Anaconda Lodge. They also house eco-travelers in traditional lodges, host a Thai restaurant, and have an outdoor pool which our guests are welcome to use.

For the next few days we sampled many of the streams around Puerto Maldonado to help get a handle on the local fauna (fig. 6). One thing that I noticed was how each stream had its own form of *Ancistrus*. These may well be colour forms of a widespread and variable species, but it's interesting nonetheless and shows the diversity in the area that might be found in other fish.

On Wednesday, we teamed-up with Lance's good friend and neighbor Fernando Rosenberg. We loaded our collecting gear into the 4x4 and set off for Quinci Mill, a site Lance knew well and where we were going to base ourselves for a couple of days with a view towards collecting *C. weitzmani* and *C. sp* CW016 'Teniente'. One of the things that became obvious while traveling along the 30C highway, especially when nearing Quinci Mill, is the devastation being caused by gold mining.



Fig. 7. *Apistogramma rubrolineatus*. Photo: L. Peck.

We sampled a couple of sites *en route*, one of these is a good spot called Santa Rita (fig. 8)

where on the earlier trip I collected two species of *Apistogramma*, one of which proved to be a new species. To this, we added *C. sp.* CW032, CW096, CW097 and CW080 (fig. 5), two species of *Ancistrus*, one species of *Rineloricaria*, an *Otocinclus* (fig. 9), and with just about every dip of the net we caught the tiny candiru! Along with a set of silver or pale-blue tetras, these small parasitic catfish were common wherever we collected.



Fig. 8. Santa Rita locality. Photo: I. Fuller.

We eventually arrived at Quinci Mill, checked into the hotel and then found somewhere to get a good meal. You would think that being in the middle of the Peruvian jungle finding a good place to eat would be a problem, but nothing could be further from the truth! We found clean and comfortable restaurants serving good and inexpensive food in all the small towns and villages on the main roads. Basic meals cost as little as 6 soles (£1.20) per person and often included two courses. The one thing that everyone traveling in the tropics should remember is to always take plenty of drinking water with you – and drink it! It's surprising how quickly you can become dehydrated.

The following morning we got an early start on the hunt for *C. weitzmani* (fig. 1). Marketed in Japan as "the dream cory", *C. weitzmani* was one of the most sought after species of the late 1990's and early 2000's, and several aquarists spent a lot of money searching for it in vain. Lance finally found them in 2004 in an area near Quinci Mill that is now devastated by gold mining. Fortunately, *C. weitzmani* has a broad distribution and can be found upstream in the Andean foothills and nearby streams. While we found *C. weitzmani* in several locations (fig. 1)

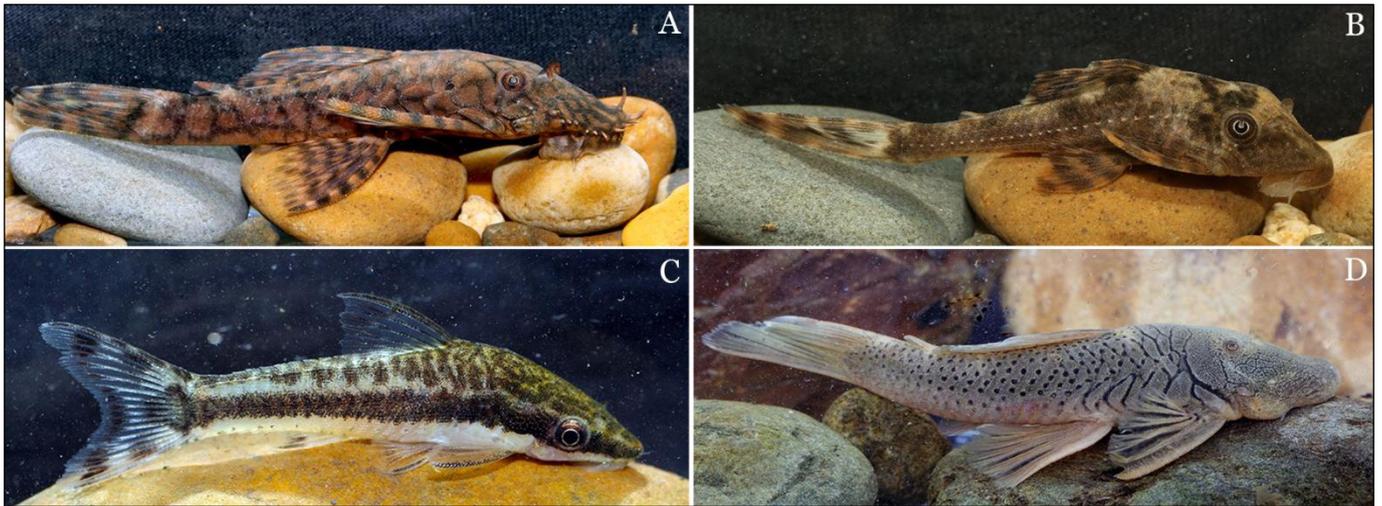


Fig. 9. A selection of the loricariids collected by Go Wild Peru personnel: A. *Ancistrus* sp. cf. L393; B. *Hypostomus* cf. *pyrineusi*.; C. *Otocinclus* cf. *vittatus*; D. *Chaetostoma* cf. *marcapatae*. Photos: L. Peck and I. Fuller.

our other target *C.* sp. CW016 was an altogether different story; we went to the site where we collected a few on the 2014 trip only to find several large trees had been brought down in recent bad weather. Lance and I worked the disturbed habitat for a couple of hours and caught *Ancistrus*, several whiptails and tetras, but no corys, which was a bit of a disappointment at the end of a very tough session.

On the way to Quinci Mill we spotted several species of orchid. Lance explained that there were many more at higher elevations, so we decided to have a break from fishing and headed higher into the mountains to see what we could find. We were not disappointed and were met by several species in full bloom as well as at least a dozen more, some only a few centimeters tall and a couple with flower spikes nearly a meter long! During the detour into the mountains we came across a festival where all the local communities were out in traditional dress showing off their dancing skills. We learned that the event takes place once every few years, so we were privileged to witness it. We stayed for a while to watch the action, have a snack and then continued our journey, sampling many more small rivers and streams on the way.



Fig. 9. Orchid. Photo: I. Fuller.



The CSG committee would like to acknowledge the generous support of the many individuals and companies that support the group and its annual convention



Aquarium technique: an automatic top-up system

By Mark Walters



My hobby has been less about catfish keeping and more about providing the right accommodation and furniture to keep them happy. To do this I rely on both shop-bought and DIY solutions on a day-to-day basis.

Ever since I started fish-keeping I have improvised and developed my own solutions to problems in the fish room. I think it's a great way for youngsters to learn about plumbing, electrics and basic handy work. I would go to car boot fairs and buy old pictures so I could use the glass to make show tanks, with plenty of cuts and scars along the way – although the smell of silicone was quite intoxicating.

The list of home-made essentials is long, and during my time I have made full size tanks, breeding caves, spawning mops, sumps, egg tumblers, filters, breeding boxes, brine shrimp hatchers – the list goes on. On a larger scale the construction of fish houses has necessitated learning how to do all the electrical, building, joinery (and the art of salvaging timber!), glass fibre and plumbing work necessary. This is not

to mention the savings by collecting aquarium décor from the woods (who needs expensive Mopani, shipped half way across the world), live food, leaves (Canadian oak is my favourite) and growing courgettes and beans to feed fish.

The skills learned along the way have been extensive. Most readers will relate to this side of the hobby and will have far more examples of home-made solutions. I am as impressed when I hear about automated water changing systems, home-made centralised tank set-ups and caves made from clay and fired in a kiln at home, as I am about the latest spawning of a Loricariid.

Auto top-up

My latest solution to a problem isn't that ground breaking – and has no doubt been encountered on numerous occasions, but it's worth mentioning. I have a sump which filters most of my loricariid tanks, over 1000 gallons in total. The rigorous circulation and open-nature of the system leads to significant water loss

through evaporation and the odd drip here and there. The consequence is the need to regularly top up the system, usually with a few gallons a week from my rain water butt (another DIY replacement for RO water). My latest holiday plans left me with a dilemma. Do I trust my non-fishkeeping neighbour to keep an eye on the sump and top up if needed, or do I attempt some kind of auto top-up system?

Obviously, I plumped for the latter. I started by trying a simple siphon system from a higher-level header tank containing rain water, and for a couple of weeks tried to regulate a drip feed system to keep the sump topped up. It was impossible to gauge the rate of evaporation and I either overfilled or under filled the sump. My solution was to pop to the toilet – and have a look at the ball-cock and water top-up device in the cistern.

A trip to the DIY store opened my eyes to the range of top-up devices available (very sad I know). The most likely solution appeared to be the 'side-entry cistern filling valve'. In my mind I was working out how it would work and stood in the DIY shop staring at cistern filling devices and thinking for at least 15 minutes.

For only £7, I had what I hoped was the answer to my problem and started working out how best to cobble it all together for my purpose. My first issue was attaching the device to the sump. The tanks I have on the home-made (obviously) sump isn't side-drilled so I found a couple of pieces of hardwood, drilled a hole and slid onto the threaded pipe. Next, I needed to attach a hose to the cistern intake, which involved a rummage through a box of pipe bits and some pipe-weld solvent. The hose led to a 50 gallon header tank containing rain water, with gravity doing the job of directing water to the sump. I included an in-line shut-off valve to the hose so I didn't break the siphon if I needed to service the device during use.

With the device in place, I started the siphon on the hose and connected it to the intake. The device immediately started operating, filling the sump up to the desired level, before the rising float shut off the valve cutting off the water flow.

I left the device operating for a couple of weeks before my holiday and after a bit of tinkering it has been operating fine. The rain water isn't as sediment free as tap water, so I have included a pre-filter on the intake in the header tank. I also take the device to bits once a fortnight and clean all the components. Whilst on holiday, the device worked perfectly, maintaining a constant level in the sump preventing the filter running dry and saving my precious fish for the fortnight away.

Next on my list of DIY jobs, is to devise a circulatory system for my cooler-water catfish species, involving a pump house situated outside the warm fish house, cooling the intake water. It keeps me off the streets, as my mum used to say.





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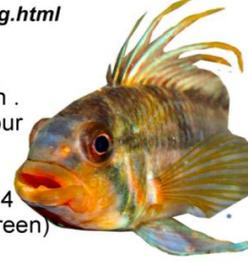
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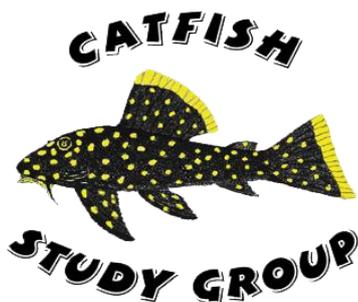
Tel: 01270 820073

The Garden Centre, Balterley Green Road (B5500), Crewe, CW2 5QP

(near Wychwood Park, 10 mins from M6Junction 16).

Diary dates October–December 2015*

<i>Date</i>	<i>Event</i>	<i>Further Information</i>
9–11 October	BKA convention	bka.webeden.co.uk
11 October	Preston & District AS auction	northtrop.co.uk
18 October	CSG meeting: plecos	catfishstudygroup.org
25 October	Ellesmere Port Aquarist Group	facebook.com/groups/wirraldistrictaquaristsociety
30 Oct–01 Nov	4 th International L-number Days	2015.l-number-days.eu
01 November	Northwest Cichlid Group auction	
08 November	Bradford AS open show and auction	facebook.com/BradfordDistrictAquaristsSociety
15 November	CSG Autumn auction	catfishstudygroup.org
13 December	CSG Christmas meeting	catfishstudygroup.org



* Please note that dates and events are correct at the time of printing and the CSG assumes no responsibility for cancellation or rescheduling of any non-CSG event listed here. Always be sure to check the date and venue of any event well in advance and again before traveling (see Further Information).



If you would like your event listed here, please contact editor@catfishstudygroup.org

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, out-of-focus blue and green, suggesting an outdoor setting.

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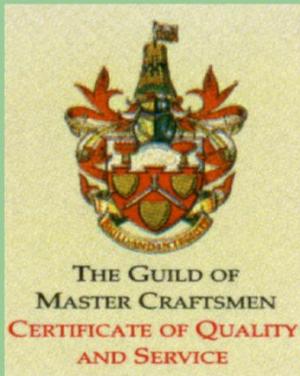
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