The Cichlid Monthly

Victorian Cichlid Society Inc

41:03
April 2012
rrp: $2.50

REGISTERED BY AUSTRALIA POST PP342780/0024

x@cichlids.org.au

COMMITTEE

president@cichlids.org.au
John McCormick
vice@cichlids.org.au
Greg Nicolacopoulos
secretary@cichlids.org.au
Graham Rowe 9560 7472
treasurer@cichlids.org.au
Uri Bouman
editor@cichlids.org.au
Daryl Hutchins 9870 3556
0430 032 304
social@cichlids.org.au
Uri Bouman
trading@cichlids.org.au
David Green
librarian@cichlids.org.au
Debra Dickson
show@cichlids.org.au
David Green

SUB-COMMITTEES

baa@cichlids.org.au
Peter Robinson
constitution@cichlids.org.au
Daryl Hutchins
handbook@cichlids.org.au
Daryl Hutchins
mailing@cichlids.org.au
John McCormick
species@cichlids.org.au
Vacant
webmaster@cichlids.org.au
Daryl Hutchins

LIFE MEMBERS

Graham Rowe, Heinz Staude, Kevin Archibald, Keith Patford, Danny Genovese, Daryl Hutchins and **John McCormick.**

HONORARY MEMBER

Max Davenport

FELLOW **Graham Rowe**

PUBLIC OFFICER **David Green**
public@cichlids.org.au

PUBLISHING **DLH Publishing**
pub@cichlids.org.au 0430 032 304

PRINTING **APS Print Solutions**
apsprint.com.au 9872 3025

CONTENTS

THE NEXT GENERAL MEETING of the Society, will be held on 2 May at 8 pm sharp at the **Oakleigh Centre, 773 Warrigal Road, Oakleigh**. Visitors? Love 'em. But this month is ... **April Auction – the ONE AND ONLY VCS AUCTION for 2012** (the 40th Anniversary takes the place of the October Auction).

FEES 2011

Ordinary $30 Family $35

Junior or Concession Card Holder $15

Overseas $35

(New memberships add $8 Joining Fee.)

Correspondence to:

THE SECRETARY
Victorian Cichlid Society Inc
23 Mangana Drive,
Mulgrave, 3170 Victoria

Ph/Fax: 9560 7472 or
secretary@cichlids.org.au

VCS BANK ACCOUNT DIRECT DEPOSIT:
Acct Name: Victorian Cichlid Society Incorporated
BSB: 06 3206 **Acct No:** 1002 3958

UPCOMING AUCTION:

14 APRIL, 2012 at Mulgrave Neighbourhood House, Wellington Reserve, 36-42 Mackie Rd, Mulgrave.

COVER PICTURE:
Detail from Mo Devlin's 'Family Portrait' part of his ongoing 'Today in the Fishroom' series, which can be sighted at aquamojo.com.

Discovered the VCS Facebook page yet? Be a 'Friend' ...

facebook.com/vcscichlids

VCS Calendar 2012

April 14 Sat (AUCTION) – Mulgrave Neighbourhood House, Wellington Reserve, 36-42 Mackie Road, Mulgrave — (Committee, Fri 20/4).

May 2 – (Committee, Fri 18/5), Home Show 27/5.

June 6 – (Committee, Fri 22/6).

July 4 – (Committee, Fri 20/7).

August 1 – (Committee, Fri 17/8).

September 5 – Elaine Turner Memorial Art & Photographic Competition (Committee, Fri 21/9).

October 13 in the Empire Room, Manhattan Hotel, Canterbury Road, Ringwood – (Committee & VHS deadline, Fri 19/10).
NOTE: end of Financial Year 31/10 (fees are now due).

November 7 – (Committee, Fri 23/11).

December 5 – Annual General Meeting. Normally there is no Committee Meeting in December.

TABLE SHOWS

Any cichlid species can be entered at any General Meeting except June (Dwarfs) and August (Pairs).

See the VCS Calendar online, **calendar.cichlids.org.au**, for more details or discussion.

Presidential Patois

By John McCormick

Hi Everyone,

Well there you have it, all the details that you could ever want regarding the 40th Anniversary Convention and Dinner. With pricing like that you would have to be mad to miss it.

With limited tickets available (only around the 80 mark I believe) they are sure to be snapped up quicker than you can say "It's not likely to ever happen again." Of course the main attraction is our guest speakers, Alf Stalsberg and Spencer Jack (Hey! I'll be there – Ed). From what I have heard about them, we will be thoroughly informed *and* entertained. Remember also as an added bonus you also get afternoon nibblies and a three-course meal in the evening.

One thing I would ask at this point is "Why are you sitting here reading this." Contact the club now and order your tickets, or you will miss out. (**A40.cichlids.org.au** will do the trick nicely – Ed.)

By the time you get to read this Uri will have been back down to Hazelwood Pondage for another fishing expedition with those of you who fancy the chance of catching cichlids in the wild so to speak (even though it is not their native waters). It is an experience worth doing at least a couple of times. For those that have missed this opportunity I'm sure that Uri will organise another trip later in the year.

It is also Auction time again, so you should also realise that the normal April general meeting is replaced with the Auction, so don't turn up on Wednesday as no-one will be there. I hope you all have your stock ready for sale and some empty tanks available for the usual fish that you just couldn't resist buying on the spur of the moment.

Venue and start time details are the same as usual and no doubt will appear in this issue of TCM.

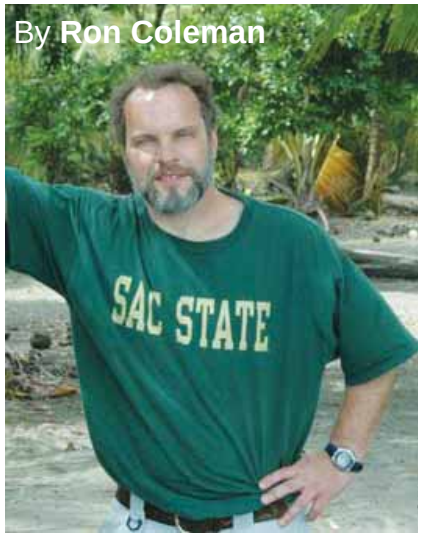
Daryl has mentioned about supporting our advertisers, I would like to second that and suggest that when you visit one of our advertisers, you make yourself known to the shopkeeper and let him know you are a VCS member and where you saw his advertisement.

I have spoken to a couple of the advertisers lately and they have said that very few people have identified themselves as VCS members, we need to let them know we are there, it will encourage them to continue advertising in the magazine thus helping to support the club.

I look forward to seeing you all at the Auction in April.

John

SO YOU WANT TO BUILD A FISH ROOM



Many fish enthusiasts, at one time or another, think that they might want to build a fish room. I am not talking about adding a few more tanks to the living room, or maybe "temporarily" stationing a tank on the kitchen counter, but rather a full-blown room dedicated to fish tanks, ie, lot's of 'em! If such a thought has been poking into your brain, here are some points to ponder before taking the plunge.

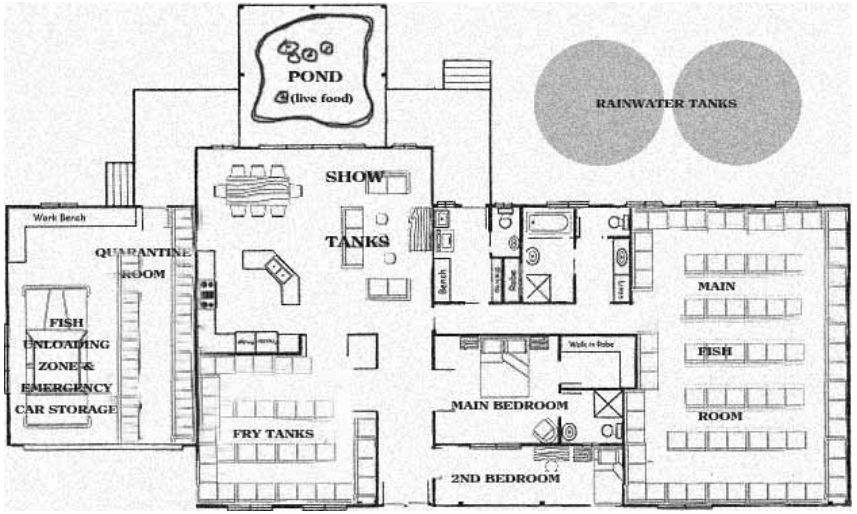
As part of my job, I have faced this situation a number of times and it came up again suddenly this fall. Student enrolment at Sacramento State in Biological Sciences has skyrocketed and one of the former classrooms that our lab was using for fish tanks needed to be repurposed back into a teaching room. We had about 50 tanks (most larger than 75 litres) in that room. I was allocated two much smaller rooms that I have been busy setting-up for tanks for this coming spring.

The first thing to do when considering making a fish room is to face reality. While a person can be careful with a tank or two in the living room, when you have a lot of tanks, you are going to be moving a lot of water here and there and some of that water is going to end up on the floor. You simply cannot have a fish room that does not have any provision for dealing with this. The ideal situation is a concrete floor with a floor drain. Other solutions are possible, but you will be amazed at how much water 75 litres is when a tank breaks and all 75 litres end up on the floor at once. It is impressive. Make sure that such an occurrence is only an inconvenience and not a disaster.

If you do use concrete, consider treating the floor. Wet concrete is dangerously slippery. I paint my fish room floors with garage floor concrete paint with a sand additive. The sand additive provides traction and makes the floor non-slippery. Unfortunately, it also traps dirt and is hard to clean so I strongly suggest you avoid white. I go with "Mustang yellow". It takes longer to look dirty. I repaint it once a year.

You also need to consider the walls and ceilings. Water will splash on them and the high humidity of a typical fish room encourages mold to grow. I paint the walls with primer, then two coats of Ultra-White, high-gloss paint. To the paint, I add an anti-mold agent to inhibit the growth of mold. I use the high-gloss white so that the walls and ceilings will reflect as much light as possible, so I can use less light (and hence electricity) over the tanks.

Speaking of electricity, this aspect is going to take some thought. The electrical outlets in a typical residential room are often located near the floor, a spot that is not only inconvenient, but also dangerous in an active fish room. In one of my rooms, the outlets are mounted on the ceiling. This actually works pretty well. In each of these outlets, I plug in 12 outlet power strips that run vertically down the front of the racking. This puts the outlets within easy reach and makes them unlikely to get too close to water. Do not set yourself up for disaster by having to reach across tanks into awkward places to plug things in or to unplug equipment. You are going to need far more outlets than you could possibly imagine. You may not need them all at once, but you do not want to have to run extension cords and power strips all over the place. If you can, you are far better off to put in excess outlets and then not use them, rather than to put in only a couple and try to solve your



If you're not into that "facing reality" deal, you might like to include a few extras.

Image from the Eitor's 'To Do' file.

electrical needs with stop-gap fixes later on

What to put the tanks on? Here you have a number of choices. Perhaps the easiest and cheapest option in the short-term are wooden racks. Most people can work with wood themselves and you can modify or add to the shelves as your needs change. At universities such as mine, wood is not allowed because it rots, harbors molds and insects, and it is not terribly strong unless you use a lot of it, in which case the fish racks themselves consume a lot of your available space. Some universities require fiberglass racking. We tried that at Berkeley. It was incredibly expensive and, like wood, could not provide long, clear spans (ie, no uprights in the way) without significant warping. Keep in mind that a little "dip" in a shelf is enough to cause large glass tanks to crack.

If you know exactly what sizes of tanks you want in your room, then you can build wooden racking that fits perfectly around those tanks but remember that fish tanks are often just a little larger than their supposed dimensions, eg, a 2-foot long tank actually takes a little more than 24" because of the plastic molding, so do a lot of measuring and planning before you start building.

In my situation, we are constantly changing things around for different experiments, so we need flexibility. The key to flexibility is to have long, clear spans with no uprights. The solution is to use industrial-grade pallet racking, the kind of stuff you see at Home Depot (but surprisingly is not sold at Home Depot ... [sounds just like our hardware stores - Ed]).

This stuff is not cheap in the short term: a 10 foot (3048mm) long, 7 foot (2133mm) high, 3 foot (900mm) deep, 3-shelf rack costs about $500). We overbuild it and that has paid off in the long term. The racks which we put up 10 years ago, using 4.5" (115mm) horizontal steel beams show no warp at all despite being heavily loaded all that time. Our longest ones have a clear span of 10 feet, which allows us to put whatever combination of small or large tanks we want on them, to suit a particular experiment

On top of the pallet racking, I put 3/4" (19mm) oak plywood coated with primer and two coats of ultra-white high-gloss paint with the anti-mold additive. These have also held up very well over the years. The bottom line is that if you want to do this right, do it right from the start, and you will have far fewer problems later on.

Finally, how many tanks are you going to stuff into this room? This is a really hard decision to make. Theoretically, the more tanks you have in your room, the more fish you can keep. But from tons of past experience I can tell you that the more awkward it is to get to and service a tank (eg, too high, too low, not enough clearance or stuck in a corner), the less likely you are to do the regular water changes that every tank needs. I have found that in a typical room, I can get three levels of tanks. The bottom of the first is at about a foot above the ground, the next starts about waist high and the next at shoulder height. The key distance that I have found is the height above the tank, below the shelf above. For me, this distance must be tall enough to fit the ubiquitous 2 gallon pail that we use for all sorts of things around the fish rooms. That is also just about the right amount of clearance for me to reach in and service the tank. It works out to about 10-11 inches (250-280mm). You might get by with less, but choose this distance carefully – it will haunt you every day if you make it too narrow.

The bottom line if you are thinking about doing this is to visit as many fish rooms as possible and see how people have solved the various problems I have discussed so you can get the most enjoyment out of your own fish room.

Reprinted from the Nov/Dec 2011 *Youngstown Aquarist*, journal of the Youngstown Area Tropical Fish Society.

How World War II Contributed to the Golden Decade of the Aquarium Hobby, the 1950s

By **Alan Mark Fletcher**

This DC-3 has flown millions of fish. Looks like Atkinson Field, British Guiana.
Picture from Alan M. Fletcher.

First of all, it is important to point out that WWII was all-consuming for Americans, in a way that had not been seen before and will never be seen again. Every aspect of our lives was in some way directed toward the war effort. We were told what we could eat (food rationing), where we could travel (fuel rationing), what we could say, and what we could wear; and we willingly complied. We gave up most of our civil rights, confident that they would be returned to us after the war. My father, who was a Presbyterian minister, and in poor health, went to work in a New Jersey defense factory. My mother worked as a secretary in a government office. My older brother enlisted in the Navy halfway through his college education and served as a quartermaster (steers the ship) on a small gunboat that went in with the landing troops to provide cover fire, in several of the later Pacific invasions. As a teenager I was a warden, trained to search for enemy planes (which never came!) and to watch at night for homes that might be violating the blackout regulations. I was in ninth grade on December 7, 1941. The Pearl Harbor attack took place on a Sunday. On Monday morning the junior high principal called us all into the school auditorium to hear President Roosevelt give his famous "Day of Infamy" speech, live.

We were only a typical family. Everyone worked in some way to win the war. Even members of pacifist religious groups went to work in hospitals and other essential non-military services.

Just this morning I received a query from Steve Hinshaw, in Alaska, asking why the cover of his 1942 copy of *Exotic Aquarium Fishes* looks so different from the other editions. It was the war. Everyone had to make do with what they were able to get their hands on – even printers. I suspect that those wartime Exotics might be worth more than others.

Al Klee has correctly pointed out that the aquarium hobby and industry benefited mightily from the US economic boom that followed the war. People had money to indulge in hobbies, and entrepreneurs had the confidence to take a gamble on new products. We even had sufficient wealth that we were able to fund the rebuilding of our former enemies, and the other European and Asian nations that had been devastated by the war. Even the Green Revolution of the 1960s and 70s, which made food available to poor countries all around the world, grew out of that post-war prosperity. Some cynics have called it geopolitics and US hegemony, but I believe American generosity, pure and simple.

Hugo Schenelle and Fred Cochu. Partners in Paramount Aquarium. Cochu was married to Schenelle's sister.
Photo from Alan M. Fletcher.

The aquarium hobby benefited from the war before it ever became worldwide, however. Many Germans came to the US in the 1930s because they did not like what was happening in their country, many of them being Jewish, feared for their lives. The aquarium hobby will owe an eternal debt to some of them, and in particular to Hugo Schnelle and Fred Cochu, brothers-in-law (photo below) who left Aquarium Hamburg and founded Paramount Aquarium in New York City. Paramount had a virtual monopoly on fish imports to the US in the 1950s.

WWII was the first big war in which aircraft played a dominant role. Even the first unpaved airstrips in remote places like Letecia, Columbia were built for security reasons. But most

Fred Cochu and his pilot, Captain Doc Moor, one of several great pilots employed by Paramount.
Photo from Alan M. Fletcher.

Awaiting transportation home. Lagos Nigeria.
Photo by Alan M. Fletcher.

important, ultimately, for the aquarium trade, there was a huge demand for all kinds of aircraft built in America, but needed for the war effort in Europe and Asia. Thousands of aircraft were ferried from the US to the war theaters. Thousands of Air Force pilots did nothing but fly new planes across the oceans. They delivered their planes to where they were needed, and then hitched a ride back to the US to transport another plane.

There were two main air routes between Europe and North America. Planes could fly to Newfoundland, to Greenland, to Iceland and finally to Great Britain. But that route was subject to frequent bad weather, and downed pilots stood no chance of surviving in the bitter cold water. The shortest distance across the Atlantic Ocean is actually from the east coast of Brazil to Senegal, West Africa. That became the main route. To make this passage from the

Paramount's PBY amphibious plane on Yarina Cocha. To take-off the plane had to run the length of the lake to get up on the step, then spin 180 degrees and race in the other direction to get up in the air. A frightening experience.
Photo by Alan M. Fletcher.

[TOP] Paramount's chief pilot, Richard E 'Nick' Nicholas (AOPA 278100) has been flying since 1935.

[CENTRE] Paramount makes its aircraft pay by round-trip use. Pilot Nicholas checks a load of day-old chicks flown to British Guiana. Each year, the firm flies about 1,000,000 chicks to South America and brings tropical fish back. To carry delicate living cargo like chicks and tropical fish, an aircraft must have an efficient heating system. Note heating ducts and insulation.

[BOTTOM] Paramount's DC-3 being unpacked at Miami International Airport. When the cartons of fish are sorted, some are immediately sent on to customers by commercial lines, the rest are flown to the Paramount plant at Vero Beach, Florida. This load came from British Guiana and Trinidad.

Photos on this page are from the October 1965 issue of The AOPA (Aircraft Owners and Pilots Association).

New World to the Old possible, US Navy SeaBees constructed air-fields, most of them with concrete runways. They built airbases in Panama, Trinidad, British Guiana, Surinam, near Belem at the eastern hump of Brazil, and northern Venezuela. (A raunchy but very popular WWII song was about the airbase at Point Cumana, Venezuela. It was called "Working for the Yankee Dolluh".)

But enough. You can figure out the rest of it). Many thousands of aircraft of all types hopped between these bases finally ending up at the Brazil base, where they took on every drop

Paramount Aquarium's converted B-17 bomber. Shortly after Paramount sold this ship, it was lost in Venezuela under mysterious circumstances. Photo: Bob Palmer.

of fuel they could and went across the Atlantic, nearly on the Equator.

After the war these bases became major transportation sites for Paramount Aquarium and a few fringe exporters/importers. On my first trip to British Guiana (now Guyana) we stayed in an abandoned military barracks at Atkinson Field south of Georgetown. On subsequent trips we stayed with Louis Chung, who was the principal collector of Guianese fishes in the 1950s.

It should be noted here that during World War II Paramount Aquarium had a secret contract with the United States government to collect and import electric eels for use in top secret government research. To my knowledge the nature of this research has never been revealed. But the important point is that even during the War Paramount Aquarium had its own aircraft and was able to fly them through any or all of the US bases in South America. When the war ended, they already had a mechanism in place for the transport of all aquarium fishes. No other company had that advantage. I have always wondered how they carried those big metal cans loaded with high-voltage electric eels. It must have been a great relief to have been able to shift over to carrying Neon Tetras!

Immediately after the war ended, thousands of nearly new airplanes of

Fish cans loaded on the plane for Paramount Aquarium before the days of bags and cartons. Photo from Alan M. Fletcher.

all kinds were sold-off by the government at a fraction of their true value or scrapped. Paramount Aquarium was able to take advantage of this surfeit of aircraft. During The 1950s they owned a Lockheed Lodestar, a Navy PBY flying boat, a Curtis C-46 cargo plane, a converted Boeing B-17 Flying Fortress bomber, a very fast twin-engine light bomber whose designation I cannot recall, and several Douglas DC-3s (C-47 military). I made at least one trip in most of them. The DC-3s had the best cost ratios of any planes Paramount ever owned. They were slow but they were real workhorses. Some DC-3s are still in service around the world after 60 years. I would not be surprised if some were still being used to fly aquarium fishes from remote airstrips in South America and Africa.

Spare parts for most former military aircraft were abundant, easily available, and inexpensive. On one trip to Leticia in a DC-3, an engine blew out on landing. A new engine was flown in from Miami in a few days, and it was installed by Paramount's co-pilot, who was a certified A&E mechanic. We had intended to be home for Easter, but the delay enabled Fred and me to celebrate the Easter holiday with an Indian Baptist congregation. That was a memorable experience.

I have previously mentioned how this air travel, combined with tightly sealed inflated plastic bags in styrofoam-lined cartons made it possible to fly millions of staple and new fishes to the US in hours instead of a couple of weeks, and they arrived in excellent condition. With such quantities of old and new fishes available it is no wonder the hobby thrived in the 1950s.

The hobby of the 1950s was also boosted by the GI Bill of Rights, which enabled thousands of veterans to attend college and professional schools at little cost. Most of the younger ichthyologists of the 1950s who identified the new fish, engineers, chemists, and business people who brought the innovations to the hobby were educated under the GI Bill.

I know that WWII contributed in more ways than these to the boom in the hobby in the 1950s, but I have written enough. Hopefully other AHHS* members who are as old as I am will be inspired to add to this WWII thread.

(*Story originally from the Aquarium Hobby Historical Society website: groups.yahoo.com/group/AquariumHobbyHistoricalSociety/.)

From *Fins&Tales* March 2012, journal of the Kitchener-Waterloo Aquarium Society

Strangers in your home: Archaea thrive in aquarium biofilters

By **Dr Josh D Neufeld**
Assistant Professor, Department of Biology, University of Waterloo

Dr Josh D. Neufeld is an assistant professor at the University of Waterloo in Waterloo, Ontario, Canada. He began working on the nitrogen cycle as an undergraduate student with Roger Knowles at McGill University in 1996 and now has an active research group that investigates microbial communities in aquatic, terrestrial and host-associated environments. The research described here was conducted by Laura Sauder (PhD student) and colleagues and was funded by the Natural Sciences and Engineering Council of Canada (NSERC). To find out more about this research, the publication is freely accessible online on the PloS ONE journal website (Sauder *et al*. 2011. Aquarium nitrification revisited: Thaumarchaeota are the dominant ammonia oxidisers in freshwater aquarium biofilters. PloS ONE. 6: e23281).

Please feel free to contact Dr Neufeld directly with questions about this research (jneufeld@uwaterloo.ca).

"Be careful not to add too many fish or overfeed, especially in the first month" echoes the advice my customers received countless times over the 10 years I worked for the Centre D'Animaux Nature in Montreal, Quebec. Following these comments I would often wield a permanent marker to sketch the nitrogen cycle (Fig. 1) on an aquarium front. The diagram helped me illustrate how fish and decomposing fish food produce toxic ammonia waste (NH_3), which must be converted to nitrite (NO_2^-) and then nitrate (NO_3^-) by the combined energy-generating activities of nitrifying bacteria of the *Nitrosomonas* and *Nitrobacter* groups, respectively. Together, these bacteria require approximately one month to reach sufficient population densities in filter media to reliably maintain NH_3 and NO_2^- below toxic concentrations. Since Sergei Winogradsky discovered these bacteria that obtain their energy by removing electrons from inorganic chemicals and their carbon from carbon dioxide over a hundred years ago, there was little reason to suspect that my aquarium diagram was only partially correct.

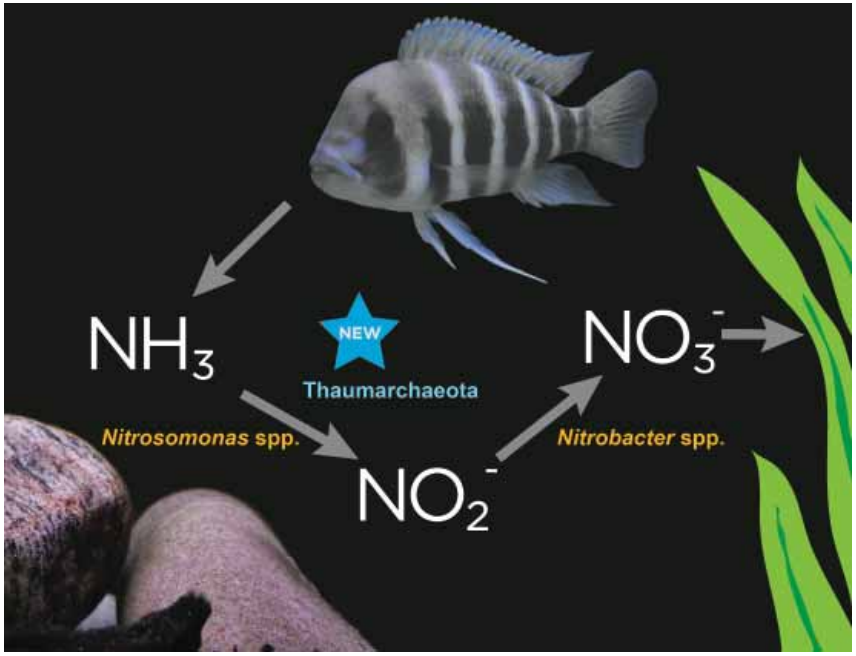


Fig. 1. **Simplified nitrogen cycle diagram showing how ammonia produced by fish and decomposing food provides an energy source for ammonia-oxidising bacteria (AOB), the newly discovered ammonia-oxidising archaea (AOA), nitrite-oxidising bacteria. The end product, nitrate, is incorporated into plant tissue or depleted through water changes. As the text describes, research suggests that ammonia concentration influences whether AOB or AOA dominate freshwater aquarium filter environments.**

Common knowledge in the aquarium industry dictates that "in the presence of oxygen, ammonia is oxidised to nitrite (NO_2^-) by bacteria of the *Nitrosomonas* [genus]" (Andrews C, Exell A, & Carrington N. 1988. *The Manual of Fish Health* (Tetra Press, Morris Plains) 1st Ed p 208). In fact, similar statements are reflected in the introductory sections of most aquarium books available today. However, one book cites recent research on freshwater nitrogen cycling, stating, "there is currently a degree of uncertainty concerning the actual identity of the bacteria responsible for the detoxification of wastes" (Dawes J. 2001. *The Complete Encyclopedia of the Freshwater Aquarium*, Firefly Books Ltd., Willowdale, 1st ed. p 304). This uncertainty arose from the research of Timothy Hovanec ("Dr Tim") and Ed DeLong (Hovanec T & DeLong E. 1996. Appl. Environ. Microbiol. 62:2888-2896), who investigated the occurrence of ammonia-oxidising bacteria (AOB) in both marine and freshwater aquaria with DNA probes. Their results demonstrated that *Nitrosomonas*-like bacteria were abundant in tested marine aquaria but could not be detected in sampled freshwater aquaria. Burrell and colleagues (Burrell P *et al*. 2001. Appl. Environ.

Microbiol. 67:5791-5800) later prepared enrichment cultures from active nitrifying biomass from freshwater systems containing relatively high ammonia concentrations (>5 mg NH_3 L^{-1}). These enrichment cultures yielded bacterial nitrifiers closely related to *Nitrosomonas marina* and were effective at maintaining aquarium nitrification when seeded into aquarium systems. Despite demonstrations that members of the *Nitrosomonas* can be enriched from freshwater aquaria, key questions regarding ammonia oxidation within aquarium biofilters remain unanswered.

Beginning in 2004, research studying DNA from the environment (i.e. "metagenomics") precipitated the startling discovery of another group of microorganisms capable of oxidising NH_3 to NO_2^-: certain types of Archaea, specifically those within the "Thaumarchaeota" division, can also carry out this process. These findings were important because Archaea and Bacteria are fundamentally different, despite appearing similar under a microscope. Some of the most important differences between Bacteria and Archaea include cell membrane lipids, DNA-binding proteins, cell wall structures, cellular machinery and antibiotic sensitivities. Importantly, their genomes are distinct from one another; based on DNA similarity, we humans share more similarity to the Archaea than Bacteria share with Archaea. Following the discovery that Thaumarchaeota can oxidise ammonia, research demonstrated that they are the most abundant ammonia oxidisers in naturally occurring marine, freshwater and soil environments. But are ammonia oxidising archaea (AOA) abundant in aquarium biofilters as well?

Beginning at the University of Waterloo in 2007 as an assistant professor provided me with an opportunity to test important hypotheses in microbial ecology. One hypothesis my team began testing in 2009 was that ammonia-oxidising Thaumarchaeota are involved in nitrification in engineered biofilter environments, from wastewater treatment systems to aquarium filtration. We began our work with biological filters by sampling sponge material from the aquarium filter in my office, which is a Fluval 404 treating a 110 gallon (416 litre) aquarium with a colony of *Cyphotilapia frontosa* from Lake Tanganyika and a small school of Giant Danios. Our methods involved extracting DNA from the organisms living in the filter and detecting the abundance of genes related to AOB and AOA. Our initial result from this preliminary assessment was that the genes from Thaumarchaeota were very abundant; we were unable to detect any bacterial ammonia oxidisers at all. Because many more aquarium filter samples were required to confirm this observation, we contacted the Kitchener Waterloo Aquarium Society (KWAS) and asked for their help. Through the assistance of enthusiastic local fish hobbyists and the generosity of aquarium stores throughout Kitchener, Waterloo and Cambridge (Ontario), we collected dozens of samples from freshwater filters, in addition to several saltwater filter samples. The results were clear: AOA were the dominant ammonia oxidisers in most of the sampled filters (23 of 27 filters).

In fact, 12 of the freshwater filters had no detectable AOB signal at all.

When presenting these preliminary results at a monthly KWAS meetings, one curious member asked an important question about our observations: "why?" Although we did not yet know the answer to this question, some evidence from the first published AOA enrichment cultures already indicated that AOA can have very high "affinity" for ammonia. In other words, AOA may be adapted to very low concentrations of ammonia, such as those common to most established aquaria. When we tested this hypothesis by measuring ammonia concentrations in water samples from the same aquaria for which we had estimated AOA and AOB population sizes, it became clear that when ammonia is low (e.g. less than approximately 200 ppb), AOA dominated. AOB were dominant in aquarium filters associated with high biomass and high ammonia concentrations. Although most of our saltwater filters were also dominated by AOA, these did not appear to follow the same trend with ammonia.

In addition to identifying the numerical dominance of AOA in most sampled aquarium filters, we examined the communities of AOA associated with our aquarium filters. The results were clear: different combinations of relatively diverse AOA populations inhabited each filter. The most apparent trend in the data was that the AOA communities in freshwater filters were distinct from most of the communities in saltwater filters. Although some types of AOA were similar in both saltwater and freshwater filters, certain groups of AOA demonstrated a clear preference for either freshwater or saltwater filters. This differential distribution of AOA between fresh and salt environments is consistent with previous aquarium filter research. Burrell and coworkers previously showed that shifting an established freshwater aquarium to saltwater resulted in a complete loss of nitrification activity that coincided with an increase in ammonia concentration. In their study, nitrification activity in salinity-shifted aquaria resumed after a period of time similar to that required to establish nitrification under the original freshwater conditions. Because AOA were unknown when Burrell and colleagues conducted this study, the question remains as to whether this shift and reestablishment involved AOA or AOB.

A core concept in ecology is that organisms have evolved adaptations to help succeed in survival and producing offspring under specific environmental conditions. The complete set of conditions that an organism fills is called its "niche". The results of our study indicate that AOA and AOB that inhabit aquarium biofilters have evolved to fill separate environmental niches. AOB appear to be adapted to high ammonia conditions that may characterise heavily stocked aquaria or those that are routinely overfed. On the other hand, well established and "balanced" aquaria likely present an ideal low-ammonia niche for the AOA. Indeed, Burrell and coworkers found that the only two freshwater aquaria with detectable *Nitrosomonas* bacteria were dosed regularly with ammonium chloride. The ability to enrich AOB in the laboratory under

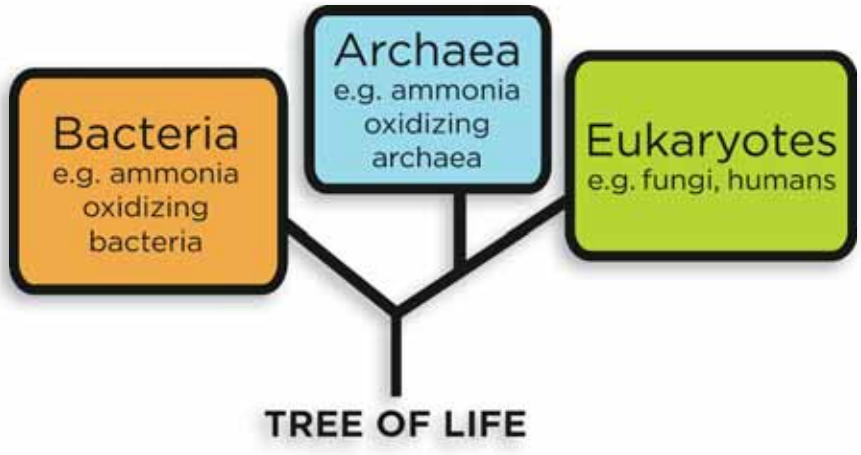


Fig. 2. **A cartoonised tree of life, based on DNA similarities, showing the approximate placement of Bacteria, Archaea and Eukaryotes.**

high ammonia conditions also indicates that AOB are well adapted to the high ammonia niche provided by enrichment culture conditions. The saltwater and freshwater differences described above also reveal a possible salinity-specific niche for particular AOA species; future research will determine whether the observations of this study can be replicated under carefully controlled experimental conditions.

The implications of these findings for aquarium filtration are not yet clear. We know that ammonia concentrations are important for determining whether AOA or AOB dominate in freshwater aquaria. We do not yet know to what extent these two types of ammonia oxidising microorganisms contribute to ammonia oxidation. We are now beginning activity-based assessments of AOA and AOB from biofilter systems to help answer this question. Importantly, when I would help customers set up new aquarium systems, aquarium supplements were provided to help establish the nitrogen cycle. Our study also tested the relative abundance of AOA and AOB in two commercial aquarium supplements; both were completely dominated by AOB, as expected. Because aquarium start-ups are characterised by high ammonia concentrations, it seems likely that these supplements are important for boosting the population sizes of AOB to help bring down toxic ammonia concentrations until AOA can establish numbers sufficient to serve a role in "polishing" ammonia, well before it reaches toxic concentrations. What we do not know is whether an early AOA boost to newly established aquaria could reduce the need for AOB and prevent a toxic ammonia spike in aquarium start-ups. Indeed, an ideal mechanism for "cycling" a new aquarium is adding a filter fragment obtained from an established aquarium. In the future, we expect that the direct addition of AOA cultures to new aquaria would be effective, possibly through AOA

amendments to existing aquarium supplement products. A major challenge remains: AOA have proved very difficult to grow in the laboratory. Only a few enrichment cultures, and two pure cultures, have been obtained to date. Of these, none have been obtained from freshwater environments.

Our lab continues to pursue research questions related to AOA in biofiltration, in addition to assessing the possibility of potential applications for AOA in aquaria. On a personal level, it is very exciting to be able to combine my passion for microbial ecology with the aquarium hobby. A few years ago, I would not have been able to predict that some of the most important questions in microbial ecology would converge on the aquarium hobby and I, for one, could not be more pleased. As for the aquarium hobbyist, these findings are not likely to change the way established aquariums are maintained, but it does shed a little more light into the strange microorganisms that live in our homes and help keep our aquarium environments healthy for our fish.

References

1. Andrews C, Exell A, & Carrington N (1988) *The Manual of Fish Health* (Tetra Press, Morris Plains) 1st Ed p 208.
2. Dawes J (2001) *The Complete Encyclopedia of the Freshwater Aquarium* (Firefly Books Ltd., Willowdale) 1st Ed p 304.
3. Hovanec T & DeLong E (1996) Comparative analysis of nitrifying bacteria associated with freshwater and marine aquaria. *Appl. Environ. Microbiol.* 62:2888-2896.
4. Burrell P, Phalen C, & Hovanec T (2001) Identification of bacteria responsible for ammonia oxidation in freshwater aquaria. *Appl. Environ. Microbiol.* 67:5791-5800.
5. Sauder *et al*. 2011. Aquarium nitrification revisited: Thaumarchaeota are the dominant ammonia oxidizers in freshwater aquarium biofilters. PloS ONE. In press.

Aims of the Society:

The Victorian Cichlid Society was formed by cichlidophiles in March 1972, thus becoming the first specialist aquarist group in Victoria. Its main aims are:

1. To promote the keeping of cichlids;
2. To gain and disseminate knowledge of cichlids, their habits and attributes through the use of slides, films, books, lectures, practical demonstrations, local and overseas magazines, articles by members and discussions with fellow members or experts in the field;
3. To assist, in any way possible, the establishment and/or maintenance of approved public aquaria;
4. To be involved in the education of the general public with regard to the benefits of fishkeeping (particularly cichlids), and the potentially harmful effects of animal mismanagement;
5. To promote fellowship between members;
6. To further the conservation of species and their natural habitats;
7. To further the identification, distribution, breeding, maintenance and enjoyment of species in the Family Cichlidae.

Minutes of the Previous Meeting

The President welcomed all present and opened the March 2012 meeting at 8:05 pm. The February minutes were taken as read on a motion moved by Daryl Hutchins and seconded by Uri Bouman.

The Treasurer reported that all bank statements were viewable online. The balances were:

$16,718.05	"A40" account
$2,170.47	working account
$13,000.00	Term Deposit

The latter matures in five months and is earning 5.34% interest. This report was received on a motion moved by Tony Ferguson and seconded by Johanna Frost.

Correspondence was then tabled: Bank Statement;
Research means Iridovirus legislation won't be enacted until at least March 2013;
Email of "missing" letter from EDAS.

Outgoing: Email reply to EDAS.

The correspondence was accepted on a motion moved by John Vella and seconded by Peter Frost.

We were then treated to a video visit to Greg Nicolacopoulos's fish house.

John McCormick then thanked Greg for this insight to his collection.

After a short break, Uri Bouman showed a short video of his altered tank.

He then displayed the bank statements on the screen to show the members what information could be accessed online.

John McCormick then thanked Uri. A brief mini auction was then conducted, courtesy of Keith Stephenson's donation.

Graham Rowe then led a discussion on the necessity of reviving the Species Maintenance Committee. Several potential ideas were discussed, including Vien Nguyen's suggested feasibility study of a VCS "fish room".

John McCormick then thanked Graham and all those who contributed ideas on how to achieve a viable SMC.

Uri Bouman then reminded members of the upcoming Hazelwood trip.

The raffle was then drawn and Uri Bouman won the Internal Filter from Reptiles and Aquariums at Cranbourne. Tony Ferguson won the $50 Reptiles and Aquariums at Cranbourne voucher. John Vella won the chocolates.

40th Anniversary tickets are on sale now. Only 74 tickets left. Happy Birthday to us. The committee meeting will be held on 23 March at Daryl Hutchins' residence. The next meeting is on 14 April and is The Auction. The meeting adjourned for supper and a chat at 10:50 pm.

"In building a society it should always be remembered that a congenial membership is more important than numerical strength." - Dr William T. Innes.

the last word

By Daryl Hutchins

Nothing ever goes exactly according to plan does it? Why should A40 plans be any different?

Unfortunately for our photography buffs, we have lost one of our A40 speakers, Angel M Fitor.

Fortunately for Angel, he got an unexpected offer that he just could not afford to refuse, a job with the BBC Natural History Unit filming in Lake Tanganyika ... I think I would drop everything for that too!

The committee has thanked Angel for his interest and wished him well in his new endeavour, the results of which we await with very great interest indeed.

The A40 program will be adjusted to compensate and ensure that a great time will continue be had by all ... even our fish photography buffs.

The Elaine Turner Memorial Art & Photographic Competition judging will take place in **October**, during the A40 Convention.

It is most important that we put on a good showing this year ... everyone is watching.

It has also been suggested that the competition be thrown open to all-present at the convention. So a good representation of VCS members is absolutely essential.

Some reminders: while the photographic section is open age-wise, the art component is separated into Senior (as in "not-junior ... you don't need a card) and Junior sections. The Junior Section being further divided into Primary and Secondary School students. So, presumably, university students and working stiffs are "Seniors".

"Art" is defined as "the original, uncopied and unaided work of the entrant and must not have been previously entered in the competition." That pretty much means that anything goes, as long as there is a piscean theme and you did it yourself. Painting, drawing, carving, knitting, cake decorating, sculpture, weaving, digital art, etc, etc. The only real limitation is your imagination.