

Algal Turf Scrubbers

MJL Note dated Oct 21, 2014: Sixteen years later and the most fundamental change is the color of my beard! I sincerely hope that the contributions of experienced ATS users such as yourself, here and at ATScrubber.com, will help ensure a much different hobby sixteen years from now!

(October 4, 1998 IRC presentation by Morgan Lidster on #reefs)

I hope I can lend some clarity to the convoluted subject of algal filtration, especially in regard to Algal Turf Scrubbing. As many of you are aware, my experience with Algal Turf Scrubbers, provides a sharp contrast to much of what has been published on the subject. I would like to point out that I represent Aquatic Technologies, Inc., better known as Inland Aquatics. Though these companies have yet to prove profitable, they are For Profit enterprises. Make no mistake about it. I am biased! Truth be told, it is arguably more accurate to describe Inland Aquatics as a representative of me. Inland is a public window into the last five years of my life.

Presenting myself as anything but intimately connected to it would be dishonest. Nevertheless, as you learn more about Inland Aquatics, I am confident you will agree that I'm actually "pitching" a sustainable future for OUR hobby. It's important to note that, except when I state otherwise, I am speaking of true Algal Turf Scrubbers (ATS), as developed by Dr. Walter Adey of the Smithsonian's Marine Systems Laboratory. True ATScrubbers are specifically designed to maximize the sustainable growth of algal turfs, the most efficient algal community known, while minimizing maintenance. ATScrubbers should not be confused with other types of algal filters, many of which are confusingly marketed as "Algae Scrubbers". The patented dump bucket makes it possible to maintain the turfs - the turfs do the "scrubbing".

Undoubtedly, many of you are familiar with the controversy that arose in FAMA magazine in 1994, just after the release of Dr. Adey's book, Dynamic Aquaria. While I don't want to rehash that here, it should be obvious by the end of the evening that many of the endlessly repeated criticisms of ATS systems have proven to be unfounded. (By the way Dynamic Aquaria volume 2 was released at MACNA X last week. It features many of the systems from our facility. Check it out.)

Inland Aquatics has designed, built and operated ATScrubbers on commercial mariculture systems, retail showroom systems, and residential (40 to 400 gallon aquaria) systems for approximately five years. Based on our experience with commercial mariculture systems, we designed ATScrubbers for hobby scale usage. Though they have yet to be mass marketed, we have been selling residential size systems to aquarium hobbyists since mid 1997. Total gallons of ATScrubber-driven systems maintained, by I.A, under this paradigm is approximately 45,000 gallons. Some of our original systems have been combined into larger systems, but our showroom houses systems over 4 years old. ATScrubbers are the only filters on all our systems, unless you count the sediment trapping Refugia. While we recommend at a 5% -10% annual water changes, the water in these display systems has yet to be changed. Nevertheless, we are pleased to compare it to any conventional, high maintenance system, regarding appearance, biodiversity and overall success!

The following is a brief summary of the benefits I have witnessed with ATS filtration: The benefits of true Algal Turf Scrubbing include the effective regulation of oxygen, pH, and nutrient cycling, as well as surge simulation. Other benefits include the following:

- Stabilization of pH and oxygen (at super-saturation) levels, leading to:
- Elimination of typical "dark tank" pH swings
- Increased fish health and minimization of stress
- Minimization of circulation requisite to facilitate coral respiration and metabolic exchange
- Freedom to FEED a captive reef system without increasing the need for water changes/maintenance

---Our systems are fed HEAVILY, 3-6 times daily; allowing planktivores such as Anthias, Chromis and Sleeper Gobies to flourish.

---Reefs with large fish populations are awesome, especially when the fish are healthy, robust, and spawning as they would in their natural environment.

--- Simulation of natural wave motion via the dump bucket

---This is very aesthetically appealing

---We feel this may be a contributing factor to overall coral health and our success with *Goniopora* sp.

--- ATScrubbed systems serve as hospital systems for most LPS corals

--- We've seen examples of *Fungia*, *Turbinaria*, *Goniopora*, *Lobophyllia*, *Wellsophyllia*, and *Favia*, which were exceptionally damaged when introduced to the system and recovered fully; quickly in many cases.

---Traditional cycling isn't necessary. ATScrubber screens make it possible to establish healthy, heavily loaded and fed, reefs in a day or two!!

--- ATS filters are inexpensive and much easier to maintain, especially on larger systems

---Minimization of water changes (10%/year) provides substantial long term savings.

---ATScrubbers eliminate the need for multiple filtering and maintenance systems

--- Significant "buffering capacity" regarding mishaps

---The ATScrubber readily handles nutrient spikes caused by dead fish, overfeeding, etc. Moreover, unlike any other filter, it can actually be run "overtime".

---Supersaturation of oxygen allows for maximum system downtime (power outages, for example)---
ATScrubbers will remove nitrates, phosphates, heavy metals, silicate and even hydrocarbons on closed systems

--- Increased biodiversity due to the ability to feed heavily and the absence of skimmers, mechanical and chemical filters or multiple power heads.

---The majority of our ATS systems are designed to turn the system volume over a mere 1.5-4 times per hour. Oxygen at super saturation seem to make a big difference.

---There is no loss of plankton or microfauna due to the operation of the ATS filter

---Though we discourage it, Amphipods and other microcrustaceans proliferate in the ATS itself and are occasionally dumped into the system, providing Anthias, Convict Blennies, Seahorses, and other finicky feeders with live food

---Many fish that require live foods flourish in these systems, including parasite eaters

Talk's cheap! I'm sure you're wondering, "why", if ATScrubbers are so great, "have I read so much negative opinion about Algal Turf Scrubbing". I'm going to touch on the three main reasons, as I'm sure I'll get asked about this later.

- 1) All "scrubbers" are not created equally! Although there are benefits to any photosynthetic filtration process, only true ATScrubbers are designed to utilize the incredible power of algal turfs. Turfs are 10 to 100 times as effective as macroalgae. Only filters with true algal turfs are truly scrubbers.
- 2) These systems are different! Many have failed simply due to mis-communication of the Dynamic Aquaria paradigm. ATS microcosms work incredibly well, but only if one allows them to! The success of Dr. Adey's personal systems, hundreds of ATScrubber owners, and Inland's 40,000 + gallons of thriving captive reef illustrate the incredible potential of this difference. Accounts of frustrated professional aquarists, on the other hand, illustrate the gravity of that difference.

3) Misinformation!!! Ninety percent of the articles/books published, and online services about "scrubbers" have been written by authors with little or no experience with these systems. One of the most striking illustrations of this is a FAMA article describing algae scrubbers as "mechanical filters that remove algae from the water or magnets used to scrape the glass". Another favorite, entitled "The Difference Between Algae Filters and Algae Scrubbers" concluded with the author mentioning that he had no idea what an algae filter is. Even venerable authors appear content to echo hackneyed critiques, without investigation.

Well, I'd better open things up to questions and answer. I was going to address some of the specific critiques of ATS, but let's see if there are any questions about points I glossed over. I would like to reemphasize one point concerning the "controversy" concerning ATScrubbers. Nearly all the information published about ATS systems in the hobby literature and on the net has been written by authors who admit to having no experience with the technology. Considering all the hoopla and magazine sales generated by the 1994 controversy, I'm amazed at hobbyists' willingness to settle for such heresy.

Several of the articles mentioning Algal Filtration in 1997 (Delbeek, Sprung, Tyree to name a few) refer to successful mariculture operations using this technology, yet not one of these authors bothered to pick up FAMA and drop us a line or e-mail to get a little first hand information. I believe the Algal Turf Scrubber has a lot to contribute to our hobby and I sincerely appreciate your giving me an opportunity to tell you about it.

Like we always say, DON'T TAKE OUR WORD FOR IT - COME AND SEE FOR YOURSELF!
Please feel free to e-mail if you have any questions.

Thank you,

Morgan Lidster

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Question and Answer Session

Q: Is there a picture anywhere on the web of one of these systems so we can get an idea what they look like?

A: Well, there are some photos on Compuserve's fish net. I'm not sure about ours being elsewhere. The Smithsonian systems are featured somewhere. I'd have to check the site. I have files (photos) that I'll send (e-mail) or provide for post on request.

Q: What do you do w/ the algae that you harvest from your scrubbers? Is it composted?

A: We feed some of it, sell some of it and compost a fair amount of it.

Q: Where do you attain the seed algae for the scrubber?

A: Originally from Adey's systems. It will show up on its own, but it takes significantly longer than using a seed screen.

Q: Do you have any reason to believe that system volume impacts the effectiveness of ATS?

A: Well, no more so than any other paradigm. That's not to say you can use one of our small systems on a 20,000 gallon system. Maybe I misunderstand the question?

Q: How do IA's and AWC's RDP-ATS systems differ?

A: They seem to be the same to me, from the models I have seen.

Q: Are you affiliated in any way?

A: Hmm... AWC, then Wildlife Ecosystems, were partners with IA in the now defunct SeaPhix LLC. A couple of years ago, controversy arose as to whether or not to continue royalty payments to Adey....we opted to stay with Adey and our two groups separated. At that point, the R&D for the hobby ATScrubbers had been done here and we were working with a common supplier. When we parted, our designs did as well, but remain relatively similar. The Clarks, owners of AWC, are great people and deserve the support of our hobby, IMO. I think that covers the question?

Q: What are the nitrate levels in your system ? I have heard that they are high ?

A: I am unaware of a detectable (via standard hobby kits) level in the building. We seldom ever test. It's possible someone knows something I don't, but I doubt it.

Q: For those who are not familiar with ATS, can you explain how it works and how one would go about setting it up?

A: The key to ATS, the thing that separates it from other algal filters and often called "scrubbers" is that it is designed to optimize the growth and long term maintenance of algal turfs. This is primarily the result of the dump bucket design, which is illuminated when the tank lights are off. The dump bucket is difficult to build. Our literature includes diagrams.

Q: I've heard many reports that SPS don't survive long in ATS systems, is this true?

A: Nope. We've been culturing SPS for about five years. Adey and Small have documented growth in Adey's ATS systems at greater than the mean growth on natural reefs. Most of the original myth criticisms ('94) have been recanted. For example, that you shouldn't keep sand on the bottom of your reef. Adey took real flack over that one.

Q: Is there information available for the Do-It-Yourself people in the hobby on building ATS setups?

A: *Dynamic Aquaria* has diagrams, we're available for questions and *Dynamic Aquaria* volume two has even more diagrams.

Q: There have been several people who have supposedly visited IA who have stated the systems looked very dirty and the water was green. Is there validity to this?

A: Who? I've never had anyone report that to me? I've had some pretty big skeptics here and have yet to know of anyone who did not have a positive response. Our water is not as clear as many Berliners, but we do not strive for it to be... We are working toward the goal of effective model microcosms and commercial mariculture. I suspect someone expected to see all living room type set-ups when they visited. I'll look for feedback later.

Q: What are the chances of algae spreading from scrubber into tank proper?

A: Basically, none. This is evidence of a distinct misunderstanding of nutrient cycling. The ATS's entire function is based upon utilizing the most efficient photosynthetic organisms known, under ideal conditions, within the same system, to out-compete less efficient algae for nutrient. Like "mangrove filtration", "sponge filtration", or "mud filtration", only super-duper charged and with additional benefit such as oxygenation and pH stabilization, allowing one to keep and feed fish too!!!

Q: Do you use carbon to control yellow in the water? And how much of the algae do you prune, how often?

A: Carbon: In the last year, we used carbon to clean up our retail display tanks. Generally speaking, we have not seen a need to though. Our oldest system is over five years old, receives 4-6 heavy feedings per day, has never had a water change (not recommended/to make a point only), and is still not a bit yellow. (I know of no other paradigm that would claim to be able to pull that off). As for algal pruning, if you mean in the ATS, we scrape all the excess algae once every 7-14 days.

Q: How is it that the algae stays out of the main tank? Lights? Circulation? Substrate?

A: Algae doesn't really stay out of the main tank in our systems, as we promote the use of decorative macroalgae. However, I assume the question was regarding problem algae (see previous response) Lights - we have used all common lighting paradigms over our systems. Circulation - due to oxygen saturation (?) we have found that we are able to get by with minimal circulation relative to conventional systems; turnover of system volume 1.5 to 5 times per hour. Substrate - all of our systems have always employed deep, oolitic, sand beds; no plenum. Some of our beds are as deep as 24". I do not believe it is possible to have a bed "too deep", if it is set up properly.

Q: What types of algae do you use in your scrubbers?

A: Algal turfs are comprised of several dozen species of algae. The community is rather dynamic. Dynamic Aquaria covers this in some detail. We tend to culture a bed of extremely dense, nearly maroon, algae. Of course, we still have a lot of diversity.

Q: Is not zooxanthellae algae? Does the ATS then out-compete the coral's algae for nutrients?

A: I guess it could. Any filter could. ATS is simply a much more powerful tool than any of the conventional ones. We utilize it to allow, high bioload, HEAVY feeding, and drastically minimized water changes.

Q: What is the smallest system you have used ATS on - what do you think would be the lower limit? Like 5-10g tanks?

A: The smallest ATS we have played with was 15 gallons. I have systems between 5 and 10 gallons that are enclosed in a jar (non sealed) and operate under the same philosophy. It's all nutrient cycling. ATS is just a super charged filter with none of the negative attributes of other filters...algae/fresh water plants can be used in the same way, there just not as efficient. Some of the participants may have seen our "ecoJars" at MACNA IX.

Q: Is there any protein skimming done on these systems?

A: We have never used protein skimmers. There has never been a need, based on our desired result with these systems. I'm not "against" skimmers, they can certainly be used in conjunction with ATS, I simply have yet to set up a system that needed one.

Q: How much light does it need, is the light included in the package?

A: The ATS.... we have always used high intensity lighting; first VHO and MH, now compacts. The lights are included in the ATScrubbers that we sell.

Q: If you are shipping corals out with water, then you have to replace that water. If you ship enough corals, then you are in essence doing water changes. With 40000 gallons total, and 10% per year water changed, that means you only ship out 4000 gallons worth of water per year. Comment?

A: I doubt that we ship that much, but I know, at least in the past, we easily spilled that much. Our display systems, lease maintenance systems, etc; however, are not subject to such turnover. Some of them have been maintained now for 4 and 5 years with no water exchange at all. This is not our goal and not recommended. BUT, considering the populations, the way we feed and the diversity within these with MINIMAL maintenance. Which is my goal.

Q: Which systems would be better refugium or scrubbers?

A: I'm not sure I understand the question. The purpose of the two is distinct. For most applications, ATS is the most effective nutrient cycling (filter) method I have tried. I also recommend Refugia be employed whenever possible to aid in particulate settling, biodiversity and generation of live foods.

Q: What do you recommend for filtration on a really big tank (over 350G)? I notice your largest scrubber is for 250G and under.

A: We have a couple of tanks in the 450+ range, such as the one at the Indianapolis Childrens' Museum. At MACNA last week, Bruce Carleson recently praised the ATS systems at Biosphere and the Townsend Marine Park...the latter is over a million gallons. Unfortunately, these systems have been limited by the utilization of other technologies such as sand filtration and minimized lighting allowance. As I mentioned in my presentation, many of the systems critiqued have not been maintained by Adey or under his approach. Nevertheless, these systems continue to be lauded by venerable folks such as Dr. Carleson.

Q: What is the percentage of the dry weight for different elements in the turf algae? For example, P and N and S

A: I only wish we had the time to monitor such things. We have rare species of fish that are perfectly raiseable; yet, lack the manpower to collect the spawns. *Dynamic Aquaria* provides such information in great detail.

Q: How is it possible to have a fully loaded reef within a couple of days with this system?

A: A great deal of the filtering power of the system is innate the the ATS screen. By moving the screen to a new system, one may set up a system with equally great nutrient uptake power. Several of our systems have been set up and receiving several daily feeding (via feeder) within 36 hours. Some of you may have seen our set up at MACNA in Chicago; that 55 was fed, heavily, nearly 40 times during the 48 hours or so that it was set up. I doubt any other animal at the conference was fed that weekend.

Q: Where do you believe the "yellow water" label that ATS got came from?

A: The Smithsonian and other systems not maintained under "Dynamic Aquaria" protocol. Some of those systems (not the Smithsonian) were run for over a year with no screen scraping. What would a Berlin look like under those conditions?? It's a real shame. Let me restate, however, that our systems are certainly not as "clear" as a heavily skimmed Berlin. We do not strive for them to be and I know of no one that has disagreed that any tint is offset by the aesthetic of the display. Perhaps some of you were at the Western Marine Conf in April when Julian described his new, non skimming, approach in which he harvests algae for nutrient cycling. Not a quote, but he said something along the lines of: This system has a bit of a tint to it, don't think it's unattractive, it's just different. If ever I were discontent with the color of a system, I would run carbon on it, like any knowledgeable reef aquarist. Ironically, I think anyone, upon investigation, would agree that our systems are

incredibly clear, once you consider how they are maintained and how conventional tanks would fare if critiqued by the same standard!

Q: How do you control alkalinity and calcium levels in your scrubber systems?

A: It varies. Some low calcium demand systems do very well just from the oolite. Our oldest system has not seen any calcium addition/water exchange in over five years and still has average 420 Ca w/ 2.5 meq. Larger demand: we use one of the commercially available two part additions, the one that BOB guy sells. Commercial systems: We use dissolved aragonite on some and Kalkwasser on others. Both seem to work equally well.

Q: Where do you get the terbellid worms that you use in your detritivore kits, which are so popular?

A: The terbellid worms, as well as all the creatures in our DetritivoreKit, Refugium Flora and Fauna Kit, etc. are cultured at Inland. This is why we had to stop shipping some of them last month. They are not available, in any significant number, from the wild, and we simply almost ran out and had to give them time to repopulate.

Q: Last question - Do you believe that people with currently successful systems should switch to using ATS? Or stay with their current setup?

A: Stay with what works. There is a very good reason as to why there has been so much opposition to ATS...two actually:

#1 The folks who originally promoted ATS basically told the hobby that they were doing it wrong, before they had actually proven (beyond Walter's home systems) that the ATS theory would work repeatedly, this understandably upset a lot of people.

#2 This is a tricky hobby. Most of us have spend countless hours and thousands of dollars finding something that works and/or people who are worth listening to. It is understandable that people would be adamant about the way they do things. Moreover, there is no reason to change if what you are doing works. However, ATS is a TOTALLY different approach. It is not a cure all, but it is an incredible tool for those working toward more stable systems and those that better mimic a natural environment. If this is your goal, I definitely believe ATS is worth looking into.

ATS (Actually the Dynamic Aquaria approach) isn't nearly as radical as it was just a couple of years ago. Refugai, live sand beds, mimicry of natural systems and attention to natural nutrient cycling make up the hottest buzz trends in our hobby today. Ironically, ATS is the last major tenent of Dynamic Aquaria to be investigated by the hobby. I know you'll like what's coming.

Thanks for listening.