

# Fish 'N' Chips

A Monthly Marine Newsletter  
January 2003 Issue

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## From Liz

By Elizabeth M. Lukan 1/27/03

***Oceanic USA recalls CDX first stage scuba regulators:*** Oceanic USA, of San Leandro, California, USA, has recalled approximately 24,700 Oceanic CDX first stage regulators used for scuba diving. Extreme vibration can occur within the CDX regulators, which can cause air leakage. Six reports have been received, but no injuries were reported. Regulators with serial numbers 9200001 to 9205622, 9800013 to 9801711, 0200001 to 0213294, 0D0001 to 0D3046, or 9D0001 to 9D3273 are affected. They were sold from May 1999 to October 2002. Recalled products should be taken to an authorized Oceanic dealer for free repair. Contact Oceanic for more information at (866) 723-2642 or visit <http://www.oceanicworldwide.com/>. The complete recall notice and a picture of the product can be found at <http://www.cpsc.gov/cpscpub/prerel/prhtml03/03047.html>.

***Visit This Month's Subscriber's Tank Showcase:*** Ken McWilliams' Reef Tank is this month's Showcase and can be seen at <http://www.marinefiends.com/showcases.html> (*updated 8/24/04*).

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# Filtration in a Marine Aquarium

by Hennie Landman

Edited by Elizabeth M. Lukan 1/27/03

## *Introduction*

Filtration can be a touchy subject, as just about everyone has his/her own ideas on what constitutes a "good" filter. May I suggest we try to establish what the filtration system should do (and not do...), and then look at options. I think we will all agree that the water quality of our tanks must be as close to that of natural seawater as possible, and that proper filtration plays a vital role in achieving this. I offer this "Introduction to Filters 101" as a starting point for the beginner's own research (I definitely do not presume to have all the answers, in fact, I still have many questions myself, so don't take this info as Gospel).

## *Background on the "nitrogen cycle"*

All living organisms eat some kind of food, and excrete some kind of waste. In our tanks this waste accumulates as "Dissolved Organic Content (DOC)", for want of a better word (sorry, I'm not a biologist, and must express myself in layman's terms). The DOC breaks down to ammonia, which is deadly poisonous to fish and inverts, even at very low concentrations. Certain "aerobic" bacteria break down this ammonia to nitrites, which is slightly less poisonous. Other "aerobic" bacteria then break down the nitrites, and turn it into nitrates. (These "aerobic" bacteria require oxygen rich water in which to live). Nitrate is much less poisonous - fish can tolerate up to 60 - 100 PPM, and inverts up to 5 - 20 PPM, I've read. However, "tolerate" is far from "enjoy", and we should strive to reduce the nitrate level to not more than 20 PPM for fish, and less than 2.5 PPM for inverts (again, in my opinion). The nitrates are further "broken down" to harmless nitrogen gas by "anaerobic" bacteria, which only live in an oxygen poor environment.

## *The requirements of the Ideal filter*

- It must remove waste from the system before it can break down into ammonia, nitrites
- It must have a large aerobic component to reduce ammonia and nitrite to nitrate
- It must have sufficient anoxic regions to allow the establishment of anaerobic bacteria, to reduce the nitrate to nitrogen gas
- It must supply adequate circulation to the tank
- It must be easy to maintain
- It must have sufficient "reserve capacity" to maintain water quality even if an animal (such as a snail, etc) dies and remains unnoticed in the tank.

- It must be able to "survive" short-term power failures or pump breakdowns without losing the beneficial bacteria.

## *Filter Types*

### *Under-gravel filters*

They have been the main "biological" filters for as long as I can remember. They supply oxygen-rich water, and a large surface area, allowing aerobic bacteria to thrive. They do not allow any anoxic conditions, so there is no nitrate reducing bacteria. They can thus lower ammonia and nitrite levels, but will increase nitrate levels in the long run. Also, waste is drawn into the sand, where it can accumulate and block the free flow of water, thus reducing the efficiency or the aerobic filtration as well. They require frequent cleaning, but are difficult to clean (siphon "vacuuming"). They can only survive being "switched off" for a short time (2-4 hours) before the aerobic bacteria start to die off. Used with "power heads" they supply excellent circulation.

### *Canister filters*

Another "old technology" mainstay. They are the most efficient removers of water borne particulate waste. Unfortunately they do not really "remove" the waste from the system, they only concentrate it inside the canister. They therefore require very frequent (like daily) cleaning to remove this waste before it decomposes, releasing the DOC back into the water. If used as a biological filter, using appropriate media, they are excellent aerobic filters, but also do not allow any anaerobic reduction of nitrates. They are fairly cumbersome to clean, requiring in-line shut-off valves, but in my experience still spilling some water every time they are uncoupled. If they are used as bio-filters they also require a pre-filter to prevent waste from accumulating in them. They do provide good circulation in the tank, and allow UV filters, etc. to be connected in-line. Due to the high organic load (detritus) normally found in these filters, and the small volume of the canister, they lose oxygen very rapidly when switched off. Aerobic bacteria can thus only survive for a few minutes if the power goes out.

### *Fluidized bed filters*

These are "new generation" aerobic filters. They are the most efficient aerobic filters available today. They do not build up any waste, and can maintain a very high aerobic bacterial population, without any maintenance or regular cleaning. They do not have any nitrate reducing capabilities, though, as they have no anoxic regions. They also produce nitrates at a very high rate, causing the nitrate level in the tank to increase to a dangerous level sooner than most other filters. Due to the high bacterial population they also have a good reserve capacity,

and can prevent ammonia spikes caused by dead organisms in the tank. Unfortunately they cannot survive a "stoppage" for more than a few minutes before the bacteria start to die off. This type of filter has a restricted flow rate (as the "fluidized" medium must remain in the filter, and too fast a flow will wash the medium into the tank (or sump), destroying the filter) and does not contribute much to tank circulation.

### ***Wet/Dry "Trickle" filters***

These are the filters most widely used today in "Fish Only" marine aquaria. They are very good aerobic filters, usually having enough "reserve capacity" to safely neutralize the decomposition of a dead creature in the tank, without causing a disastrous ammonia "spike". They also have the longest "switched off" survivability, as the media is exposed to air, and must only remain damp for the majority of bacteria to survive. They do tend to accumulate detritus over a long period, and require regular cleaning (every 4 - 6 months) to perform optimally. They do not have any anoxic regions, and does not support nitrate reducing anoxic bacteria. Because they are such efficient ammonia / nitrite reducing filters they tend to produce large quantities of nitrate, causing the nitrate level of the tank to increase over time - in fact many people refer to them as "nitrate factories". The water is usually returned via a dedicated pump, providing some circulation to the tank.

### ***Protein skimmers***

Also known as Foam Fractionators, these "filters" remove DOC from the water before it can decompose, thus preventing the formation of ammonia, nitrite and/or nitrate, to a large extent. I won't go into the principle of their operation, suffice to say that good quality skimmers do work very well. They can also "export" phosphate if used with "Kalkwasser" (a calcium additive). In my opinion a good quality skimmer is a MUST for any system, as it reduces the workload of any other filter.

### ***"Live Rock" and/or "Live sand" filtration***

Depending on rock, sand or both are used, this method is known as the "Berlin", "Jaubert", "NNR (natural nitrate reduction)" or "Modified Berlin" system. This filtration system makes use of efficient skimming (to remove most DOC before it decomposes), so-called Live Rock (for aerobic and anaerobic biological filtration), high water circulation using some power heads, and a very light bio-load. It is mostly used in "Reef-type" tanks, where exceptional water quality must be maintained, with the ideal being an undetectable nitrate level. The "Live Rock" is usually very porous calcitic or sandstone rock. The high water circulation causes a highly oxygenated area in the outer region of the rock, allowing ammonia and nitrite reduction. Deeper into the rock the anoxic condition is ideal for anaerobic bacteria, and nitrate to nitrogen

reduction occurs here. The proximity of the two regions also allows for a very efficient nitrate reduction.

The "Live Sand" method works on the same principle, with the sand close to the surface being aerobic, and the deeper region being anoxic. Both types, but especially the "Live Sand", also make use of small organisms, such as worms and Copepods, to eat the (primary) detritus of the fish, thereby also reducing their pollution effect. The "Modified Berlin" system uses both rock and sand, combining their advantages.

### ***Plant filters***

Algae consume nitrate and phosphate as food. A good growth of macro algae, or coralline algae, will thus use up some of the available nitrate. If the macro algae is regularly "harvested", the nitrate is removed from the system. Although some aquarists have reported success with the use of "algae filters", separate tanks with algae grown exclusively to extract nutrients, much greater success is usually achieved with the use of a Refugium. I run a section of my sump as a refugium. I have 4 "economy" household power compacts, totalling 80W (the equivalent of 480W of incandescent light), on a reverse daylight photo period.

Others have used "Mangrove filters", using Mangrove plants growing out of the water in the sump, to achieve the same goal. Personally I don't have any experience with these types of filtration, and can thus not comment on their effectiveness.

### ***UV (Ultra Violet) sterilizers***

These are not actually filters. They use ultra violet rays to kill (sterilize) any living organism in the water flowing passed the UV tube. This kills alga spores, bacteria and small parasitic organisms. It also kills the spores of coralline algae, beneficial bacteria and beneficial organisms (potential invert food). It is therefore more applicable in a densely populated fish only set-up, to reduce illness.

### ***Editor's Comments:***

The above article is the property of Hennie Landman and has been republished with his permission. My editing was limited to checking spelling and grammar (if applicable) and putting Hennie's article into the Fish 'N' Chips format.

Please visit Hennie's site for this article, a huge collection of beautiful photos and much more. Hennie's "Indoor Reef" can be found at <http://www.reefmaniacs.com/hl/>.

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## Caught In The Net

By Elizabeth M. Lukan 1/27/03

### New Stuff Found

On Advanced Aquarist's Online Magazine (<http://www.advancedaquarist.com/>):

- Volume II, Issue 1, January 2003 is now available.

On Reefs.org (<http://www.reefs.org/>):

- Download: TankLogger

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## Marine News

By Elizabeth M. Lukan 1/31/03

### ***1/6/03 - DC, USA:***

The Nature Conservancy and The Ocean Conservancy are collaborating in an effort to conserve and protect the Caribbean marine environment and its species.

News Release: <http://ens-news.com/ens/jan2003/2003-01-06-09.asp#anchor4> (*url dead 8/24/04*)

### ***1/14/03 - California, USA:***

Integrated networks of marine reserves offer the best formula for protecting and preserving marine resources, according to a new report released today by the Pew Oceans Commission. Marine reserves are areas in which no extractive use of any living creature, fossil, or mineral resource, nor any habitat destruction, is allowed.

News Release: <http://ens-news.com/ens/jan2003/2003-01-14-10.asp> (*url dead 8/24/04*)

### ***1/17/03 - California, USA:***

A group of researchers has shown that sediments in the deep ocean can be a biomedical resource for microbes that produce antibiotic molecules.

News Release: <http://ens-news.com/ens/jan2003/2003-01-17-09.asp#anchor7> (*url dead 8/24/04*)

**1/24/03 = DC, USA:**

After a year of deliberations, the 16 Commissioners of the U.S. Commission on Ocean Policy agree that the nation's oceans, coasts and marine resources are in trouble. Pollution, coastal development and intensive fishing have caused severe harm to many U.S. marine ecosystems and to the economies of many coastal areas.

News Release: <http://ens-news.com/ens/jan2003/2003-01-24-10.asp> (*url dead 8/24/04*)

**1/24/03 - Florida, USA:**

An invasive, coral smothering seaweed has spread like a green tide across the reefs along the south Florida coast. Recent reports from divers and fishers show that the seaweed has become so thick on reefs in Florida's Palm Beach County, about an hour north of Miami, that it is forcing lobsters and fish away.

News Release: <http://ens-news.com/ens/jan2003/2003-01-24-06.asp> (*url dead 8/24/04*)

**1/29/03 - California, USA:**

Seacology, the world's premier nonprofit organization with the sole purpose of preserving island environments throughout the globe, announces an unprecedented partnership between Caribbean and South Pacific Islands. Seacology specializes in win-win projects where islanders receive a critically needed benefit they request in return for making an important sacrifice on behalf of the environment.

News Release: <http://www.ewire-news.com/wires/4F1FC695-2E3A-43DC-8CCAD6B4D49C2759.htm> (*url dead 8/24/04*)

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## **Chips...er...Tips**

### **Skimmer Cup Balancing Act**

By Elizabeth M. Lukan 1/31/03

I run a CPR Bak-Pak 2 skimmer on my tank and the O Rings that keep the skimmer cup balanced at the waterline only last so long. They keep snapping no matter how well I take care of them. It's not like they are expensive but who wants to keep ordering them and paying for shipping. Or, more likely, who can remember to keep extras on hand - I've got enough to do! I've started using rubber bands instead. The thick rubber bands work just as well, and two will do the job if one isn't fat enough. Works for me and pretty much costs nothing since I've

already got rubber bands in the house!

**To Submit Your Tip:** Send your tip via email to fishnchips@mindspring.com (visit <http://www.marinefiends.com/submit.html> - updated 10/12/05) and I'll publish it in an upcoming issue of Fish 'N' Chips. I'll write it up for you or you can do it yourself if you are so inclined. Make sure you let me know if I can include your name and email address or if you'd rather go anonymous.

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## Upcoming Events

By Elizabeth M. Lukan 1/27/03

Event	Start Date / Time	End Date / Time	Location	Event Details, Notes, and For More Info
Aquarium Survey for Mike King	now	unknown		Reefs.org: <a href="http://www.reefs.org/survey/mike_survey.html">http://www.reefs.org/survey/mike_survey.html</a>
Marine Aquarium Animals Survival Survey 2002	now	unknown		Marine Conservation Society, <a href="http://www.mcsuk.org/">http://www.mcsuk.org/</a>
Salinity Survey	now	unknown		Reefs.org: <a href="http://www.reefs.org/">http://www.reefs.org/</a>
Salt Mix Survey	now	unknown		Reefs.org: <a href="http://www.reefs.org/">http://www.reefs.org/</a>
International Coral Reefs Conference of Paris (CIRCoP)	1/31/03	2/1/03	Paris, France	<a href="http://www.circop.com/">http://www.circop.com/</a>

MASLAC Meeting: Larry Couture re: Cycling a Marine Aquarium and Some New Ideas on the Process + Lance re: Members tank presentation	2/14/03 7pm		Denny's Restaurant, 3060 San Fernando Rd, LA, CA, USA	Marine Aquarium Society of Los Angeles County: <a href="http://www.maslac.org/">http://www.maslac.org/</a>
#Reefs Talk: Frank Marini	2/23/03			<a href="http://www.reefs.org/access/index.html">http://www.reefs.org/access/index.html</a>
MASLAC Meeting: Ed Ramirez re: Breeding Marine Clownfish at Home; What you Need to Know to DIY + Fish Disease Roundtable	3/14/03 7pm		Denny's Restaurant, 3060 San Fernando Rd, LA, CA, USA	Marine Aquarium Society of Los Angeles County: <a href="http://www.maslac.org/">http://www.maslac.org/</a>
MASLAC Meeting: Carol Keen re: Keeping and Caring for Seahorses + Drew Wetherholt re: Members tank presentation	4/11/03 7pm		Denny's Restaurant, 3060 San Fernando Rd, LA, CA, USA	Marine Aquarium Society of Los Angeles County: <a href="http://www.maslac.org/">http://www.maslac.org/</a>
Tampa Bay Aquarium Society & Tampa Bay Reef Club host Eric Borneman talk	4/12/03		Lakewood High School CAT Auditorium in St. Petersburg	No admission charge! <a href="http://www.aka.org/TBAS/EricBorneman.html">http://www.aka.org/TBAS/EricBorneman.html</a> (url dead 8/24/04)
International Marine Aquarium Conference 2003	5/2/03	5/4/03	Chicago, IL	<a href="http://www.theimac.org/">http://www.theimac.org/</a>

Third International Days of Marine Aquaristic	6/7/03	6/9/03	Salle des fêtes in 67400 Illkirch Graffenstaden, Strasbourg, France	Organized by Récif France. Announced: Hans-Evers Balling, Heiko Blessin, Craig Bingman, Dieter Brockmann, Robert Brons, Lars Sebralla, Julian Sprung, Dieter Stüber. Contact: <a href="mailto:jjekert@evc.net">jjekert@evc.net</a>
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**To Submit Your Event:** Send your event and all the specifics (date, time, location, pricing, contact info, etc.) via email to [fishnchips@mindspring.com](mailto:fishnchips@mindspring.com) (visit <http://www.marinefiends.com/submit.html> - updated 10/12/05) and I'll publish it in all issues of Fish 'N' Chips prior to the event.

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## Prove It!, a Bibliography

By Elizabeth M. Lukan 1/27/03

**Article:** From Liz Recall Notice

- The U.S. Consumer Product Safety Commission (CPSC) Subscription List (<http://www.cpsc.gov>)

**Article:** Marine News

- Environment News Service, <http://ens-news.com/>

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To unsubscribe, ~~send an email to [FishNChips-unsubscribe@yahoo.com](mailto:FishNChips-unsubscribe@yahoo.com)~~ visit <http://www.marinefiends.com/> (*updated 8/24/04*).

Any and all comments, suggestions, etc., should be directed to [fishnchips@mail.com](mailto:fishnchips@mail.com).

The Fish 'N' Chips Website can be found at <http://www.marinefiends.com/> (*updated 8/24/04*).

To view the current issue of Fish 'N' Chips, visit <http://www.marinefiends.com/current.html> (*updated 8/24/04*).

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