Fish & Chips

A Monthly Marine Newsletter
July 1999 Issue

From Us

By Elizabeth M. Lukan 7/19/99

As promised last month, this month's Critter Corner features the first part of my Tridacnid Clams series. This article, called **Tridacnid Clams: The Basics** covers, well, the basics. It's about the biology of these beautiful animals and lays the groundwork for my next article which will cover what you need to know to actually keep clams in your tank. More to come as my research continues.

The Hobbyist Skimmer Review Survey hosted by Ian McDonald has been closed due to lack of response. I will continue to publish the reviews until I have no more. I would like to thank Ian for his time and effort in trying to do this. I know he had high hopes for this survey and I for one am sorry that things didn't work out.

Critter Corner
Tridacnid Clams: The Basics

By Elizabeth M. Lukan 7/22/99

Tridacnid clams taxonomy is as follows:

- Phylum: Mollusca
- Class: Bivalvia
- Order: Veneroidea
- Family: Cardiacea
- SubFamily: Tridacnidae

The tridacnidae family can be broken down into two genera containing eight species as follows:

- Hippopus (genus)
  - Hippopus hippopus
  - H. porcellanus
- Tridacna (genus)
  - Tridacna crocea
  - T. derasa
  - T. gigas

- T. maxima
- T. squamosa
- T. tevoroa (According to The Reef Aquarium Volume One (July 1994), the name tevoroa will be a junior synonym of Tridacna mbalavuana Ladd, but this change had not yet been formally published.)

A ninth species, Tridacna rosewateri, isn't being generally accepted because it was described only from shells found in an isolated region in the Indian Ocean.

Where You From, Partner?
(Distribution)

Tridacna clams are found throughout the Indo-Pacific and Red Sea areas. They are usually found among corals or on sand and rubble areas next to reefs. The following table shows the clams' distribution areas.

<table>
<tr><th>Clam</th><th>Distribution</th><th>Notes</th></tr>
<tr><td>Hippopus hippopus</td><td>Found from the Nicobar Islands to Tonga.</td><td></td></tr>
<tr><td>Hippopus porcellanus</td><td>Found only between eastern Indonesia and western Papua-New Guinea.</td><td></td></tr>
<tr><td>Tridacna crocea</td><td rowspan="3">Found from the Nicobar Islands in the west to Fiji in the east.</td><td></td></tr>
<tr><td>Tridacna derasa</td><td></td></tr>
<tr><td>Tridacna gigas</td><td>There are doubts about T. gigas actually being found in Fiji. According to The Reef Aquarium Volume One, years of observations throughout Fiji have never turned up any living T. gigas or fossil shells. T. gigas has, however, been "re-introduced" there.</td></tr>
<tr><td>Tridacna maxima</td><td rowspan="2">Found throughout the Indo-Pacific, from the Red Sea in the west to Tonga and Pitcairn Island in the east.</td><td rowspan="2">These Tridacna clams have the largest distribution area.</td></tr>
<tr><td>Tridacna squamosa</td></tr>
</table>

Tridacna tevoroa	So far has only been found in eastern Fiji and islands within the Ha'apai and Vava'u groups of Tonga.	

Tridacnids are usually limited to shallow water where they'll receive the most light. Some are found in water shallow enough that the clam is exposed to air during low tide. T. gigas can be found as deep as 66 feet (20 meters). T. tevoroa is only found in deep water.

The Knee Bone's Connected to the Leg Bone...
(Morphology and Anatomy)

Tridacnids have two valves (shells), like normal clams. The major difference between normal clams and tridacnids is the presence of zooxanthellae.

The mantle of the clam increases the surface area available for exposure to light. The mantle is an extension of the inhalant and exhalent siphons and is also referred to as siphonal tissue. The mantle contains majority of the zooxanthellae as well as fixed cells called iridophores that contain pigments. These pigments are mainly in the color range of blue to brown or green to yellow. These pigments and their combinations are the reason for the wide range of colors and patterns that are found in these clams. The pigments' main function is to protect the clam against excessive light and UV radiation.

If clams do not receive the proper light intensity and quality, they will lose their bright colors. This can happen very quickly. When clams lose their bright colors, the brown color of the zooxanthellae becomes visible. Unless conditions are improved immediately, the zooxanthellae may begin to disappear too, and the clam will take on a whitish-brown color. This condition is called bleaching and once this has occurred, death will follow. Improper lighting does not always cause bleaching. Bleached clams have been reported under intense metal halide lighting. This lighting is normally ideal, but the bleaching may still occur when iodine has been depleted.

The inhalant siphon is made up of an elongated opening. Fringing tentacles sometimes surround this opening. The tentacles will strain out large particles. The exhalent siphon forms a raised cone, which can be found further along the mantle from the inhalant siphon. Water leaves the clam's body cavity through the exhalant siphon after being filtered by the gills.

Since the clam's siphons and mantle are in an upper position, the internal organs have been twisted 180 degrees. This twist causes organs like the heart, inhalant and exhalent siphons, and stomach to lie near the top of the body, just below the mantle. With the siphons on top of the clam, even more surface area is available.

Another result of the rotation described above is that the muscular foot, which is very prominent in other clams, is greatly reduced in tridacnids. The foot of a tridacnid can be found next to the hinge of the valves. To make up for the small and functionless foot, tridacnids have a more prominent byssus gland. The byssus gland produces filaments called byssal threads that extend through an opening between the two valves and fasten the clam to the substrate. T. gigas, T. derasa, T. tevoroa, and Hippopus spp., the larger clams, will lose these glands as they grow. Instead of fastening themselves to the substrate with byssal threads, they will rely on their size and weight to hold them in place.

Tridacnids have hundreds of eyes along the edges of their siphonal tissue (mantle). T. crocea and T. maxima can also have eyes on top of raised tubercles scattered over the mantle surface. These eyes are used mostly to detect shadows, which warn the clam of potential predators. The eyes are also sensitive to green, blue, and ultraviolet light. This helps the clam to position itself toward the light to expose as much zooxanthellae as possible. The eyes may also function to detect excessive amounts of potentially harmful UV wavelengths.

Clams also have light concentrating organs in their mantles called hyaline organs. Hyaline organs are translucent windows that allow more light onto pockets of zooxanthellae. This increases the clam's metabolism.

Cheeseburger With Fries To Go, Please (Nutrition & Feeding)

Most clams fulfill their nutritional requirements by, among others, filter feeding and absorbing dissolved organic compounds from the water. Tridacnid clams have gone further than this by using zooxanthellae to manufacture food for themselves.

The zooxanthellae are located within zooxanthellal tubules. The tubules extend from the stomach into the mantle tissue. This is different from corals who's zooxanthellae are located within individual cells. The zooxanthellae (through photosynthesis) provide clams with the same products corals receive. The zooxanthellae transforms carbon dioxide and dissolved nitrogen, such as ammonium, into carbohydrates and other nutrients for their hosts. Some other nutrients the clams receive from the zooxanthellae are: carbon (in the form of glucose) and amino acids like alanine. Research has shown that glucose is the primary carbohydrate released by the zooxanthellae to the clam, followed by a group of glucose-based oligosaccharides, then glutamate, aspartate, succinate, alanine, and glycerol.

With sufficient light, the zooxanthellae can provide all the respiratory carbon requirements of a clam. The zooxanthellae in return use the nitrogenous wastes of the clam (mostly ammonia) as a nitrogen source. The tridacnids benefit greatly from this system because it allows them to use a very efficient internal food source. The recycling of nutrients between clam and zooxanthellae minimizes energy loss between trophic levels.

Tridacnid kidneys contain large amounts of calcium phosphate. The role of this phosphate is unknown. These deposits are also found in clams without zooxanthellae.

The mantle also absorbs dissolved nutrients directly from seawater. When exposed to light, the zooxanthellae in the mantle will take in ammonia, nitrate, phosphate and sulfate from the water and use them to make amino acids. This explains why tridacnid clams are able to lower these substances within closed systems, such as your home aquarium. Depending on their need to eliminate excess ammonia, the clams can also expand and contract the mantle to adjust for light intensity changes.

It has been shown that additions of ammonia, nitrate and ammonium (mostly in the form of ammonium nitrate) to breeding (culture) systems has improved the growth of juvenile tridacnid clams. These breeding systems were open systems. Unlike our home aquariums, these systems received a constant supply of nutrient poor seawater. Additions of these substances are not necessary to the home aquarium where nutrients are generally many, many times (10 to 100 according to The Reef Aquarium Volume One) higher than seawater.

Studies noted in The Reef Aquarium Volume One on feeding and growth of tridacnids show the following:

- Filter feeding of particulate organic matter alone in T. gigas can meet 64% of the carbon requirements of 4.2 cm specimens.
- This percentage declines to 34% in 16.7 cm specimens.
- T. derasa and T. tevoroa could easily gain their carbon requirements from zooxanthellae alone.

T. gigas' growth rate and large size may be reached because of its ability to use both autotrophic and heterotrophic feeding. Using both feeding methods means more carbon is produced which means more carbon can be used for growth because the clam's respiration needs are also being met.

The role of phytoplankton in tridacnid nutrition is not understood. Although it is believed that phytoplankton provides the clam with some protein, it may be just a carbohydrate source. It is unlikely that there is enough phytoplankton on the reef to meet the clam's needs.

It is believed by some that clams must be fed. Especially since clams have feeding appendages like gills, palps, and a digestive system. The gills are required for respiration, ammonia expulsion, and possibly the intake of nitrate. The palps are greatly reduced and the digestive system is used to expel excess zooxanthellae.

Zooxanthellae can produce more oxygen than is required by the clam. High levels of oxygen can be lethal and must be eliminated, either through the mantle or, maybe, the gills.

There is speculation that tridacnids digest the older zooxanthellae as a source of protein but studies have shown that much of the zooxanthellae found in the stomach, rectum, and feces of tridacnids is still alive and fully functional. Zooxanthellae is usually resistant to digestion so this is not surprising. Clams obtain their zooxanthellae when they are juveniles. The zooxanthellae is introduced through the feeding organs and move from the stomach to the mantle through the tubule system. If the zooxanthellae weren't resistant to digestion, it would never make it to the mantle. Clams have been known, especially after being stressed, to release thin, brown strands from the exhalent siphon. Microscopic examination of the strands reveals viable zooxanthellae. According to The Reef Aquarium Volume One, it is possible to cultivate this expelled zooxanthellae which would prove useful to those considering breeding tridacnids. No other information was provided on how you would cultivate the zooxanthellae.

A Baby! - Eh? What'd I Miss?
(Reproduction)

When Tridacnid clams first reach sexual maturity, they are male and then become simultaneous hermaphrodites about a year later. This makes tridacnids protandric.

Clams reach full sexual maturity at approximately 5 to 7 years according to The Reef Aquarium Volume One. But, according to The Secret Of The Giant Clam by Annie Mercier and Jean-Francois Hamel that appeared in Freshwater And Marine Aquarium's May 1996 issue, sexual maturity is reached in 3 to 5 years. Each species matures at a different age. Some clams become sexually mature as males within two years and will then gradually acquire female gonads.

Even though clams have male and female sex organs at maturity, the release of sperm and eggs are separate. This is to prevent self-fertilization, although it is not guaranteed to do so. Usually, sperm is released first and then the eggs.

Self-fertilization and cross-fertilization between different species can occur. Hybrids can exhibit characteristics of both the parent species. Known and suspected hybrids include:

- Hippopus hippopus and H. porcellanus
- T. maxima and T. crocea
- T. derasa and T. gigas
- T. maxima and T. squamosa

At lower latitudes, breeding can occur throughout the year. But, at higher latitudes, each species of tridacnid seems to have its own breeding season as follows:

Clam	Breeding Season
Hippopus hippopus	Summer
Hippopus porcellanus	Breeding season not found in my research.
Tridacna crocea	Summer

Tridacna derasa	Spring
Tridacna gigas	Fall
Tridacna maxima	Winter
Tridacna squamosa	Winter
Tridacna tevoroa	No Data

Sperm release can be triggered by temperature, light, salinity changes and the presence of pheromones. The release of sperm is thought to be a cue for the release of eggs by other clams and vice versa with clams further away releasing sperm because of the presence of eggs in the water. Sperm release in a hatchery can be artificially induced by adding to the water macerated clam gonads or neurotransmitters like serotonin.

Tridacnids in the home aquarium may spawn after some kind of disturbance to their environment. This would include excessive additions of freshwater, increased lighting, addition of carbon, or UV exposure. The clams sometimes die a few days after spawning in the home aquarium. This is probably because of the disturbance to their environment and not the actual spawning. But, there is also the chance that the sperm release may be toxic and the amount of sperm within the closed system of the aquarium kills the clams. In the case of a spawning in the home aquarium, a partial water change afterwards is recommended.

Sperm and eggs are released into the water by strong contractions of the adductor muscles which close the valves (shells) vigorously. This can continue for over 30 minutes releasing billions of sperm and millions of 100 micron diameter eggs into the water. For the larger species, hundreds of millions of eggs are released.

The stages of clam growth are as follows:

- Approximately 12 hours after fertilization, the eggs hatch. The larvae are called trochophores. No solid food is taken during this stage which lasts for 12 to 24 hours.
- Metamorphosis occurs sometime in the next two days. They are now bivalved veligers about 160 microns long. The veligers take in dissolved nutrients and start to ingest zooxanthellae and phytoplankton. Symbiosis with zooxanthellae won't happen until after the final metamorphosis.
- About a week after fertilization, the veligers transform into pediveligers (pedi means foot). At this stage they develop a larval foot and begin to settle, they also alternate between swimming and resting on the substrate.
- Sometime in the next 9 days, the clam settles permanently on the substrate and uses its byssal threads to attach itself. The clam is now a 200 micron juvenile. The clam can still travel short distances using their foot.

What actually triggers metamorphosis and substrate selection is unknown. It takes approximately 1 to 2 weeks from fertilization to settlement and symbiosis with the zooxanthellae. The larger species have shorter larval periods.

The zooxanthellae, which is ingested by the clam during the veliger stage, are dinoflagellates possessing a flagellum to help them move. The algae becomes encysted as they lose their locomotion organ and may stay in the stomach for as long as a week. The algae is not ingested, they are stocked intact along the gut. A few days after metamorphosis, the zooxanthellae can be found in the tissue adjacent to the stomach and then in the rows in the tubules which extend into the still developing mantle. Beating of the cilia lining the tubule move the zooxanthellae along the tubular system. The final step in symbiosis is reached when the zooxanthellae begin to grow within the mantle. The zooxanthellae divide inside the juvenile. A three-week old clam has about one hundred cells. An adult would have hundreds of millions.

Propagating these clams in the home aquarium is possible according to The Reef Aquarium Volume One. Some problems faced with the breeding of clams follow:

- Since sperm production is easily induced, getting clams that can produce eggs is a hurdle that will have to be overcome.
- Once the veliger stage is reached, the clams can be fed single-celled algae (for example: Isochrysis galbana). Success can be reached without feeding.
- After metamorphosis, zooxanthellae has to be introduced into the clam.
- Growing zooxanthellae cultures is not difficult but getting a suitable strain may be.
- Once symbiosis with the zooxanthellae is reached, the clam only needs light and the proper nutrients to promote shell and tissue growth. Proper nutrients include calcium, strontium, iodide, ammonium, sulfate, and nitrate.
- Bacteria will cause some deaths. Antibiotics will help limit these losses.

How Big? How Old?
(Growth)

Some species of tridacnids, like T. gigas, can reach ages over one hundred years. Their size is now believed to be due to their rapid growth instead of age.

T. derasa and T. gigas, the largest of the tridacnids, can grow more than 4 inches (10 cm) a year. Smaller tridacnids like T. crocea and T. maxima grow only 0.8 to 1.6 inches (2 to 4 cm) a year. T. gigas can obtain a length of 2 feet (60 cm) within 10 years.

Growth during the first year is relatively slow. After the first year, growth increases rapidly for the larger species. The smaller species' growth rate slows. Growth and calcification rates also slow as the clam becomes sexually mature.

Tridacnids can live for 8 to 200 years depending on the species according to The Reef Aquarium Volume One. But, only 20 to 100 years according to The Secret Of The Giant Clam by Annie Mercier and Jean-Francois Hamel that appeared in Freshwater And Marine Aquarium's May 1996 issue. The clams form seasonal growth bands in their shells making it possible to age sections of dead shells. It was noted in The Reef Aquarium Volume One that very little work has been done on age measurements.

Till Next Time

Well folks, that's it for now. Coming soon is the second part of this article series on Tridacnid Clams which will cover the keeping of these animals in the home aquarium.

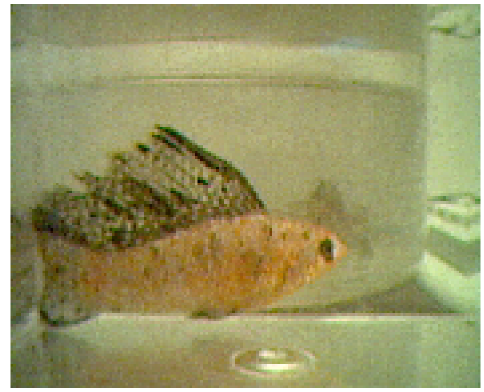
Saltwater Sail-Fin Mollies

By Carol E. Keen
Edited By Elizabeth M. Lukan, 7/14/99

Yes, you read the title correctly! Mollies are truly brackishwater fish and so they can live in your reef tank! In fact, once you get them into saltwater, you have a wondrous thing in your tank. Any of the mollies can be saltwater mollies, the "regular" mollies, black mollies, balloon mollies, and the Sail-Fin mollies. I raise the Sail-Fin mollies because I love their large elaborate finnage.

Mollies can tolerate many temperatures, but I keep mine in the saltwater tanks at 74 degrees Fahrenheit. Sail-Fin mollies were named such for the large dorsal fins on the males. It looks much like a boat sail, and that is where they got their name. The females have a slightly larger dorsal fin than standard mollies, but not as large or ornate as the male does.

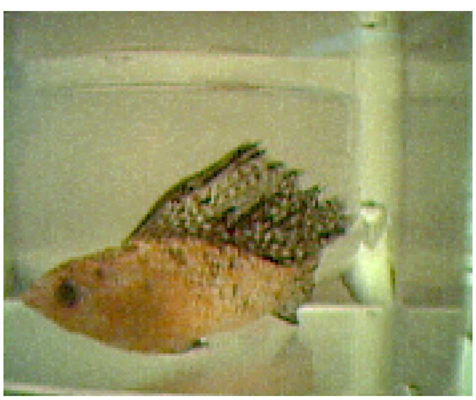
Mollies can live up to 4 years, if well fed, and in saltwater or brackishwater. Sail-Fin mollies reach 4" in length when "grown". As with all fish, they grow all their lives, but they do slow down to a non-noticeable growth at 4". Most of the other mollies are smaller when grown, usually about 2". The smallest ones I have seen are the balloon mollies, which have been bred to be compact, thus shrinking their size, and limiting their ability to breed.



The male Sail-Fin molly can have a dorsal fin at least half as tall as the fish is long. In some males, they have extra large dorsals, making the dorsal fin look 4" high. The dorsal fin is usually 2" high at the least. Female mollies that loose their males but have bred can keep having babies for up to six months. So, you can rear those babies and not loose your strain of molly just because you lost the male(s).

To get a molly into saltwater, all you have to do is add saltwater to the tank it is in, or its bag, until you get it over half full with saltwater, and then the fish can go into your tank. Since mollies are messy, I think of them as the saltwater "goldfish". Mollies cycle a tank much better than damsels in my opinion, and will continue living and even cycle new tanks when needed. A saltwater molly tank need not have heavy filtration if you want just a molly tank. I use sponge filters in my 55 gal saltwater Sail-Fin molly tank.

Mollies, as a species, are a gentle fish. As long as you feed them well, they will not eat their babies. Since mollies are livebearers, you can expect babies every 28-31 days. The babies eat newly hatched brine shrimps at birth, or finely crushed flake foods. They are completely independent, and can swim as soon as they are born, resulting in their classification as livebearers. Young mollies grow quickly, and know when to hide, so if you move them to another tank a few days after birth, they can be a challenge to catch.



By the age of two or three months, mollies are usually showing if they are male or female. At this time you can separate the girls and guys, or leave them all together in the tank. It truly depends on if you are working with them genetically, or not.

If you are housing your mollies in a reef tank with many inhabitants that eat small fish, you are likely to not see the baby mollies, or not see them for long. Baby mollies are used as a saltwater food when rearing certain fish, like seahorses for instance.

Tank raised Sail-Fin mollies are very friendly. They can be trained to eat out of your hand. They will eat flake foods, and they also clean up the tank. They will eat dead shrimps, and live or frozen brine shrimps. They also keep the algae down in tanks, as they eat it. Because they originated in brackishwaters, they eat a lot of vegetable matter, but they do not eat all the plants in your tank like an Angel fish will.

If you are looking for a new fish to add to your saltwater tank, that will not eat its neighbors, or move the corals about, I suggest you take another look at the molly. You might find an old favorite fish that got called "freshwater" is truly your saltwater tanks' friend.

Editor's Comments:
Editing was limited to spelling and grammar corrections. No other editing was done, what you read was exactly what was sent to me by Carol. You can get in touch with Carol E. Keen at her website, Fish To The Nth, at http://home.earthlink.net/~fish2nth/ **(address updated 4/19/00)**.

Photo Credits:
All images with this article were provided by Carol E. Keen.

EuroReef F2 Skimmer

- A Hobbyist Skimmer Review -

Edited By Elizabeth M. Lukan, 7/15/99

General Information:
All ratings are 1 through 10 (10 being the best or yes, 1 being the worst or no). The items in parentheses are only given as a more detailed explanation and to give you an idea of what was meant by the category. Permission to publish these reviews was obtained through a clause in the survey. See the end of this article for review, survey, and article credits.

Construction Quality (Acrylic thickness, polish, glue job, etc.):
Score: 10

Aesthetic Quality (Does it look good, etc.):
Score: 9

Performance (Does it keep your water clean, must you adjust it all the time, etc.):
Score: 9

Foaming (Does it do it consistently, is it nice and thick, is it dark, etc.):
Score: 10

Ease Of Installation:
Score: 9

Would you buy it again?:
Comments: Yes

Electrical Efficiency (Does the pump it uses work well, etc.):
Score: 9

Plankton Level (Do you have a lot, etc.):
Score: did not answer

Overall Value (Did you get what you paid for, etc.):
Score: 5

Overall Satisfaction (Do you like it, etc.):
Score: 10

Comments:
The above ratings are on my EuroReef F2. It is running on a 175 gallon reef tank with two 22 gallon sumps. It has been running for about 4 months now and none of the reef inhabitants have complained. I have no real plankton levels so I didn't place a rating in that area. The rating of 5 in the overall value is low due only to the cost of the unit (600.00) and has nothing to do with the performance of the unit. It's a workhorse and hopefully the price will come down soon on them. It's quiet, foams like mad, and is really energy efficient. What more can I say?

Review, Survey, and Article Credits:
Review by Jim Black on 11/24/98.

Survey created and hosted by Ian McDonald (IANsSnakes@aol.com)
The Survey is closed.

Ian would like to extend his thanks to Chris Paris (aka Cap) and Steve Wolfe (aka NerveGas) for all their assistance in getting the survey going.

Editor's Comments:
Editing was limited to spelling corrections and some grammar (capitalizing the beginning of a sentence, adding a period at the end, etc.). No other editing was done, what you read was exactly what was sent to Ian by the reviewer.

The EuroReef F2 can be found on the following websites: AquaDirect by AquaLink (http://www.

aquadirect.com), Marine Depot (http://www.marinedepot.com), Premium Aquatics (http://www.premiumaquatics.com), and Jeff's Exotic Fish (http://www.exoticfish.com) with prices ranging from $549.00 to $579.00 US Dollars. EuroReef's manufacturers do not have a website.

Photo Credits:
The EuroReef Skimmer image (euroreefmd.jpg) was obtained at (and permission for its use granted by) the Marine Depot website (http://www.marinedepot.com) back in February 1999 when I published the review of the EuroReef F3. At that time, Ken informed me that the specific model pictured was unknown. I tried again, but was still unable to find images of the individual EuroReef models, so the one above will have to do yet again.

Caught In The Net

By Elizabeth M. Lukan 7/19/99

The following list contains Information & Educational Sites containing Articles.

Informational & Educational Sites

Articles

- **Big Al's On-Line - http://www.aquariumservices.com (2/1/99)** *Serving Canada. (Listed by ELukan, Fish & Chips)
- **Choosing Your Next Anemone - http://fins.actwin.com/species/anemone.html *(updated 8/24/04)* (11/26/98)** *By Phil C. Henderson (Listed by ELukan, Fish & Chips)
- **Don Tuleja - Duroc's Fish Page - ~~http://www.oncebitten.com/fishpage~~ (address updated 4/19/00: no longer valid) (2/22/99)**
- **Exotic Tropicals - http://ExoticTropicals.com (5/4/99)**
- **Field Guide To Anemone Fishes And Their Host Sea Anemones - http://www.biodiversity.uno.edu/ebooks/intro.html *(site gone, updated 10/02/05)* (11/26/98)** *By Dr. Daphne G. Fautin and Dr. Gerald R. Allen, copyright West. Aust. Mus. 1992 (Listed by ELukan, Fish & Chips)
- **Geothermal Aquaculture Research Foundation (GARF) - http://www.garf.org (1/12/99)** (Listed by ELukan, Fish & Chips)
- **Harbor Aquatics - http://www.harboraquatics.com (1/12/99)** (Listed by ELukan, Fish & Chips) ***(url dead, 10/02/05)***
- **Monolith Marine Monsters (m3) - ~~http://www.marine-monsters.com~~ *(url dead 8/24/04)* (6/25/99)**
- **Reefers - http://www.acropora.com (1/12/99) *(url dead 10/03/05)*** (Listed by ELukan, Fish & Chips)

- **Simplified ReefKeeping - http://www.connix.com/~reefkeep/** ***(url dead 8/24/04)*** **(3/11/99)** (Listed by ELukan, Fish & Chips)
- **Slimy's Aquarium Page - http://www.slimyfrog.com/aquaria** ***(url dead 8/24/04)*** **(3/15/99)** (Listed by ELukan, Fish & Chips)
- **Thiel Aqua Tech - http://www.tadreef.com (1/12/99)** (Listed by ELukan, Fish & Chips)
- **Thiel Infobase - http://www.athiel.com (3/11/99)** (Listed by ELukan, Fish & Chips)
- **Ugo's Gwadloop Reef - http://perso.wanadoo.fr/hugo.margo/ (4/25/99)** *"A Caribbean reef tank in FWI, site in French, but short translations available, photos of diving spots on the Guadeloupe Island."*

The above list matches a portion of the site list maintained on the Fish & Chips Website as of the date of this publication. What you see above is what was listed as on their site by the submitter. The date that follows in parenthesis is the date submitted to the list. For the complete up-to-date list, check out the Fish & Chips Website at http://www.marinefiends.com/ ***(updated 8/24/04)***.

Site Submission and Updating: To submit your site for inclusion in the Fish & Chips newsletter and Website based Site List, please go to the Fish & Chips Website at http://www.marinefiends.com/ ***(updated 8/24/04)*** and complete the Site Submission Form. Please do **NOT** send any site submission or update requests via email **-** ***I will not process them***. Of course, emails are welcome if you are having trouble submitting the form or if your browser doesn't support forms.

Chips...er...Tips

Water Changes - Tip By Elizabeth M. Lukan 11/30/98

Tired of using siphon hoses and buckets to get water out of your tank and buckets to get water back in? Well, so were we. So, we purchased an inexpensive water pump (the Hagen Aqua Pump Model 1) and enough hose to run from the bottom of the tank to the kitchen sink. We setup our DI unit, run water into empty tanks or containers, mix salt, age, then pump water out of the tank right down the drain. Then dump the pump into the new water and pump it right into the reef's sump. Since us "salties" can't use things like the Python "No Spill Clean 'N Fill" or Aquarium Products Meridian Automatic Water Changer to add water to our tanks, this little system works great for us. The only time I use a siphon hose and bucket now is when I'm sucking detritus out of the corners.

To Submit Your Tip: Send your tip via email to FishNChips@mail.com **(address updated 4/26/00)** ~~with a subject of *Tip Submission*~~ **(information updated 4/26/00: coding replaces need for subject notation)** and I'll publish it in an upcoming issue of Fish & 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.

What the ... ?

By Elizabeth M. Lukan 7/22/99

Autotroph
Plants and bacteria that can synthesize organic compounds from inorganic nutrients.

Bleaching
When corals or clams expel their zooxanthellae and appear pale or white.

Byssus Gland
The structure in clams that produces fibrous threads (byssus) that attach the clam to substrate.

Calcification
The process of extracting calcium from seawater and depositing it as calcium carbonate.

Cilia / Cillum
A microscopic hairlike process extending from a cell or unicellular organism and capable of rhythmical motion.

Dinoflagellates
A group of single-celled microscopic organisms with flagella that belong to the kingdom Protista. If they posses chlorophyll, they are considered plants and some are entirely photosynthetic while some ingest food. If they don't posses chlorophyll, they are more animal-like. The symbiotic algae zooxanthellae are dinoflagellates. "Red Tide" is caused by a dinoflagellate bloom that releases toxins into the water. Amyloodinium (Marine "Velvet") is also caused by dinoflagellates.

Encyst
To enclose or become enclosed in a cyst, which is usually defined as an abnormal membranous sac containing a gaseous, liquid, or semisolid substance.

Flagella / Flagellum
A whiplike extension of certain cells or unicellular organisms that serves in locomotion.

Genera / Genus
Genera is the plural of genus. In the taxonomy classification, the genus is the category ranking below a family and above a species. Simply said, it's a class, group, or kind with common attributes.

Gonads
Gonads are an organ in animals that produce gametes (a reproductive cell like sperm or an egg) such as a testis or ovary.

Hermaphrodites
An animal in which both male and female sex organs are present. Rarely do both systems operate simultaneously.

Heterotroph
Organisms which are not capable of producing their own food.

Hyaline Organs
Clear areas in the mantle of tridacnid clams that appear to focus light onto dense aggregations of zooxanthellae.

Iridophores
Fixed cells in tridacnid clams that contain numerous UV protection pigments.

Larvae
The newly hatched stage of any of various animals that differ markedly in form and appearance from the adult.

Macerated
To soften or separate by soaking or steeping.

Mantle
Large, pigmented fleshy portion of tridacnid clams that is exposed to the light by gaping of the shell valves. Also called siphonal tissue. Also coral tissue is fleshy polyps (e.g. Catalaphyllia).

Metamorphosis
A change in form and often habits during development after the embryonic stage.

Micron
A unit of length equal to one millionth of a meter. One foot equals 0.30 meters.

Neurotransmitter
A chemical substance, such as dopamine, that transmits nerve impulses across a synapse.

Palps
Flap-like structures in clams that direct food towards the stomach.

Pheromone
A chemical stimulant/attractant released into the surrounding environment, either air or water.

Phytoplankton
Microscopic algae which is suspended in the part of the water column that is penetrated by light.

Protandry / Protandric
A type of hermaphroditism in which the individual is a functional male first, then develops into a

functional female.

Sclerites
Part of the skeletal/structural support in soft corals. They are composed of calcium carbonate imbedded in the tissue of most soft corals (octocorallia).

Siphon
The inhalant and exhalant siphons of tridacnid clams are used to allow for gas exchange and to expel wastes.

Siphonal Tissue
Another description of mantle.

Trochophore
Free-swimming, first planktonic stage of mollusc larvae.

Tubercles
Wart-like projections on sclerites.

Ultraviolet (UV) Light
Ultraviolet is a high energy, short wavelength of light. It is shorter than violet in the visible spectrum and on the border of the x-ray region.

Veliger
Second larval planktonic stage of molluscs where the foot, shell, and other structures first make their appearance.

Zooxanthellae
These are the tiny plants called dinoflagellates (single-celled microscopic organisms which belong to the Protista kingdom) that live symbiotically with corals, tridacnid clams, and some sponges. They provide food for the host and in return get the nitrogen, phosphorous, and carbon dioxide they need for growth. The scientific name is Symbiodinium spp.

Prove It!

By Elizabeth M. Lukan 7/22/99

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The Wave - Eastern PA Reef Club Newsletter Volume #1, Issue #9, July 1998, Tridacna Clams By Todd Kunkel

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