The added expense and effort of keeping cold water aquariums tends to limit them to professional biologists, public facilities, or divers and specialists. Indeed, the difficulty of obtaining specimens tends to further limit the latter two categories to people living in the coastal zones of the Western states. The color and variety of cold water marine life still attracts many who live nearby, though the accessibility of specimens may be dependent upon state laws that govern collecting of marine organisms.

Small, colorful fish are common. The more easily obtained are quiet bottom dwellers that don't swim openly in a tank, like the Catalina Goby (Fig. 1) or

Effects of Chemotherapeutics on Biological Filters

A common question asked by hobbyists with sick fishes is, "What will the recommended treatment do to the biological filter." This is serious because a particular treatment may successfully treat a disease, only to have the fishes die from ammonia or nitrite toxicity. One answer, of course, is use a quarantine tank for treating, but in many cases this is not practical, such as when many sick fishes are involved.

If one must treat a show tank then the selection of the medication should be carefully considered. Unfortunately, information about the side effects of drugs is scarce, particularly for salt water aquariums. To give some guidance, results of several scientific investigations dealing with inhibition of nitrification in either freshwater (FW) or saltwater (SW) biological filters have been tabulated, and are shown in Table I.

<table>
<thead>
<tr>
<th>Medication</th>
<th>FW Level</th>
<th>SW Level</th>
<th>Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorotetracycline</td>
<td>100%</td>
<td>50%</td>
<td>90%</td>
</tr>
<tr>
<td>Neomycin</td>
<td>80%</td>
<td>70%</td>
<td>75%</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>90%</td>
<td>80%</td>
<td>60%</td>
</tr>
<tr>
<td>Sulfadiazine</td>
<td>100%</td>
<td>50%</td>
<td>80%</td>
</tr>
<tr>
<td>Sulfinamide</td>
<td>80%</td>
<td>70%</td>
<td>60%</td>
</tr>
<tr>
<td>Methylene blue</td>
<td>90%</td>
<td>80%</td>
<td>50%</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>70%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Sulfaemazine</td>
<td>90%</td>
<td>80%</td>
<td>50%</td>
</tr>
<tr>
<td>Oxycycline</td>
<td>100%</td>
<td>50%</td>
<td>90%</td>
</tr>
<tr>
<td>Quinacrine Hydrochloride</td>
<td>80%</td>
<td>70%</td>
<td>60%</td>
</tr>
</tbody>
</table>

The Table shows that several medications are risky in a community tank. Specifically, chlorotetracycline, neomycin, erythromycin, sulfadiazine, sulfanilamide, and methylene blue are harmful to biological filters. These treatments would be best suited for use in a hospital tank.

Of the remaining drugs, several produced conflicting results. The largest difference was for chloromycetin, making its use questionable. Also, it has been reported to be ineffective in water above pH 8.0, thus limiting its usefulness. Formalin also gave irregular results, but both studies were in freshwater, and its use in saltwater is limited primarily to combination treatments with copper. Copper had no effect during short term tests but produced a temporary inhibition after extended treatments (twice a day for 14 days). Extended treatments, under hatchery conditions at Instant Ocean Hatcheries, showed no noticeable changes in nitrification with copper alone. However, it will precipitate onto the filter gravel and remain indefinitely, so it also is best administered in a hospital tank.

Furanace appears to be reasonably safe; however, its effectiveness in saltwater is not well established. Based on these reports, gentamycin and sulfamerazine may be used with caution. Oxytetracycline is safe but not particularly effective in saltwater.

Quinacrine Hydrochloride, which is sometimes recommended for protozoan infections, also seems to be safe.
the Snubnose Sculpin. The juvenile California Garabaldi is a colorful subject in red-orange and electric blue, but its status as the state fish, combined with legal protection, make it a potentially expensive addition to a collection. Invertebrates, such as nudibranchs, are among the most colorful animals that can grace an aquarium. Many colorful species inhabit the waters of the West Coast and the “Spanish Shali”, Flabellinopsis iodinea, is one of the most common. Species of the genus Dendronotus (Fig. 2) are not quite as flashy in color but make up for this with beauty of form. Rose, yellow, and a variety of colors add to a showy display.

Specimens will not survive long in captivity without access to a food source. Sponges, microscopic hydroids, and stalked bryozoans are among the prey of nudibranchs, with some species being quite specialized in their diet.

The background of a cold water aquarium may be brightened by the addition of the “Strawberry anemone”, Corynactis californica, (Fig. 3). These tiny anemones form masses up to 6-8 inches across on exposed rock overhangs and shaded ledges. Pink, orange, lavender, red and variegated red and white are among the commonly observed color variations. Larger species of anemones are available in green, red, and white to add color and dimension to the aquarium. Fortunately, anemones are hearty and relatively easily fed.

These are but a glimpse into the color and variety of life available to those who can deal with the difficulty of maintaining a cold marine habitat and obtaining specimens to stock it.

Figure 1 — The Catalina Goby, Lythrypnus dalli.

Figure 3 — Strawberry Anemone, Corynactis californica.

Effects of Chemotherapeutics

As an alternative, quinine (Hydrochloride or Sulfate), may be more effective than quinacrine. Quinine was used as a treatment for Oodinium and Cryptocaryon at Instant Ocean Hatcherries and no inhibition of biological filtration was ever noted.

Based on the reported studies, medications marked "****" in Table I can be used with caution in a show tank without jeopardizing the biological filter.

### Table I

<table>
<thead>
<tr>
<th>Medication</th>
<th>Level ppm (mg l)</th>
<th>Inhibition of Nitrification</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloromycetin</td>
<td>50</td>
<td>0%</td>
<td>3-FW</td>
</tr>
<tr>
<td>(Chloramphenicol)</td>
<td>13</td>
<td>0%</td>
<td>4-FW</td>
</tr>
<tr>
<td>Chlortetracycline</td>
<td>10</td>
<td>slight</td>
<td>1-SW</td>
</tr>
<tr>
<td>*Oxytetracycline</td>
<td>50</td>
<td>76%</td>
<td>4-FW</td>
</tr>
<tr>
<td>*Gentamycin</td>
<td>5.3</td>
<td>0%</td>
<td>3-FW</td>
</tr>
<tr>
<td>Neomycin</td>
<td>67</td>
<td>slight-NH3</td>
<td>1-SW</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>50</td>
<td>severe-NH3</td>
<td>1-SW</td>
</tr>
<tr>
<td>*Nifurpinol</td>
<td>0.1</td>
<td>100%</td>
<td>3-FW</td>
</tr>
<tr>
<td>(Furanace)</td>
<td>1</td>
<td>0%</td>
<td>1-SW</td>
</tr>
<tr>
<td>*Sulfamerazine</td>
<td>50</td>
<td>20%</td>
<td>4-FW</td>
</tr>
<tr>
<td>Sulfadiazine</td>
<td>25</td>
<td>0%</td>
<td>3-FW</td>
</tr>
<tr>
<td>Sulfanilamide</td>
<td>25</td>
<td>74%</td>
<td>4-FW</td>
</tr>
<tr>
<td>*Quinacrine HC1</td>
<td>12</td>
<td>64%</td>
<td>4-FW</td>
</tr>
<tr>
<td>*Cupric Sulfate</td>
<td>5</td>
<td>0%</td>
<td>4-FW</td>
</tr>
<tr>
<td>1(x3)</td>
<td>0.3Cu(x14d)</td>
<td>slight-NH3</td>
<td>1-SW</td>
</tr>
<tr>
<td>mod.-NO2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Formalin</td>
<td>15</td>
<td>27%</td>
<td>4-FW</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>0%</td>
<td>2-FW</td>
</tr>
<tr>
<td>Malachite Green</td>
<td>0.5</td>
<td>11%</td>
<td>2-FW</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
<td>0%</td>
<td>4-FW</td>
</tr>
<tr>
<td>Methylene Blue</td>
<td>1</td>
<td>92%</td>
<td>4-FW</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>100%</td>
<td>2-FW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>severe-NH3</td>
<td>1-SW</td>
</tr>
</tbody>
</table>

Bibliography


Product Advisory

Subject: Interference in SeaTest® Nitrate determinations caused by proprietary “slime-producing” agents.

It was recently determined that presence of Novaqua® water conditioner may cause low readings in SeaTest Nitrate tests that are run soon after the addition of Novaqua. The interference varies with the level used and may be particularly pronounced at treatment levels significantly higher than the manufacturers recommended dosage. “Slime-producing” agents from other manufacturers would be expected to behave similarly. Such products apparently coat and deactivate the Cadmium particles in the reagent, preventing a chemical reaction that is essential for color development.

The effects of such products would be expected to decrease quickly (12-24 hours), but could be significant if nitrate tests are run soon after addition, such as following partial water exchanges.

SeaNtotes

SeaScope was created to present short, informative articles of interest to marine aquarists. Topics may include water chemistry, nutrition, mariculture, system design, ecology, behavior, and fish health. Article contributions are welcomed. They should deal with pertinent marine aquarium topics and are subject to editorial reviews that in our opinion are necessary. Payment will be made at existing rates and will cover all author’s rights to the material submitted.

SeaScope is published quarterly for free distribution through local aquarium dealers. Dealers not receiving copies of SeaScope for distribution to their customers should call Aquarium Systems, Inc. to be added to the mailing list. Telephone: 1-800-822-1100 (in Ohio call 1-800-822-1300). Aquarists interested in receiving copies directly should send their name and address, along with $1.00 for postage and handling (four issues) to: SeaScope, Aquarium Systems, Inc., 8141 Tyler Blvd., Mentor, OH 44060. Address comments, questions and suggestions to: Thomas Frakes, Editor.
A Living Coral Reef Aquarium
by John Hackney

A living coral reef microcosm, exhibited at the Smithsonian Institution's Museum of Natural History in Washington, D.C., employs over 200 species of marine plants and animals to prove the success of an innovative strategy in aquarium management. This 3,330-gallon system supports a community that is modeled after reefs in the eastern Caribbean, the first of its kind to be maintained in captivity. The microcosm, which consists of a separate lagoon area attached to a larger reef tank (see diagram), was developed not by attending to the needs of individual organisms, but by supporting the physical and chemical needs and general patterns of energy exchange that typify a tropical ecosystem of this sort.

The reef's foundation was constructed with several tons of dry coral rubble, stabilized by acrylic rods to form a crest between fore- and back-reef slopes. Besides providing the habitat required by many reef dwellers, this carbonaceous substrate aids in buffering the water for pH control. The floor of the lagoon tank and the areas to the front and rear of the reef foundation were covered with thick layers of sandy sediment to provide a residence for microorganisms that are vital to community stability.

The entire system was filled with seawater from the nearby Virginia coast that had been previously treated with phytoplankton cultures to reduce nutrients to the low levels required by reef organisms. (Subsequent reef microcosms at the St. Louis and Pittsburg zoos have been established using INSTANT OCEAN Synthetic Seawater exclusively.)

Efficient circulation through the system is provided by pumping seawater from the lagoon to the fore-reef, where it flows into a large bucket. This bucket extends forward on the front side and is suspended on pivot pins so that, when it fills, the center of gravity shifts forward dumping the bucket, and causing a wave. Once empty, it returns to an upright position to begin refilling. This cycle repeats every 20 seconds and provides a tremendous cloud of tiny air bubbles as the "wave" breaks in the main reef tank. The waves generated here combine with the pumped circulation to thoroughly mix the water column, preventing oxygen depletion and detritus accumulation upon the reef surface.

Illumination is provided by overhead, 400 and 1000 watt metalhalide lamps. These were found necessary to reproduce the spectrum and intensity of sunlight on tropical reefs.

To allow the major groups in the community to establish a natural balance the reef organism were introduced gradually, beginning with those from the lowest levels. Initially, pieces of "living rubble" covered with marine worms, crustaceans, protozoa, algae, bacteria, and various other microorganisms, were collected in the field for placement on the reef foundation. After this community had become well established, various organisms that might otherwise be lost through over-predation or competition.

Today, four years after establishment, the microcosm supports over 50 species of plants and a wide variety of animals, including some species normally kept in captivity only with great difficulty. Sessile invertebrates, including sea fans, sponges, and anemones, are generally positioned upon the reef foundation to correspond to their distribution in the field. Over 20 species of stony corals have been successfully maintained, with several exhibiting noticeable growth. Fireworms, snails, queen conchs, starfish, sea urchins, cleaning and burrowing shrimp, spiny lobsters, and a variety of crabs are among the invertebrates that roam the surface and burrows of the reef.

Up to 30 species of fish, representing the major feeding types found upon natural reefs, are supported. However, fish-eating predators have been limited to occasional juvenile specimens of barracuda or jack, which reject community members at meal time in favor of supplemental goldfish.

The nearly constant environment is dependent upon a number of mechanical and biological stabilizers. Salinity is measured by an electronic sensor. As the seawater level drops from evaporation the sensor triggers the inflow of high quality, deionized water, which dilutes the salinity to maintain a range of 35-36 parts per thousand. Temperature varies from 77-84°F (25-29°C) throughout the year. The water is heated solely by the overhead illumina...
Living Coral Reef
Continued from page 3

dissolved nutrients within the system's seawater slowly but steadily decline. It is hoped that a balance will one day be reached after nutrient levels have been decreased to the extremely low concentrations that characterize most natural coral reef ecosystems. By attaining such a balance, the laboratory would also promote a stronger adher-
ence to the patterns of energy transfer that naturally occur between organisms on coral reefs.

References

New Airline Valve Solves Problems

Even a device as simple as an airline valve can be the source of much frustration and irritation when it fails to operate properly.

Expensive brass valves frequently corrode and freeze, making adjustment impossible. This is a major problem for marine aquarists, because of the especially corrosive nature of salt water.

Typical plastic valves, while free from corrosion, are notoriously prone to leakage, even when new. And, since many are not true needle valves, it is difficult to adjust the air flow precisely.

Aquarium Systems has recently introduced a new airline valve that eliminates all of the problems previously associated with other valves. They incorporate the best features of brass and plastic valves, and have exciting new features as well.

These sturdy, plastic valves are free from corrosion. They are true needle valves that permit sensitive adjustment and precise regulation of air flow. An internal seal eliminates annoying leakage of air from the valve stem.

A unique, modular design allows every valve set to be expanded indefinitely. Extension valves are easily added, and lock firmly in place. It is possible to assemble gang valves of any size, so there is no longer a need to maintain a stock of various sizes of pre-assembled gang valves.

Unlike other valve assemblies, these are not pre-mounted on a large, unsightly bracket that must be hung on the back of the aquarium. Each section is provided with a “Double-stick” adhesive pad that allows the assembly to be fastened to the aquarium, the stand, a nearby wall, or wherever desired to improve accessibility, or to eliminate clutter.

Extensions are easily added to previously fastened sets by slightly flexing the pad. A single pad will hold several valves.

Ask for The Aquarium System™ Air Valves and accessories whenever an airline valve is needed.
The Instant Ocean® Story

Maintaining and displaying colorful fishes is a popular hobby. In fact, tropical fish keeping has been practiced for thousands of years. Yet, until only recently, the term "tropical fishes" always referred to freshwater varieties. As little as 25 years ago, tropical salt water species were regarded as virtually impossible to maintain in ornamental aquariums.

Early attempts at maintaining tropical marine fishes were generally failures. Methods and equipment that were appropriate for freshwater fishes could not be applied successfully to marines. Salt water aquariums were little more than curiosities that were restricted mainly to a few enthusiasts who, living in tropical coastal areas, had an unlimited supply of native fishes and natural ocean water.

However, the desire to maintain live marine animals has never been limited to only hobbyists. Live marine animals have always been important for education and research purposes, but even scientists had to be content with using only very hardy animals that could survive in spite of the poor water quality that was typical of early, closed-system marine aquariums.

In the late 1950's and early 1960's aquarists began to understand why marine aquariums had proven to be much more difficult to maintain than freshwater aquariums.

It was realized that fishes, both fresh and salt water, produce ammonia as a major, primary waste product. However, because marine aquariums are...

Synthetic Sea Salts: Trace Elements, But So Much More!

Marine aquariums realize good water quality assures the health of their pets, and many products are available to help maintain water quality. However, the most important element that goes into an aquarium is the synthetic sea salt.

Superficially, all brands of synthetic sea salts appear to be similar, and in some ways they are. They will keep marine animals alive. However, confusion begins when one encounters elaborate claims about trace elements in the mix. There seems to be a trace element "war" among some of the manufacturers to see who can claim the most, and to the casual observer, elaborate claims seem quite impressive. However, to someone with even a modest knowledge of chemistry it is not at all surprising that synthetic seawater has an abundance of trace elements.

All chemicals, even highly purified grades, contain minor and trace contaminants. In addition, all domestic water supplies contain trace elements, often at higher levels than found in the ocean. Actually, it would be very difficult to make synthetic seawater free of trace elements. In general, the initial trace element concentrations that are found in synthetic seawater solutions are more dependent on contaminants than any other factor.

Some manufacturers display a so-called "guaranteed analysis" of the salt, but this may be based on naive assumptions. A comprehensive analysis may have been performed on one or even a few samples and then these values reported for subsequent batches, even through they are prepared from different raw materials and will be dismissed on page 3.
kept at higher pH than freshwater aquariums, the ammonia occurs in a chemical form that is significantly more toxic. Marine animals were dying from ammonia poisoning at concentrations of ammonia that were relatively harmless in freshwater aquariums. It is now recognized that this single factor was primarily responsible for the difficulties and failures of early marine aquarists.

A major breakthrough occurred when it was demonstrated that naturally occurring organisms could be utilized to detoxify the ammonia. These organisms, nitifying bacteria, could be cultured in a "biological filter" that would oxidize toxic ammonia and produce relatively non-toxic nitrate. Under the resulting conditions, fishes and other delicate marine animals could be kept in closed-system aquariums for extended periods.

"Undergravel filters" were widely adopted as ideal biological filters. They were efficient, easy to care for, and their ready availability provided the impetus for an explosion of interest in marine aquariums at academic, institutional, and hobbyist levels.

The history of INSTANT OCEAN® Synthetic Sea Salt parallels that of the "new era" of marine aquarium keeping. Aquarium Systems, Inc., manufacturer of INSTANT OCEAN was established in 1964. Its founder, a former director of The Cleveland Aquarium, was one of the individuals most responsible for elucidating and popularizing the principals of biological filtration as applied to marine aquariums. As such, he recognized the need for ready availability of functional, closed-system aquariums that could be easily utilized in both academic and industrial environments.

Manufacture of such aquariums, with integral biological filters, was the principal activity of the new company. As a service to its customers, the company also made available a mixture of chemicals that, when dissolved in freshwater, produced an acceptable substitute for natural sea water. This, then unnamed, synthetic sea salt, a modification of a formula that was developed and utilized successfully at The Cleveland Aquarium, was the predecessor of today's INSTANT OCEAN.

Concurrent with its efforts to promote availability of marine aquariums as research tools, Aquarium Systems was also commissioned to design and construct a major, inland, public marine aquarium. The Aquarium of Niagara Falls was the first to exclusively employ closed-system, biological filtration technology, and operated entirely with synthetic sea water.

Some 10 years later Aquarium Systems designed and built another aquarium in Mystic, Connecticut. The Mystic Marinlife Aquarium, while located near the ocean still utilizes synthetic sea water, and is one of the most modern facilities of its kind in the world.

Editor's Note:
The Mystic Marinlife Aquarium and The Aquarium of Niagara Falls are no longer associated with Aquarium Systems, Inc. They are now owned and operated as educational and research facilities by the Sea Research Foundation, Inc., an independent, non-profit organization.

In the early years of its manufacture, INSTANT OCEAN was primarily supplied to institutional researchers, because ornamental marine aquariums were relatively uncommon. All this was to change in the early 1970's with the establishment of extensive jet air service, especially to tropical Indo-Pacific regions, such as the Philippines and Hawaii. Suddenly hundreds of species of unusual and beautiful tropical marine animals became available at prices that, while more expensive than freshwater specimens, were still affordable. Development of all-glass aquariums overcame the final obstacle, and the marine aquarium popularity explosion soon spread from research institutions into homes. Marine aquariums became one of the fastest growing areas of the aquarium industry.

Initially, because of its technical orientation Aquarium Systems did not pursue the hobbyist market. Neverthe-
best indicator of product quality. Only INSTANT OCEAN has had exposure to hundreds of thousands of marine fishes in various stages of development, through several generations. Much of what was learned at the Hatchery helped INSTANT OCEAN to retain its position as America’s best performing, and most popular synthetic sea salt. It’s standards are the highest in the industry, and so is its quality.

In 1983, a factory in Europe was opened to meet the rapidly growing demand in foreign markets. Today, INSTANT OCEAN is the only such product that is manufactured on two continents. It is a true, international product, and its production utilizes the best of both American and European technologies to produce a product that is unsurpassed. There is no finer choice for your marine aquarium.

Photo: Courtesy of Mystic Marinlife Aquarium.

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**Sea Salts**

Continued from page 1

solved in different local water. Alternatively, a formulator may simply calculate the composition of the dissolved solution based on the recipe, assuming that all components are 100% pure. Unfortunately, this does not account for the significant contributions of trace contaminants.

Considering the claims of superiority by some companies, a comparative analysis of solutions of various products should be of interest. Tables 1 and 2 show the results of such a comparison. Products were purchased from local retailers. Synthetic seawater solutions were prepared from tap water and filtered through dolomite in an aquarium for 24 hours before sampling. Coded samples were submitted to a nationally prominent analytical laboratory for analysis of the most commonly considered and biologically important trace elements as well as the major constituents.

The products analysed are listed below:

- **Sample A** — Imported product with uniform appearance, hardened into a solid block during storage (Tropic Marin neu®)
- **Sample B** — Domestic product with non-uniform appearance, a mixture of large and small particles (Forty Fathoms Marinemix®)
- **Sample C** — Domestic product with two-part formulation, a small bottle of liquid is supplied with each package (Marine Environment®)
- **Sample D** — Domestic product with uniform appearance, free flowing, dry powder (INSTANT OCEAN®)

**Trace Elements:**

A careful examination of Table 1 reveals that the trace element levels of all the solutions are remarkably similar and, in general, are higher than natural seawater (NSW) levels. This is especially interesting in regards to claims by the manufacturer of the two-part product, that the “small bottle” is the only way to insure trace element distribution.

It has been known for some time that marine animals obtain their trace nutrients primarily from their food. On the other hand, marine algae extract trace elements directly from their environment. Algae have the ability to concentrate these elements far above seawater levels, sometimes by factors of several thousands. This begins the food chain for these nutrients making them available to animals. At the same time, algae in an aquarium can strip out these same trace nutrients very quickly. This, coupled with the physical-chemical pathways for loss, explains why micro-nutrients must be supplemented periodically, for vigorous algal growth, like the rivers do for the oceans. Use of SeaGarden® Algae Nutrients is a way to meet these special requirements. In view of the analytical data and with a realization of the requirements of marine organisms, it appears that no product offers any real advantage with regards to trace elements.

This curious preoccupation with trace elements by some manufacturers and hobbyists has often puzzled informed aquarists. Possibly it is a continuation of the simple thought that for marine animals to survive, the solution must duplicate the sea as closely as possible. Although disproved years ago, this philosophy persists, apparently based on an abundance of outdated

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**TABLE 1**

Concentrations (in parts per million) of minor and trace elements in freshly mixed, filtered synthetic seawater solutions (relative values).

<table>
<thead>
<tr>
<th>Element</th>
<th>Sample A</th>
<th>Sample B</th>
<th>Sample C</th>
<th>Sample D</th>
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</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>0.69</td>
<td>0.48</td>
<td>1.49</td>
<td>0.87</td>
</tr>
<tr>
<td>Boron</td>
<td>27.3</td>
<td>37.0</td>
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<td>32.1</td>
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<tr>
<td>Barium</td>
<td>0.07</td>
<td>0.04</td>
<td>0.08</td>
<td>0.13</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.12</td>
<td>0.10</td>
<td>0.14</td>
<td>0.13</td>
</tr>
<tr>
<td>Cobalt</td>
<td>0.05</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Iron</td>
<td>0.24</td>
<td>0.21</td>
<td>0.22</td>
<td>0.21</td>
</tr>
<tr>
<td>Lithium</td>
<td>0.17</td>
<td>2.73</td>
<td>1.98</td>
<td>2.24</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.03</td>
<td>0.02</td>
<td>0.6</td>
<td>0.03</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>1.16</td>
<td>0.40</td>
<td>1.19</td>
<td>0.42</td>
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<tr>
<td>Nickel</td>
<td>0.10</td>
<td>0.13</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>1.78</td>
<td>2.18</td>
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<td>2.40</td>
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<td>Strontium</td>
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<td>24.6</td>
<td>10.0</td>
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<tr>
<td>Tin</td>
<td>1.92</td>
<td>2.00</td>
<td>3.21</td>
<td>2.22</td>
</tr>
<tr>
<td>Vanadium</td>
<td>0.53</td>
<td>0.51</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>Zinc</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>0.04</td>
<td>0.02</td>
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</tbody>
</table>

Continued on page 4

---

**TABLE 2**

Concentrations (in parts per million) of major ionic components in synthetic seawater solutions. Variance from natural seawater shown in parentheses.

<table>
<thead>
<tr>
<th>Component</th>
<th>Sample A</th>
<th>Sample B</th>
<th>Sample C</th>
<th>Sample D</th>
<th>Natural Seawater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>19,305</td>
<td>17,667</td>
<td>19,960</td>
<td>18,417</td>
<td>18,980</td>
</tr>
<tr>
<td>Sodium</td>
<td>10,519</td>
<td>11,169</td>
<td>8,721</td>
<td>10,728</td>
<td>10,560</td>
</tr>
<tr>
<td>Sulfate</td>
<td>2,301</td>
<td>3,135</td>
<td>2,187</td>
<td>2,751</td>
<td>2,560</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1,210</td>
<td>1,074</td>
<td>1,546</td>
<td>1,328</td>
<td>1,272</td>
</tr>
<tr>
<td>Calcium</td>
<td>332</td>
<td>309</td>
<td>799</td>
<td>388</td>
<td>400</td>
</tr>
<tr>
<td>Potassium</td>
<td>333</td>
<td>475</td>
<td>729</td>
<td>388</td>
<td>380</td>
</tr>
</tbody>
</table>

Continued on page 4
literature. One explanation for the continued emphasis on trace elements could be this lack of understanding. However, it may be that some companies are using this issue to divert attention from real and potentially serious defects in their products.

### Major Elements

Table 2 lists the analysis for the key, major ions. In contrast to the trace nutrients, the major elements are surprisingly dissimilar, compared to each other and natural seawater (NSW). It is unlikely that manufacturers, who profess to duplicate seawater, would intentionally deviate significantly from natural levels since the chemicals and recipes to closely match natural seawater are readily available. Therefore, the only logical answer for these differences is the use of poor mixing and packaging techniques.

Examination of some of the products supports this conclusion. Sample B (Forty Fathoms Marinemix) is composed of a mixture of particles of non-uniform sizes that will often separate into distinct layers within the package. This same type of separation can occur during packaging so that variations can occur not only within bags but between bags of the same blend (Figure 1). Semi-liquid or predissolved salt mixes are subject to a similar problem. The liquid phase rises to the top of the package while the heavier, partially dissolved salts settle. Again, the top and bottom of the batch can be significantly different.

![Figure 1: Comparison of INSTANT OCEAN (left) and Forty Fathoms (rt) before and after vibrating on a sloped surface.](image)

Separation due to particle size variation is sometimes masked when the salt is very wet, such as with sample C (Marine Environment). The excessive moisture causes the larger particles to partially break down giving the appearance of uniformity. However, any imbalances due to inefficient mixing and packaging will still be found in the final product, as the analysis shows.

Wet salts often present another problem, high initial pH. Fig. 2 shows a pH comparison of Sample C (Marine Environment) which had a moist consistency, to Sample D (INSTANT OCEAN). Use of a pH meter is necessary for this, since aquarium test kits will only read in the normal aquarium range. Thus, a pH level over 9 would not be obvious to the hobbyist. Organisms placed in this water would certainly notice the change and it could be especially dangerous if mixed with water high in ammonia, since ammonia is much more toxic at high pH levels.

The initial pH should not be confused with the pH-holding capacity (alkalinity or buffering). There is no relation between the initial pH and alkalinity of the solution. After a day or so of vigorous aeration, the pH in these solutions will moderate. In the meantime your pets will have been exposed to additional stress.

Beyond these two problems, moist salts often are considerably slower to dissolve. While it is not uncommon for synthetic sea salts to have small amounts of insoluble material, moist salts usually produce significant quantities of flocculent solids that may be objectionable aesthetically.

Another difference that may not be obvious to a consumer is a difference in package size. Some brands, in an effort to reduce costs have reduced the amount of salt per bag. Thus, not all 25 gallon size bags are the same. Forty Fathoms Marinemix has, over the last five years, reduced the amount of salt in their "25 gallon" size from 8 lbs. to 7 lbs. It is still a "25 gallon" package, but it mixes at a lower salinity.

Of course, many hobbyists will argue that it is better to keep fish at a lower salinity anyway, but if that is what is desired then a full strength mix, like INSTANT OCEAN (8 lbs/25 gallon), will make 15 per cent more of the dilute seawater than the other 7 lb. product.

### Sea Notes

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### Conclusions

The extraordinary attention and importance given to trace elements in synthetic sea salt mixes is unjustified. Marine animals obtain nutrients, including trace elements, from their food. The trace element compositions of several commercial products have been shown to be quite similar, regardless of the claims of the manufacturers.

On the other hand, the ratios of the major elements in these products showed tremendous variation, a consequence of inefficient manufacturing practices. For the six major elements, two domestic brands failed to have ANY within 5% of the natural seawater level and one product approached 100% higher for two elements. INSTANT OCEAN Sea Salts had the best results with all major elements within 7.5% of the natural seawater level and 5% within 5%.

For INSTANT OCEAN, this quality is normal. INSTANT OCEAN Synthetic Sea Salt is blended to the highest standards of uniformity and consistency. Particles are evenly sized to prevent segregation during packaging, shipping and handling. Even distribution of the smallest components is assured. Whether you use a small scoop or an entire package, the composition will be the same.

INSTANT OCEAN is the standard for marine research of all types. In addition, more marine tropical fish have been tank-raised in INSTANT OCEAN than in any other medium, including natural seawater!

For most knowledgeable marine aquarists there is only one choice, INSTANT OCEAN.

Tropic Marin neu®, Forty Fathoms®, Marine Environment®, and INSTANT OCEAN® are registered trademarks of their respective manufacturers.
The Fintastic Lionfish

By Jay Hendal

Cobrafish, turkeyfish, zebrafish, butterfly cod, and tiger fish, are all common names for fishes belonging to the family Scorpionidae, the scorpionfishes. Most often referred to as lionfishes, they are characterized by extremely elongated dorsal spines and pectoral fin rays. The dazzling beauty and graceful motions of these animals make them much in demand by beginning and advanced aquarists alike.

The lionfishes, as well as other members of their family, are venomous. The venom is produced by tissue lying in grooves along the dorsal, anal, and pelvic spines. Contact with one of these spines can be very painful. Although no human deaths have been documented, in certain individuals, a severe allergic reaction may result. Handle with care (or not at all) is the key phrase here. Obviously, these are not fishes for households with small children.

Lionfishes are found in tropical reef areas from Hawaii, through the Indo-Pacific region, all the way to the Red Sea. They are most often found lurking in dark caves and crevices waiting for a small fish or shrimp to pass by. This carnivorous, sedentary nature is what makes the lionfish so suitable for marine aquariums. They don't require large amounts of swimming room as do many other fishes, such as tangs and butterflyfish. Proper diet is no problem if smaller specimens can be obtained. These younger fish are more easily switched from feeding exclusively on live fish to a more complete diet, including gelatin mixes, shrimp, scallops, etc. Many experts believe that a proper feeding schedule is important for a lionfish's health. For instance, feeding normally for three or four days, then letting them fast for 24 hours. It seems that feeding them every single day can cause digestive problems.

When purchasing a lionfish, be certain... Continued on page 3

Dealing with Chloramines in Tap Water

Use of Chloramines for the treatment of water by municipal utility departments is rapidly becoming the predominant method of purification. In some cities, hobbyists have had to deal with this for several years. This is not a new method as it was used by many treatment plants prior to 1940 until ammonia use was shifted to utilities. It has several advantages to treatment plants in that it reduces chemical tastes and odors, and it is more stable than free chlorine which is part of our problem. It can not be easily removed from water by aeration.

In practice, chloramination refers to the production of monochloramine by the addition of ammonia to the water supply, followed by the addition of about 3 to 5 times, by weight, chlorine. At this ratio and in the pH range of 7-8 only monochloramine is formed. If more chlorine is used, then the formation of dichloramine begins, which is less desirable. A curious phenomena occurs, however, when the chlorine-ammonia ratio reaches 10:1 by weight. Dichloramine begins to form, but breaks down, releasing nitrogen gas, and forming chloride ions. This sequence occurs until the ammonia is oxidized. Then, free chlorine begins to build, if more is added.

The main question asked by hobbyists and shops is how to get rid of monochloramine. It should be noted that it is highly toxic to fish, so must be removed. A recent article by George Blasiola outlined two methods being used: (1) chemical removal of chlorine with thiosulfate and subsequent ammonia removal with clin... Continued on page 4
A World of Butterflyfishes

By Richard M. Segedl

To many people the word "fish" suggests greyish torpedo shaped creatures ghosting through the cold depths of North Atlantic fishing grounds. However, the image brought to mind by the words "tropical fishes" is of gaudily-patterned, laterally-flattened,decidedly "un-fish shaped" aquatic animals. Butterflyfishes fit this "tropical" image perfectly, probably because they are often used as models by artists, designers, and cartoonists in their depictions of tropical scenes.

Most aquarists like to set up impressive displays of unusually-shaped and colorful fishes for their own enjoyment as well as that of their "friends". Usually the aquarist will find that his choice of subjects is incompatible in a "community" set-up. The butterflyfish family, which contains so many of the species desired by the aquarist in such a display, contains generally timid fishes which often do not do well in the company of more aggressive species. But the butterflyfish family contains so many varied forms that a set-up exclusively of butterflyfishes can be as impressive as any aquarist might want. Furthermore, since these species are usually timid, they get along rather well with each other in a smallish community tank. Following is a list of a few hardy and compatible species and their requirements which, in concert, will make up a very nice display. We will assume a 75 to 100 gallon aquarium for our butterflyfish community as described here.

A Caribbean fish for the collection, one that represents the more "common" butterflyfish shape, is the four-eyed butterflyfish (Chaetodon capistratus). It is a hardy fish, and is not aggressive to other species. It makes a good break-in species for a newly set up butterfly-arium. Besides the tail "eye-spot", adults have an attractive "pinstripe" pattern. A few of these will add nicely to the collection, and they are generally inexpensive.

Chaetodon chrysurus from the Red Sea

The long-nosed butterflyfish (Forcipiger flavissimus), one of the unusually-shaped species, is widely-distributed with, as the name suggests, an elongated snout with which it probes among the nooks and crannies of the reef for food. The fish is found in the Indo-Pacific, the Red Sea, off the Coast of Baja California in the Sea of Cortez, and around the Hawaiian Islands. It can grow to a length of around four and a half inches, and its chief natural food is the coral among which it lives. Despite its rather delicate appearance, this is also a hardy species. I would suggest one pair of these in your community of impressive specimens.

Another interestingly-shaped species is the bannerfish (Heniochus sp.). The body is slightly triangular in these species. The elongated "banner", extending from the dorsal fin, and the diagonal markings break up the body shape such that any evidence of a disc-like shape is completely lost. Its profile is quite similar to the well-known jackknife fish. Bannerfish tend to fight among themselves so one specimen is enough.

One species which is definitely aggressive to others of its own kind is the copper-banded butterflyfish (Chelmon rostratus). It should be considered for the community tank described here not only for its relative ease of acquisition but also for its shape and color patterns. Its body shape is similar to that of the long-nosed butterfly described above, but its pattern and colors are sharply in contrast with that of the latter. It is a native of the Indian Ocean and Indo-Pacific region. However, water quality is more important for it than any of the others recommended here. One should be introduced to the system only after being well-established.

Lastly, there is the popular raccoon butterfly (Chaetodon lunula) which is found throughout the Indo-Pacific to Hawaii. Although it reaches a relatively large size (up to 6 to 8 inches), it is timid enough to be compatible with smaller species. Its deep coloring and raccoon-like "face" will make it a good addition to your exhibition tank.

The dietary needs are generally not too critical. Of the recommended species, the long-nosed, the bannerfish, four-eyed, and raccoon butterflyfish should all accept commercially prepared foods or frozen foods, such as brine shrimp, and bits of fish or shellfish. The copper banded butterflyfish is the most difficult to train to accept non-living foods and may require quantities of live brine shrimp. More cautious aquarists may choose to avoid this species because of this need. Of course, all of the

Continued on page 4

Chaetodon australius from the Red Sea

Quarantine Tank Maintenance

Most experts agree that a quarantine or hospital tank is the best place to treat new or sick fish before moving them into a community tank. However, maintaining water quality during the holding period is often a problem.

A typical hospital tank is a 5-20 gallon bare, glass aquarium with some habitat and low lighting to reduce the anxiety of the fishes. Excess food and feces are removed daily. Aeration is usually provided and sometimes a floss filter is used. These measures alone will not control the waste products from the fish, so the ammonia and nitrite can rise to dangerous levels during a 2 to 3 week stay. A common solut

Four-eyed butterflyfish, Chaetodon capistratus

Photo Olivier de Lastrie

Photo Olivier de Lastrie
Lionfish  
Continued from page 1

that it is eating, has clear eyes, is breathing normally, and that the caudal fin shows no sign of deterioration. An eroded caudal fin is often a symptom of bacterial infection caused by shipping stress, and lionfish frequently do not recover from this.

Lionfish are very peaceful towards other aquarium inhabitants as long as they are unable to swallow them! To be safe, a tank mate should be at least 1/3 the length of the lionfish. Few fish will bother a lionfish, but beware of the more pugnacious species, such as groupers and triggerfish. Watch carefully at feeding time to ensure that their food is not being stolen by quicker fish.

There are four lions of the genus Pterois, and three dwarf “lions” that are commonly offered for sale by dealers.

The black volitans lion (Pterois volitans) is perhaps the most spectacular of the group. Growing to 20 inches long in the wild, it is quite capable of reaching 15 inches in a home aquarium. The black volitans can be readily identified by two long fleshy spikes above its eyes, and extremely elongated pectoral rays with little webbing separating them. The red volitans (Pterois lunulata) is more commonly available than the previous species. It differs from the black volitans by having shorter pectoral fin rays that are fused together for part of their length with weblike skin. The adult red volitans lack the fleshy appendages above each eye, and the body stripes are not normally as dark or as well defined.

Smaller than the two previous species, the spotfin lion (Pterois antennata) grows to a maximum length of 8 inches in captivity. The pectoral fin rays are long but very narrow and rod shaped. The radiata lion, or white fin lion, (Pterois radiata) might be confused with the spot fin if it were not for the latter’s much lower price tag. Basically, the radiata differs in having a darker red color, and two horizontal white stripes on the caudal peduncle (just in front of the fin). When chasing food or aroused by a threatening fish, the radiata lion’s pectoral fin filaments turn from an off-white or beige color to an almost glowing bright white.

Neither of the latter two lions are as hardy as the two “volitans” species. Occasionally, they refuse to feed when first acquired. To overcome this problem, should it occur, they should be offered live brine shrimp. Even a huge 6 inch radiata lion would have a hard time passing up such a meal. After they become acclimated to aquarium life, and begin feeding on other foods, they rarely eat with the same gusto exhibited by “volitans” lions.

Both the spotfin and the radiata prefer to either hide in a cave or lie on the bottom of the aquarium next to a rock or other ornament. This contrasts with the behaviour of the two volitans lions that are often seen gliding around the aquarium, even when no food is present.

The other scorpionfishes that are known as “lionshies” belong to a different genus. The two dwarf lions, Dendrochirus biaculeatus and D. zebra, are suitable for smaller aquaria. The pectoral rays of these species are connected by skin almost to their tips. Other than downsizing the food items offered them, care is the same as for members of the genus Pterois.

Possibly the most highly prized species of lionfish is the Fu-man-chu (Dendrochirus biocellatus). It gets its common name from the two barbels that jut out from the chin, bearing a resemblance to its notorious namesake’s mustache.

By whatever of the many names you choose to call them, the “Fintastic” lion makes a fine addition to the home marine aquarium. Remember to keep foremost in your mind that these are venomous fish, and you’ll be able to enjoy their beauty in your aquarium for years to come.

Product Inquiry

QUESTION:
The color scale of the SeaTest® for Ammonia runs from yellow through various shades of green. How does one explain the blue colors that occasionally develop?

ANSWER:
Development of a blue color indicates a level of ammonia that is beyond the highest reading of the scale.

SeaTest for Ammonia was developed to be an especially sensitive test because it is important to be able to detect low concentrations of ammonia. The more common Nessler reagent kits detect only high concentrations. The highest reading on the SeaTest scale is often the lowest reading on the Nessler type.

The SeaTest reagents, without any ammonia, produce a pale yellow background color. The test forms a blue color in the presence of ammonia. So, with low levels of ammonia, various shades of green are produced. At higher levels the color becomes blue. A blue-green color could be 1.5 ppm while a deep cobalt blue may represent nearly 3.0 ppm.

High ammonia levels often occur as a result of use of medications that injure important bacteria in biological filters. Overcrowding or overfeeding are other possibilities. Water changes may be necessary to reduce toxic ammonia levels until proper balance is restored.
chloramines
Continued from page 1

optilite clays. (2) adsorption on activated carbon. Steve Spotte (personal communication) prefers the use of activated carbon, but cautioned that the adsorptive powers can vary greatly, depending on the source of carbon and its respective porosity. Some are not practical for water filtration, instead being suited for air purification, yet they may be sold as "activated carbon" for use with aquariums.

Another method that is popular in Florida relies on the "breakpoint" chlorination phenomenon described above. It was recommended by several people who have used it for 2 or more years. Basically, this method entails treating a batch of tap water with chlorine to reach or exceed the breakpoint, thereby releasing both ammonia and some of the chlorine. This must then be followed by dechlorination with a product containing thiosulfate. The recommended procedure was to add one teaspoon (3ml) bleach to 10 gallons water and aerate 2-3 hours. If excessively high ammonia levels are being used, you may need more bleach. After aerating, add normal dose of dechlorinator (Sodium Thiosulfate).

One factor that is common to all the methods is the need for a chlorine test to determine if all the chlorine or chloramine has been removed. If activated carbon is used the water must be tested to determine if all the chlorine has been adsorbed. With the other methods, over-treatment with dechlorinators should be avoided. Thus, minimal amounts of conditioner should be added, then the water should be tested for chlorine. If still present, add only a half dose, and retest for chlorine; repeat until none is left. Two methods of testing for free chlorine and chloramine are the DPD test and orthotolidine test. Although the DPD is the more accepted method, it has drawbacks, mainly that it requires a two part test to measure free chlorine and total chlorine. For our use, ortho-tolidine, which measures total chlorine, is more convenient for repeat testing.

Once the chlorine is gone, Instant Ocean® sea salt can be added. Remember that if the clinoptilolite method of ammonia removal is used, it must be done before the salt is added. In many areas the residual ammonia may be low enough that it can be controlled by the system's biological filter for partial exchanges or the use of a portable foam biological filter in the mixing tank.

In summary, the three basic methods are:
1) Adsorption by fresh activated carbon.
2) Dechlorination with sodium thiosulfate, followed by ammonia removal with either clinoptilolite or a biological filter if necessary.
3) Breakpoint chlorination by adding 1 teaspoon bleach/10 gallons of tap water, aerate 2-3 hrs., then dechlorinate with thiosulfate.

Use of a chlorine test is recommended with all three. The third is especially useful in areas with high doses of chloramine in the water.

Bibliography

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European Dry-Wet Filtration Methods

By George Smit
Netherlands

Marine tanks with only artificial or bleached corals, rocks, and stones are detrimental to keeping of marine animals, based on present knowledge. The sea provides an example of the regenerative capability of aerobic and anaerobic bacteria, in combination with the effects of intense sunlight and large amounts of macro algae and phytoplankton. In some cases we can duplicate this with small systems. Additionally, if we know how to maintain live corals in aquariums, it seems ridiculous to use "dead" decorations.

We also can maintain soft corals and Actinodiscus polyps, as well as leather corals. Caulerpa algae of various species, along with filamentous species, are being grown, and these help to consume nitrate and other organic materials with the aid of photosynthesis. We know how to mass culture Anemonefish and a few other fishes and invertebrates.

Yet, we are not filtering marine tanks correctly. Closed filter chambers may not get enough oxygen, so the bacteria-covered surfaces are subject to suffocation. Similarly, undergravel filters must be maintained carefully. If an air pump or power filter fails, the results can be a poisoning of the aquarium.

In nature there is a constant recycling of organic (living) matter and inorganic nutrients, and parts of this natural cycle can be adapted to marine tanks.

If we are to reach "biological equilibrium" between supply and demand for nutrients, we must persevere in filtration technology to achieve the delicate balances needed, utilizing nitrifying (aerobic) and denitrifying (anaerobic) filters. The aerobic part of this balance can be attained with the biological, dry-wet filter which is becoming popular in Europe.

The dry-wet aerobic filter is built in two parts. On top is the "dry" part with four plates, while the bottom is the "wet" part separated into four chambers, three submerged wet

Cyanide Update, a Call for Action

In the last decade the use of cyanide for collecting marine tropical fishes has become a major issue, primarily with regard to the Philippines. This summer, a panel discussion on cyanide use was held during the Western World Pet Supply Association trade show at Long Beach, CA. Sponsored by the Greater Bay Area Pet Industries of Northern California, panelists representing a wide variety of viewpoints had an opportunity to present their opinions. Following are a few highlights.

1) It is generally acknowledged that the illegal practice of cyanide collection does exist, however scientific documentation of its effects biologically, ecologically, and socioeconomically are not complete.

2) Capture by hand nets is a reasonable alternative to the use of cyanide. Use of nets is not new to the Philippines, however use of invisible, monofilament netting of small (3/4 inch) mesh size is also banned! Thus modern net collecting methods which could outproduce cyanide have not been available to collectors. Special government permits are just now being considered to allow the legal use of these nets.

3) Significant reductions in tropical fish populations along with habitat destruction have been reported. Scientific documentation that this change is the result of cyanide use rather than pollution, siltation, dynamite coral collecting, etc. is still lacking.

4) Short term survival following revival from cyanide capture is reported to be somewhat lower than for net collection. However, delayed mortalities reported months later are not likely to be due to collection method. In either case, conclusive studies have yet to be conducted.

Continued on page 2
Reverse Flow Filtration

By David V. Keeley
Loughborough, England

Of all filtration methods available to marine aquarists, only the “semi-natural” system, based on the undergravel filter, has found ready, overall acceptance by home aquarists. It is probably found in 99% of home marine tanks. However, there is little doubt that this semi-natural system has inherent drawbacks and faults, and this fact has driven aquarists to seek improved methods. Thus, the emergence of dry filtration, trickle filtration, and other systems.

Rather than experiment with new systems, many aquarists have chosen to improve on existing systems and remove the shortfalls of these, wherever possible and practical. They take advantage of proven techniques, rather than potentially risky and expensive new courses of action. And thus, the so-called reverse-flow system has evolved as an improvement on standard semi-natural filtration.

The semi-natural system is based primarily on the undergravel filter, hooked to an air pump via airline and an airstone. Water, moved up the uplift pipe by the action of air bubbles, is continually drawn through the gravels, carrying waste matter with it.

The larger matter will actually be physically filtered. Then, as the water passes through the gravels, the liquid, chemical and very small waste matter also pass, and the main filtration process takes place.

Once the aquarium is mature, the gravels become coated with nitifying bacteria that “process” harmful waste matter into more acceptable substances. A filter system, needs constant “gardening” to maintain its original efficiency and to remain pleasing to the eye.

1. The Water Direction — Since the water is dragged down through the gravels, larger waste matter lies on the surface, looking ugly. The gravel GRAVELS need far less maintenance, and the day of the total clean out of the aquarium is considerably delayed.

2. The Water Motivation — The water is lifted by air bubbles in an uplift tube, and the amount of air is subject to extreme fluctuations because of problems with airstones, airlines, and air pumps. Additionally, the amount of air required, especially in large tanks, can be phenomenal.

Utilization of power heads was an improvement because mess and noise are eliminated, and a far more controlled water flow is implemented.

“Reverse flow” was a logical extension. A power head or canister filter could be used to move the water backwards through the undergravel filter, providing a number of advantages:

1. Silence.
2. Controlled steady flow.
3. Cleanliness! Instead of all those bits lying on your gravel, they are now sucked into your filter, from where they are far more easily removed.
4. Choice — Internal power filters for neatness and cheapness, or canister filters for easier accessibility and greater choice of filtering materials.
5. The role of physical filter has been taken over by the water. The choice of gravels is less critical, and the amount needed is reduced.
6. Since the water passing through the gravels is now so much cleaner, the

Figure 1: Reverse flow filtration system, showing both internal and external power filters.

For further information on these projects contact:

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Cyanide Continued from page 1

Three courses of action are available.

One is to leave the problem for the Philippine government and tropical fish export industry to resolve. In the mean time location of the other sources of net collected fish. This has some merit if allegations of corruption and a lack of cooperation among the groups involved are true, however the collectors will continue to suffer the consequences.

Secondly, the pet industry could sponsor investigations to more fully understand the effects of cyanide to the health of the fish, the ecology of the reef, and the livelihood of the collectors. Mr. George Blasiola, moderator of the recent panel discussion and member of the PIJAC (Pet Industry Joint Advisory Council) cyanide committee has proposed such a project. Certainly more facts would be useful in developing a plan of action. In addition, interest by recognized representatives of the U.S. pet industry might lead to an improved spirit of cooperation among the various groups involved. Of course, if other factors were found to be the major causes of fish losses (i.e. ammonia) and deterioration of the collection sites (i.e. pollution or siltation), then a training program would still be unproductive.

The third choice is to accept the theory that cyanide use is a major factor in the shipping mortalities and the destruction of the reefs, and undertake immediate action to convert collectors to more economically sound techniques. Steve Robinson, professional collector and outspoken critic of cyanide use has proposed a plan to retrain 700 collectors and provide them with basic supplies. Under the auspices of the International Marinelife Alliance, the project would cost an estimated $75,000 for training and travel for a year. His goal is to begin training this winter and he is currently soliciting tax deductible donations to finance the program.

A similar project is currently being promoted for training villages in several areas of Indonesia. Knut Kvalavagna has submitted a three year plan for development of the ornamental fishery using net methods to the United Nations Food and Agriculture Organization (FAO). This is a research oriented project to develop the fishery and to monitor the socio-economic development in the villages. It has a budget of $97,000.

In conclusion, the cyanide issue is very complicated and emotional. Documented facts are scarce, thus public opinions must be based primarily upon the credibility of the personalities involved.
A large minireef aquarium using dry-wet filtration.

European Dry-Wet

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In contrast with undergravel filters which need fast water flows, this system needs only four turnovers per hour, thus a 100 gallon tank needs only a single 400 gallon per hour pumped flow. This separate filter does not require maintenance. The return from the dry-wet filter is at the surface of the aquarium, above the water, which increases oxygenation.

The tank must be equipped with an overflow to supply the dry-wet filter. This surface removal helps aerate water going to the filter, and is also trouble free mechanically, compared to siphons. Air bubbles, walking anemones, and a host of other problems can occur with siphons. Finally, the water level is constant in a tank with an overflow so it will always be filled.

Chemically, the surface overflow also is beneficial since most organics, including amino acids, fatty acids, etc. collect there. These slimy pollutants are skimmed off into the corner chamber which has a layer of glass wool or filter foam. Regular cleaning or changing this glass wool will remove some pollutants from the system. This chamber acts as a prefilter eliminating maintenance of the main dry-wet filter.

Aquariums must be open at the surface, not just a small amount for placing the lights, but open over the whole surface. Marine tanks must breathe. They need circulation of water at the surface to exchange gases like carbon dioxide, nitrogen, and, most importantly, oxygen.

The aquarist should be aware of his oxygen level. If it is below 5.8 milligrams per liter, it will not operate properly as a natural aerobic biological filter. The dry-wet filter design provides plenty of oxygen to the tank, generally over 90% saturation in the filter.

A final note on maintenance, if the dry trays ever become clogged, they can be removed (one per week) and gently cleaned to remove organic buildups without disturbing the system.

In conclusion, this dry-wet filter has been tested for over 8 years and has proved to be nearly maintenance free, and superior to many other systems.

Sea Notes:

When using synthetic sea salt with municipal water supplies, be sure to neutralize chlorine or chloramine with a quality chlorine remover before introducing sea water to the aquarium.

Air Valve Contest Grand Prize Awarded

The Grand Prize winner for the Aquarium Systems Instant Winner contest was chosen recently at the American Pet Products Manufacturers Association's Dealer Showcase in Philadelphia, PA. Mr. Paul Spiece, host of the highly acclaimed PBS television series, Guppies to Groupers, performed the honor of drawing the winning card from thousands of entries.

The Grand Prize of a $1,000 aquarium setup went to Mr. Joseph E. Oskowiak, Abington, PA.

Although the Grand Prize has been awarded, Instant Winner cards can still be redeemed for 1st, 2nd, or 3rd place prizes. Instant Winner cards are available in packages of Aquarium Systems Airline Valves, Airline Extensions, and Connector Sets.
An Algae Filter for Home Aquariums

By Dana Riddle

If a marine aquariumist wishes to keep fishes in the best possible condition, providing proper filtration must be a high priority. In a closed system, conventional, biological filtration will maintain many species, but some may require higher quality water.

For a modest sum, the average aquarist can build an external algae filter on a principle similar to the Smithsonian Institution's "Algae Turf Scrubbers" as described in SeaScope, Winter 1985.

Basically, this is how the filter works. A smaller aquarium is placed next to the display tank. Siphon tubes draw water into the algae filter where a massive algal growth is encouraged. Water passes the algae, is drawn through a subsand filter and is pumped back into the display tank by a powerhead pump.

The benefits of this home algae tank are two-fold. Algae reduce the level of nitrogenous matter and oxygenate the water before it passes through the high-rate subsand filter which provides additional biological filtration.

In our system, a 5½ gallon (21 liter) all-glass aquarium serves as the filter. The subsand filter tube was modified to accept a 400 gallon per hour rated power filter. Ten pounds of crushed coral and shell were used as filter media. Four acrylic rods were pushed into the gravel as supports for a glass plate, 2 inches above the filter bed. The glass plate was covered with pieces of mushroom coral which provide substrate for the algae while preventing light from reaching the filter bed. This in turn eliminates a clogging growth of algae on the bed. The coral pieces are easily removed for periodic cleaning when growth becomes excessive.

A light hood, with a 60 watt bulb, provides light for excellent algae growth. If SeaGarden Algae Nutrients are added regularly, the algae must be harvested on a weekly basis.

During the six months this experimental filter has been in operation, water quality has been stable at these levels: pH 8.2-8.3, Ammonia (NH₃-N) 0 mg/L, Nitrite (NO₂⁻N) 0-0.04 mg/L, Nitrate (NO₃⁻N) 10 mg/L.

Use of this type of filter, combined with periodic water changes, should lead to a marine aquarium where captive specimens show good growth and exhibit vivid coloration.

Editor’s Note:

The use of a separate algae filter can be beneficial and in many cases is superior to algae grown in the aquarium, since the fish cannot disturb the algal bed. Total control of pH and nitrate, however, will only be successful if the aquarium is properly balanced, otherwise the effects of an algae filter can be overwhelmed by heavy fish loading and overfeeding.

To fully appreciate the impact of feeding large fishes, one must understand that crude protein is over one sixth nitrogen. This becomes ammonia and eventually nitrate. This process produces acid resulting in a reduction of buffer and eventually a pH drop.

Growth of algae reverses this sequence by utilizing nitrate to produce vegetable protein and raising pH. As an example, consider feeding 10 grams of fresh shrimp (20% protein), which contains 0.32 grams of nitrogen. If fed in a 26 gallon (100 liter) aquarium, it would produce 3.2 ppm nitrate (NO₃⁻N). Reversing this process with an algae filter producing vegetable protein would require production of 2 grams of protein; but, since most algae are only 5% or less protein, it would be necessary to harvest at least 40 grams of drained algae to remove the nutrients from the aquarium. Thus, even with an algae filter, one should avoid crowding and overfeeding, which are major health problems for aquarium fishes.

SeaCure

A new, simple copper medication for the treatment of Cryptocarion and Amyloodinium (Oodinium).

SeaCure is formulated to deliver a therapeutic level of ionic copper, the most effective form.

Designed to be compatible with the SeaTest Copper Kit, together they form a reliable system for control of common marine parasites.

Comprehensive instructions are provided which explain, in detail, treatment methods, dosage calculations, and precautions.

SeaScope was created to present short, informative articles of interest to marine aquarists. Topics may include water chemistry, nutrition, mariculture, system design, ecology, behavior, and fish health.

Article contributions are welcomed. They should deal with pertinent marine aquarium topics and are subject to editorial reviews that in our opinion are necessary. Payment will be made at existing rates and will cover all author's rights to the material submitted.

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