

Nature Aquarium information magazine

# AQUAJOURNAL

ADA  
aqua design amano

OCT.  
2012

[ Special Feature ]

# EPIPHYTIC

AQUATIC PLANTS Tips and Techniques

# ADA's Lighting Systems

## Higher brightness and a more simple design

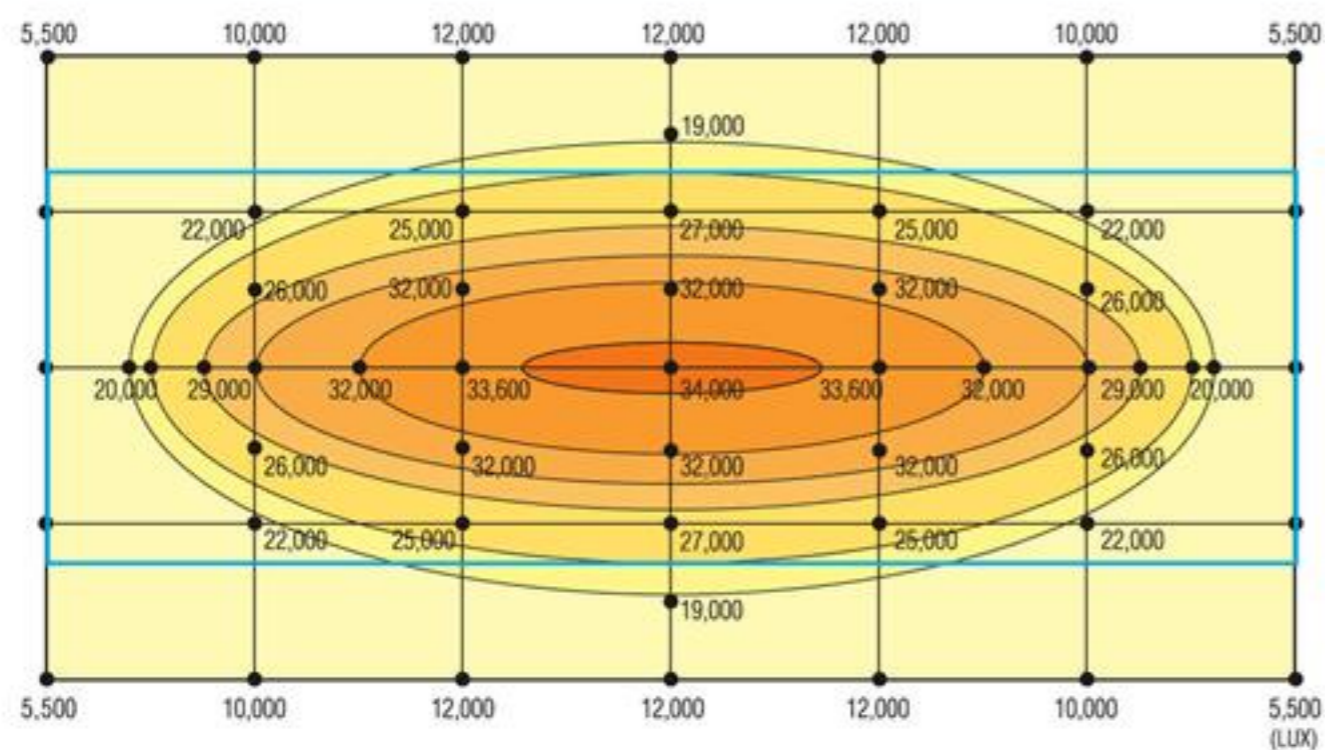
**NEW!** LED lighting system, AQUASKY, designed for planted aquariums.

# AQUASKY602

ADA's AQUASKY is the world's first LED lighting system developed specifically for planted aquariums. A new lineup, compatible with aquarium tanks 45cm wide and 60cm wide, is to hit the market, this fall. For 60cm wide aquariums, the single light model - AQUASKY 601 and the twin light model - AQUASKY 602 are available. Choose a model according to the type of main aquatic plants planted in your 60cm-wide aquarium. You can also install maximum of 3 LED lighting units (AQUASKY 601 x 1, AQUASKY 602 x 1) to a 60cm aquarium tank. AQUASKY 602 is capable of providing the same illuminance level as Solar I. AQUASKY series makes possible to fully appreciate aquatic plant layouts, which was hardly achieved by other LED lighting systems before.

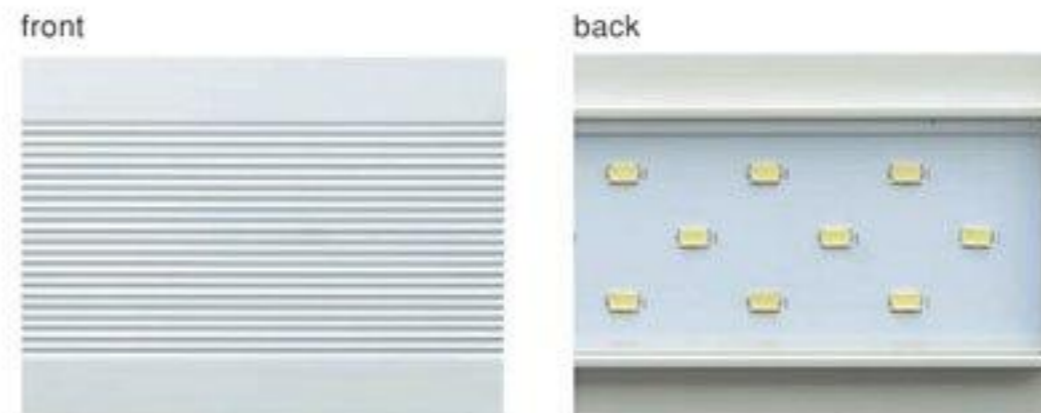
\*We measured the center spot illuminance level with following condition: Direct illuminance level measured at 12cm from the lighting source for AQUASKY 602, and 30cm for Solar I.

AQUASKY 602 featuring high light distribution performance



□ W60xD30cm (Measurement distance: 12cm, assumed distance between the light source and water surface)  
□ AQUASKY 602

High luminosity LED lighting unit developed with ADA's lighting technology



It employs the material and structure of outstanding heat radiation performance.

It provides excellent light intensity, which is created by efficient LED layout.

A key to AQUASKY's brightness is its high luminosity LEDs and their layout. Numbers of high luminosity LEDs are regularly distributed in a shifted manner, and it makes possible to illuminate a whole aquarium layout. Heat generation is a common problem of high luminosity LED lamps. ADA solved the problem by employing the high radiation performance aluminum material and its unique fin structures.

### NATURE AQUARIUM DATA 2 months after installation (trimmed 4 times)

**Aquarium:** Cube Garden W60xD30xH36cm  
**Lighting:** AQUASKY 602 (LED 0.4W/each x 63/ 2 units)  
**Filter:** Super Jet Filter ES-300 (prototype), Bio Rio, NA Carbon, Lily Pipe P-1, Lily Pipe V-3  
**Substrate:** Aqua Soil - Amazonia, Power Sand S  
**CO<sub>2</sub>:** Pollen Glass, 3 bubbles per second via CO<sub>2</sub> Beetle Counter (using YA/Ver.2)

**Additives:** Brighty K, Green Brighty STEP2  
**Water Change:** 1/3 once a week  
**Water Quality:** Temperature 25°C (77°F) pH: 6.8 TH: 20mg/ℓ  
**Aquatic Plants:** Wabi-kusa Eleocharis parvula x 3, Wabi-kusa Glossostigma x 5, Wabi-kusa Stemmed Plants Mix x 4, Wabi-kusa Stemmed Plants Mix Red x 1  
**Fish / Invertebrates:** Trigonostigma espei, Otocinclus sp., Caridina japonica



The image shown is a Wabi-kusa layout aquarium about 2 months after installing AQUASKY 602. AQUASKY 602 is capable of providing plenty of light for light-loving *Glossostigma*, *Eleocharis parvula*, stem plants and other heliophytic plants.



The single light model for 45cm wide aquariums

## AQUASKY 451

■ Light housing unit size : W430×D68×H10mm  
 ■ Clear stand size : W450×D100×H95mm  
 Product specification  
 Input voltage : AC100~240V 50/60Hz  
 Power consumption : 22W  
 Current consumption : 650mA ±5%  
 Luminous flux : 1,800~2,160lm  
 Color temperature : Around 7,000K  
 LED : 0.4W/each×45 / LED lifetime : Over 30,000hrs  
 Operating temperature range : 0~35°C

AQUASKY 451 is compatible with ADA Cube Garden / Cube Glass in the following sizes:  
 W45 x D24 x H16 (cm) glass thickness 5mm  
 W45 x D24 x H30 (cm) glass thickness 5mm  
 W45 x D27 x H30 (cm) glass thickness 5mm



The practical single light model for 60cm wide aquariums

## AQUASKY 601

■ Light housing unit size : W570×D68×H10mm  
 ■ Clear stand size : W600×D94×H120mm  
 Product specification  
 Input voltage : AC100~240V 50/60Hz  
 Power consumption : 30W  
 Current consumption : 900mA ±5%  
 Luminous flux : 2,520~2,850lm  
 Color temperature : Around 7,000K  
 LED : 0.4W/each × 63 / LED lifetime : Over 30,000hrs  
 Operating temperature range : 0~35°C

AQUASKY 601 is compatible with ADA Cube Garden / Cube Glass in the following sizes:  
 W60 x D30 x H18 (cm) glass thickness 5mm  
 W60 x D30 x H36 (cm) glass thickness 6mm  
 W60 x D30 x H45 (cm) glass thickness 6mm



The twin light model for 60cm wide planted aquariums

## AQUASKY 602

■ Light housing unit size : W570×D68×H10mm  
 ■ Clear stand size : W600×D188×H120mm  
 Product specification  
 Input voltage : AC100~240V 50/60Hz  
 Power consumption : 60W (30W per lighting unit)  
 Current consumption : 900mA ±5% (per lighting unit)  
 Luminous flux : 2,520~2,850lm (per lighting unit)  
 Color temperature : Around 7,000K  
 LED : 0.4W/each × 63 (per lighting unit) / LED lifetime : Over 30,000hrs  
 Operating temperature range : 0~35°C  
 ※AQUASKY 602 comes with 2 adapters. Each adapter takes one lighting unit.

AQUASKY 602 is compatible with ADA Cube Garden / Cube Glass in the following sizes:  
 W60 x D30 x H18 (cm) glass thickness 5mm  
 W60 x D30 x H36 (cm) glass thickness 6mm  
 W60 x D30 x H45 (cm) glass thickness 6mm

\*Due to the characteristics of LED, there is a variance in range of color temperature. \*Install AQUASKY 601 and AQUASKY 602 to a 60cm wide aquarium (W60xD30xH36cm) for higher light intensity.  
 \*Photo is for image only. The product has a power supply cord on the side. \*Other displayed products are sold separately.





Passion Ignites Enjoyment of the Hobby

ADA PREMIUM



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We recreate the natural eco-system in our aquarium, which leads to  
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aqua design amano

*The 20<sup>th</sup>  
Anniversary*

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### **The Powerful Senpiro Falls during Early Summer (Senpiro Falls, Yakushima Island, Japan)**

While visiting Senpiro Falls, a really heavy storm brought a heavy downpour of rain. Meanwhile, roaring torrents of water were gushing down the waterfall to my immediate left. The sight was so overwhelmingly dynamic that we felt as if we were being swallowed up by the raging waters. As I was shooting in this bad storm, four of my exposure meters got wet and were ruined. It was the most costly shooting I ever did.

Shooting data / Deardroff 5x7, Apo-Tele-Xenar 400mm,  
1/4 sec at f22, RVP F 5x7 inch format film

# AQUA JOURNAL

OCTOBER 2012

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[ Special Feature ]

# EPIPHYTIC

## AQUATIC PLANTS Tips and Techniques

Epiphytic aquatic plants are an essential part of Nature Aquarium for the creation of an attractive mid-ground and the expression of a natural atmosphere. Making the best use of epiphytic aquatic plants such as ferns, moss and Anubias helps you to attain a higher level of perfection of the layout and also makes the long-term maintenance of the aquascape easier. The Special Feature of this issue introduces many tips and techniques for utilizing epiphytic aquatic plants.

*Photographs by Takashi Amano*

*Text by Masatoshi Abe/Tsuyoshi Oiwa*

*Translation support by Frank Wazeter*







# Searching for Wild Epiphytic Aquatic Plants

West Africa



**Except for a few certain species which were commercially available for layout use, wild Anubias had been wrapped in mystery until Takashi Amano risked his life to discover their natural habitat in nature. Allow us to introduce you to the native land of Anubias.**

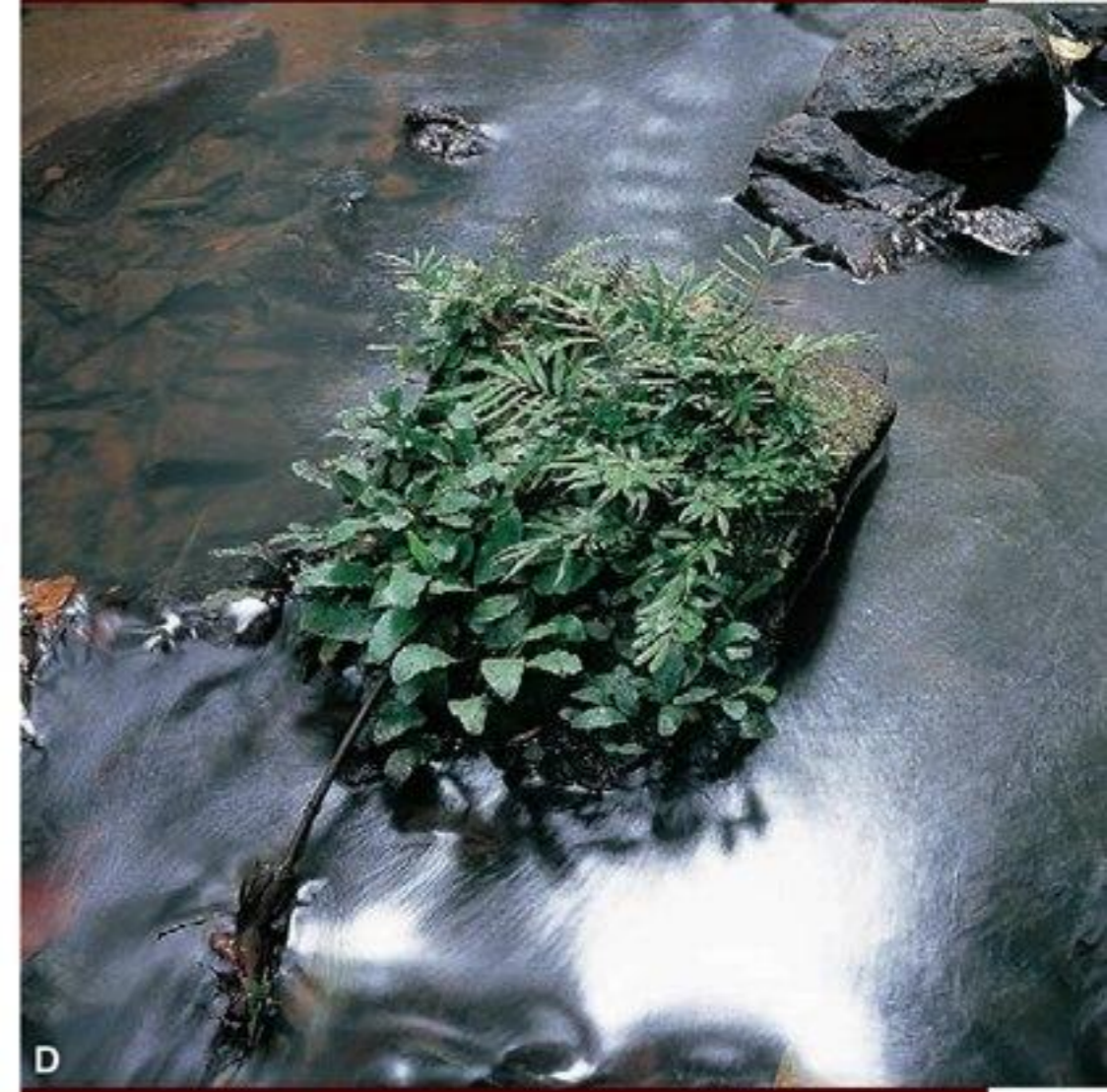
A: There was a large natural biotope of Anubias near the border between Gabon and Congo in West Africa, which is only known to some Pygmy tribes.

B: Anubias grew everywhere as far as the eye could see, lining the edges of the river flowing through jungle, which was dark even during the day.





C: Moss and Anubias were found to grow steadily on the driftwood in water. In this scene in the wild, we can find a good example of the natural composition to be expressed in Nature Aquarium. D-G: Anubias and Bolbitis grow firmly on stones scattered in a blackwater river. They are strongly epiphytic so that they will not be swept away even by an overflowing river. H: Moss and Anubias covering a stone. The Japanese "Wabi-Sabi" aesthetic can be seen naturally here. I: Under some environmental conditions, Anubias grow so vigorously that the stone under them is totally invisible.



Anubias is a core species group of aquatic plants that originate in Africa. Their habitats and lives in nature had been relatively unknown for a long time for reasons that can only be understood by visiting their native habitat. The home of Anubias was secluded deep in the jungle where only a select few Pygmy tribes were aware of it. Walking days through the jungle became deadly, as intense heat

exceeded 40°C (104°F) with nearly 100% humidity aided in creating severe conditions. Days into the journey we suddenly stumbled upon a vista brimming with Anubias. This untouched, pristine piece of nature was preserved precisely because of the dense jungle which had hindered the development of civilization. Attaching itself firmly to driftwood and stones, wild Anubias grew as if it were to fill the entire

river winding through the jungle. The sight of Anubias spreading leaves healthily on stones and driftwood, rather than rooting in soil, suggests that the methodology of how we use this plant in Nature Aquarium is absolutely correct. At the same time, observing this plant in nature offers us some guidance on how to express a feeling of universal naturalness in our layouts.

# The Lives of Epiphytic Aquatic Plants

West Africa



In Nature Aquarium, Bolbitis has long been used by attaching it to driftwood. This plant grown in the wild shows us its amazingly strong epiphytic nature and tells us the correct way of using this plant in Nature Aquarium.





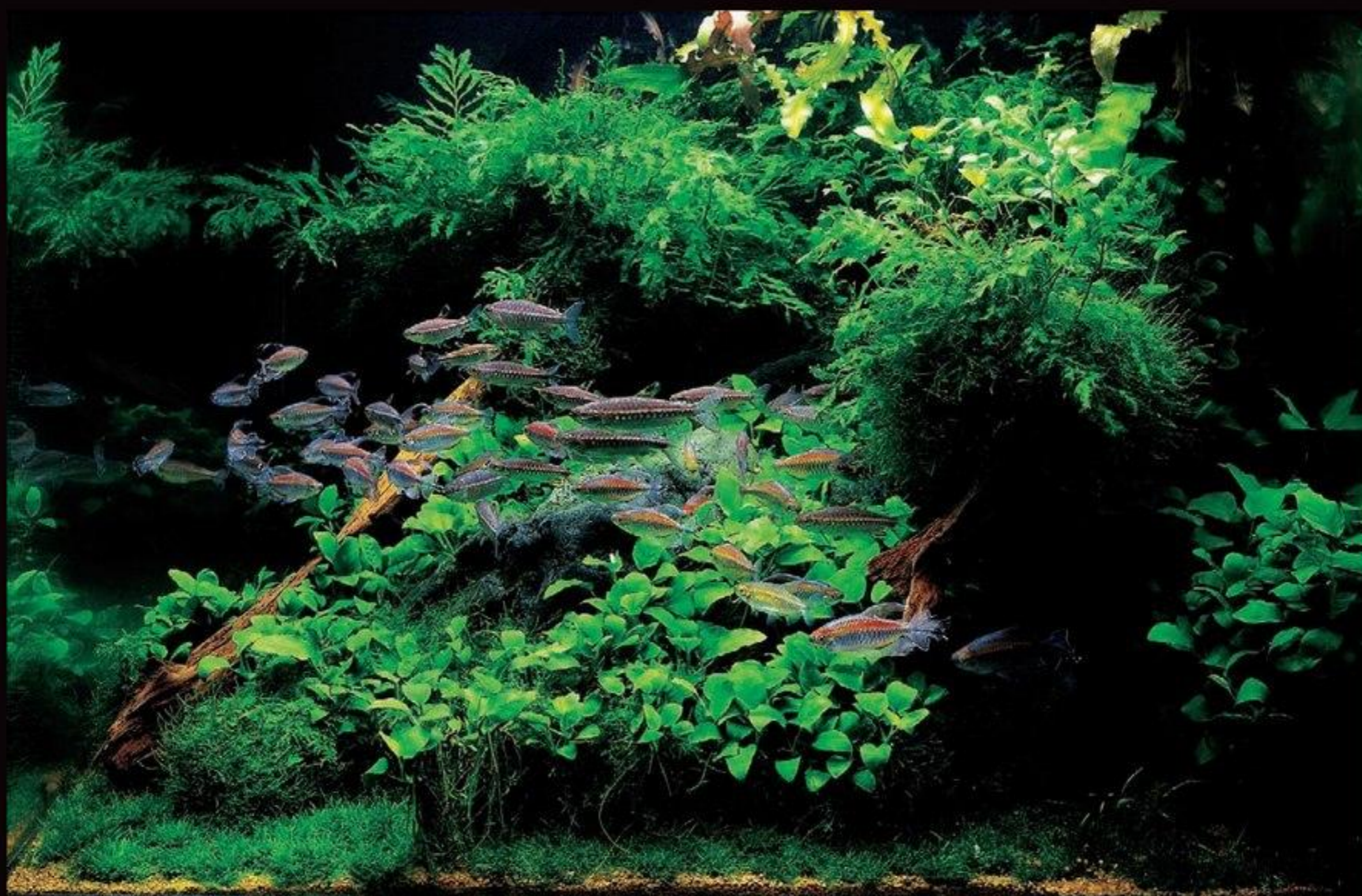
A: Bolbitis attaches itself to driftwood that is exposed to the flowing water of a river. It spreads both emerged and submersed leaves. B: Submersed leaves of Bolbitis on the river bed. At first glance, it appears that Bolbitis has taken root directly in the substrate. C: Several pebbles were found on Bolbitis when its submersed leaves were taken out of the water. D: Bolbitis keeps itself in place in the river by holding many pebbles with its highly epiphytic roots, rather than taking root in the substrate. E: Bolbitis attaching itself to mossy driftwood looks tasteful with its attractive fronds that are unique to ferns.

Bolbitis, a landmark fern species used in Nature Aquarium, has been used in layouts by attaching it to stones and driftwood. This way of growing the plant in Nature Aquarium is proven to be correct through the observation of wild Bolbitis in West Africa. Bolbitis having pinnately-divided fronds while attached to stones and driftwood together with moss gave a feeling of universal naturalness and inspired a strong feeling in us of the Japanese concept of "Wabi-Sabi" even though

they grow in West Africa right on the equator. Instead of attaching themselves to large stones and driftwood in the river, some Bolbitis grow submersed in the river by spreading its submersed leaves. An interesting fact was discovered when the submersed form of Bolbitis was taken out of the water. The discovery was that the roots of Bolbitis had been winding around several pieces of pebbles to hold itself firmly in place in the current of the river, rather than spreading its roots in the river

Bolbitis, a landmark fern species used in bed. This characteristic of Bolbitis is used in making a layout. In Nature Aquarium, it is a common technique to fix ferns to small stones and place them in areas where it is difficult to attach a plant directly, such as around the intersection of pieces of driftwood. This is one of the layout techniques developed from the inspiration of seeing how these plants grow in nature.

LAYOUT  
WITH  
BOLBITIS & ANUBIAS



W120xD100xH75 (cm)



W120×D45×H45 (cm)

## Layout using Bolbitis and Anubias

Fronds give a unique plant shape that is unique to ferns, which allows Bolbitis to add the natural feeling of a wild fern in a layout, which expresses a profound feeling of Wabi-Sabi. This plant also has a calm, soothing tone with its translucent dark-green submerged leaves. These features of Bolbitis match well with Willow Moss and Anubias, which are also members of the shade-loving plant group. Cobra Grass (Mini Microsword) have the same shade of green, matching well with the overall layout composition with a sense of continuity. The above layout was designed to

give an austere impression with elegance by coupling Bolbitis and Willow Moss together onto driftwood in order to produce a natural ambience. Besides Bolbitis and Willow moss, *Microsorium* sp. (Narrow Leaf) and *Anubias barteri* var. *nana* "Narrow Leaf" are also attached to the driftwood in this layout. Among these plants, Bolbitis effectively brings different species of plants together and expresses the feeling of Wabi-Sabi. The technique of attaching Bolbitis and Willow moss to the same piece of driftwood is a good representation of the classic technique to use

B o l b i t i s

effectively in Nature Aquarium. What is interesting is that the layout will have an African touch if Anubias and Aponogeton are added to the combination of Bolbitis and Willow moss as shown in the layout on the left. On the other hand, a natural feel can be added to a bright layout if Bolbitis is combined with sun-loving stem plants. Bolbitis is one of the most useful epiphytic aquatic plants in Nature Aquarium because it has the flexibility to alter the dynamics of a layout while shaping the aquascape's atmosphere and tying together the whole picture.

# TECHNIQUES AND KNOW-HOW

KNOW-HOW 01

## Creating the Mid-Ground

### The Role of Epiphytic Plants and the Mid-Ground

Composition materials, such as stones and driftwood, are placed in the mid-ground of the layout. This area is where epiphytic plants, such as *Microsorium*, *Bolbitis* and *Anubias*, play a key role. Creating a solid framework for the aquascape out of composition materials and creating an attractive mid-ground is a very important process in designing a layout. This segment discusses the various roles of a mid-ground which uses epiphytic plants.



*Microsorium*, which has been tied to small stones, are placed on the driftwood. This must be done carefully while keeping in mind that the driftwood is a crucial element in forming the framework of the layout in order to ensure good balance in the composition.

**1** When aquatic plants have a significant presence in the mid-ground

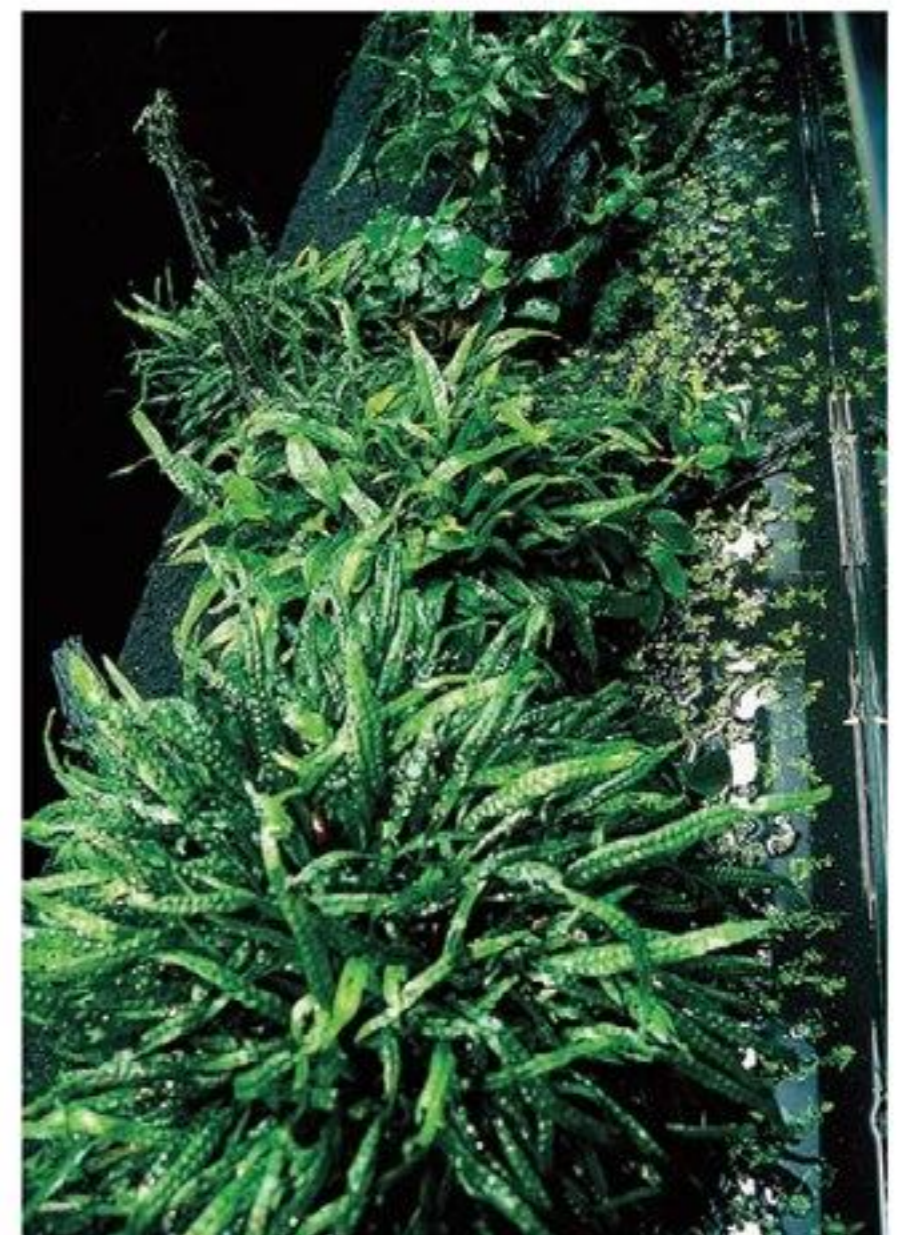
Epiphytic plants play the key role in the mid-ground when attached to stone and driftwood where the composition materials are arranged. Once you have placed the composition materials properly in the mid-ground, epiphytic aquatic plants that are fixed to small stones are placed in the recesses or intersection portions of driftwood. When attached to branches, epiphytic plants are attached using a tool, such as Wood Tight, to hold the plant in place. It is important to thin out excessively dense leaves on epiphytic plants before planting. Otherwise, fern diseases (spotted when leaves darken and then eventually start to melt) can easily occur during the hot summer when water temperatures rise. The process of attaching epiphytic plants (with the exception of Willow Moss, which needs to be attached immediately after the composition materials are arranged) may be finalized upon the completion of planting other aquatic plants while observing the overall atmosphere and balance of the layout.

**2** The key to crafting an elaborate mid-ground

The mid-ground plays an extremely important role in Nature Aquarium. The elements of the foreground and background are separated by the mid-ground and compositional materials. In many cases, stem plants are planted in the background location of the layout. Stem plants require frequent trimming for maintenance, but the cut sections of the trimmed plants are not pleasant to see. Epiphytic plants planted in the mid-ground conceal these unsightly portions; thereby the attractive appearance of the aquascape can be maintained even immediately after the trimming of stem plants.



Since the space under the driftwood where the *Microsorium* is placed does not get much light, foreground plants that require a higher light intensity cannot grow there. To make the mid-ground more attractive, shade-loving *Anubias* wound around stones are placed together with *Microsorium*.





## ■ Epiphytic Plants Decorating the Mid-ground

### Concealing the bottom part of the stem plants in the background

The leaves of *Microsorium* and *Bolbitis* plants that have been attached to driftwood play the role of concealing any unsightly cut sections of trimmed stem plants. It is strongly advised to cut off leaves of these plants if they have grown excessively large toward the background. Those leaves can block the light falling on stem plants, causing their growth to suffer.



### Softening the surface color of driftwood

The dark brown surface of driftwood would be too prominent and stand out too starkly amongst lighter-colored aquatic plants. Attaching Willow Moss and other epiphytic aquatic plants to driftwood tones down the presence of the driftwood and gives a more balanced impression.

### Covering the bottom part of driftwood

In some layouts, the aquascape can be balanced out if the uneven bottom portion of the driftwood, or gaps between driftwood and substrate, are concealed. In this particular case, placing *Anubias* that has been tied to small stones, or Willow Moss wrapped around a stone, is a good technique to cover up those areas of the layout.

### [ Basic Attaching Method ]

The following shows one method of attaching *Microsorium* to stones.



Cut off damaged leaves from the base of the leaf stem using a short type of scissors.



Put Wood Tight through the center of *Microsorium* so that its roots will wrap around the stone.



Choose a smaller stone size and securely attach *Microsorium* to the selected stone with Wood Tight.



Now that the preparation of *Microsorium* is completed, place it in a recessed portion of the driftwood or any other crevices throughout the layout as pleased.

## Making an Attractive Mid-Ground with Epiphytic Plants

Taking long-term maintenance into consideration. \_\_\_\_\_



### The Mid-Ground Plays a Vital Role in the Maintenance of an Aquascape

Aside from being a determining factor in governing the impression of a layout, epiphytic aquatic plants are used for the purpose of creating an elaborate mid-ground. This means a lot for long-term maintenance of aquascape. The trimming of foreground plants and stem plants located in the background is a necessary process to maintain the aesthetic appeal of an aquascape. Nevertheless, the trimming process inevitably detracts from the attractiveness of the aquascape immediately afterwards. In light of this fact,

creating an elaborate mid-ground from the beginning by attaching epiphytic plants to driftwood will help maintain the good appearance of an aquascape even after trimming stem plants in the background. The mid-ground plays a particularly important role in cases where stem plants are planted in the background in a large aquarium. In this case, the photograph of the layout was manipulated so that you can see the importance of the mid-ground.





Trimming image

In Nature Aquarium, it is a classic technique to conceal the bottom part of the stem plants with the mid-ground. Stones with Willow Moss attached are placed along the border of the cosmetic sand area.



Ultimately, it is important to create a mid-ground that can be appreciated as part of a complete aquascape. The layout will regain its bright impression once the stem plants grow again.



A large panoramic tank with various species of stem plants in the background. Dark green Anubias in contrast to light-colored stem plants prevents the layout from becoming monotonous in terms of color.



Trimming image

Anubias attached to the driftwood in the mid-ground serves as a guide for the trimming line for stem plants. Anubias leaves should also be occasionally thinned out to control its volume.



The driftwood placed on the left side of the layout was attached with *Microsorium* that is three times as large as the plant on the right side.



A key element in mid-ground design \_\_\_\_\_

## Aquatic Plants Attached to Composition Materials



For the smaller driftwood on the right side, the corresponding size of *Microsorium* was attached to it. The size ratio of the left and right plants was made to be 3:1.

**Driftwood attached with ferns can be widely used as a part of mid-ground.**

Nature Aquarium layouts basically consist of a foreground, mid-ground and background; and the materials and aquatic plants to be used vary for each layout. While there are some cases where a clearly-separated background is not present (such as a layout using cosmetic sand in the foreground), most of the layouts use the mid-ground as a location where the composition materials (stones or driftwood), are arranged. These composition materials are a very important element in the layout - take for example the composition of an Iwagumi layout, where the impression of the layout is almost entirely determined just by the arranging of

stones. Then when you take into consideration that in driftwood layouts, where arranged pieces of driftwood form the framework for the entire layout impression, it is easy to see the importance of compositional materials. Driftwood, in particular, is used as a platform for epiphytic plants to form the mid-ground of the layout and inevitably plays a pivotal role in creating a well-balanced composition. This section primarily highlighted driftwood attached with *Microsorium*. You will find that the proper balance between plants and driftwood determines the overall balance of the layout.

# Microsorium's Home

Southeast Asia



A: A species of *Microsorium* sticks its fronds out between the stones. B: A cluster of wild *Microsorium*. Different types of leaves can be observed if you look closely. C-E: Ferns closely related to *Microsorium* sp. "Narrow Leaf". Dense leaves on a rock face show the plant's great ability to survive even under severe conditions. F-I: *Microsorium* growing inside cracks of a rock. The Japanese concept of "Wabi-Sabi" can be observed from looking at this plant growing together with moss on a rock. This appearance is one of the most attractive features of ferns.



**Microsorium**, found in Southeast Asia, is an essential epiphytic aquatic plant for Nature Aquarium and is a member of the same fern group as *Bolbitis*. This section introduces you to the natural habitat of *Microsorium*.



A large cluster of *Microsorium*. This plant develops dense leaves under the optimal levels of moisture and the appropriate light conditions.

Most ferns are shade-loving plants and are usually observed in valleys and forests with dense foliage that provide shady conditions for most of the day. *Microsorium* is an aquatic fern species that originates in areas of Southeast Asia, such as Thailand and Borneo. It is often observed growing on a slope facing a stream or shady rock face, just like other species of ferns. Only moss and ferns can survive in these areas with such low light

and nutrient levels. *Microsorium* silently grows on the rocks and fallen trees of this kind of environment. These features of *Microsorium* and other shade loving plants implies their ability to adapt well to Nature Aquarium. In fact, *Microsorium* can adapt to a wide-range of different environments in terms of water depth and light intensity. What's more, *Microsorium* often grows on the edges of mountain streams or within cracks of moist rocks, where the plant

sends out its roots along small crevices to absorb water and nutrients. This plant displays a vigorous vitality even in the aquarium and will attach itself firmly to stones and driftwood. Once attached to driftwood or other materials, *Microsorium* develops many long roots, which can be observed as evidence of a healthy aquarium environment for this plant.

## Layout using Microsorium

Among other aquatic ferns, *Microsorium* grows in an especially attractive shape. Once the plant has grown large over a long period of time, it becomes impressive just by itself and is ideally used as a focal point for your layout. Seen in the layout below, *Microsorium* in various sizes are attached to the driftwood in three locations. In some cases, a large plant is divided or a few of small plants are joined together to achieve the best balance of size. *Microsorium* is usually attached to driftwood with Wood Tight, which can eventually be removed. However, there is

no need to remove Wood Tight if it is totally covered by the plant's leaves and grown in roots. This is one of the advantages of Wood Tight, which is brown in color and blends with driftwood. Among relatively slow growing *Microsorium* members, *Microsorium* sp. "Narrow Leaf" grows particularly slowly and it takes a long time to achieve the appearance as shown in the layout on the right side of this page. Once this plant is mature, however, it, together with the driftwood, can be transferred to another aquarium for another layout. As you notice from this trait, one of the

reasons why *Microsorium* is used in Nature Aquarium is that it can be enjoyed for a long period of time in a layout and then continue to be used in a subsequent layout after an aquarium makeover. The presence of *Microsorium* sp. "Narrow Leaf" which has grown over a long period of time is so magnificent that a layout can be almost complete just with this plant. Its distinctive presence achieved over time expresses the naturalness and inspires a "Wabi-Sabi" feeling in the layout and adds a more profound atmosphere to the aquascape.







W60×D30×H36 (cm)



W120×D45×H45 (cm)

LAYOUT  
WITH  
MICROSORUM

# TECHNIQUES

KNOW-HOW 02

## Proper Locations for Epiphytic Aquatic Plants

### Where Should an Epiphytic Plant be Attached?

The purpose of attaching epiphytic aquatic plants to driftwood or small stones can be categorized by saying "to enhance the natural feeling of the aquascape," and "to conceal undesirable aspects of the layout." If this is the case, then where should epiphytic aquatic plants be located to achieve this purpose? This section explains key tips and pointers for the where to place an epiphytic aquatic plant.

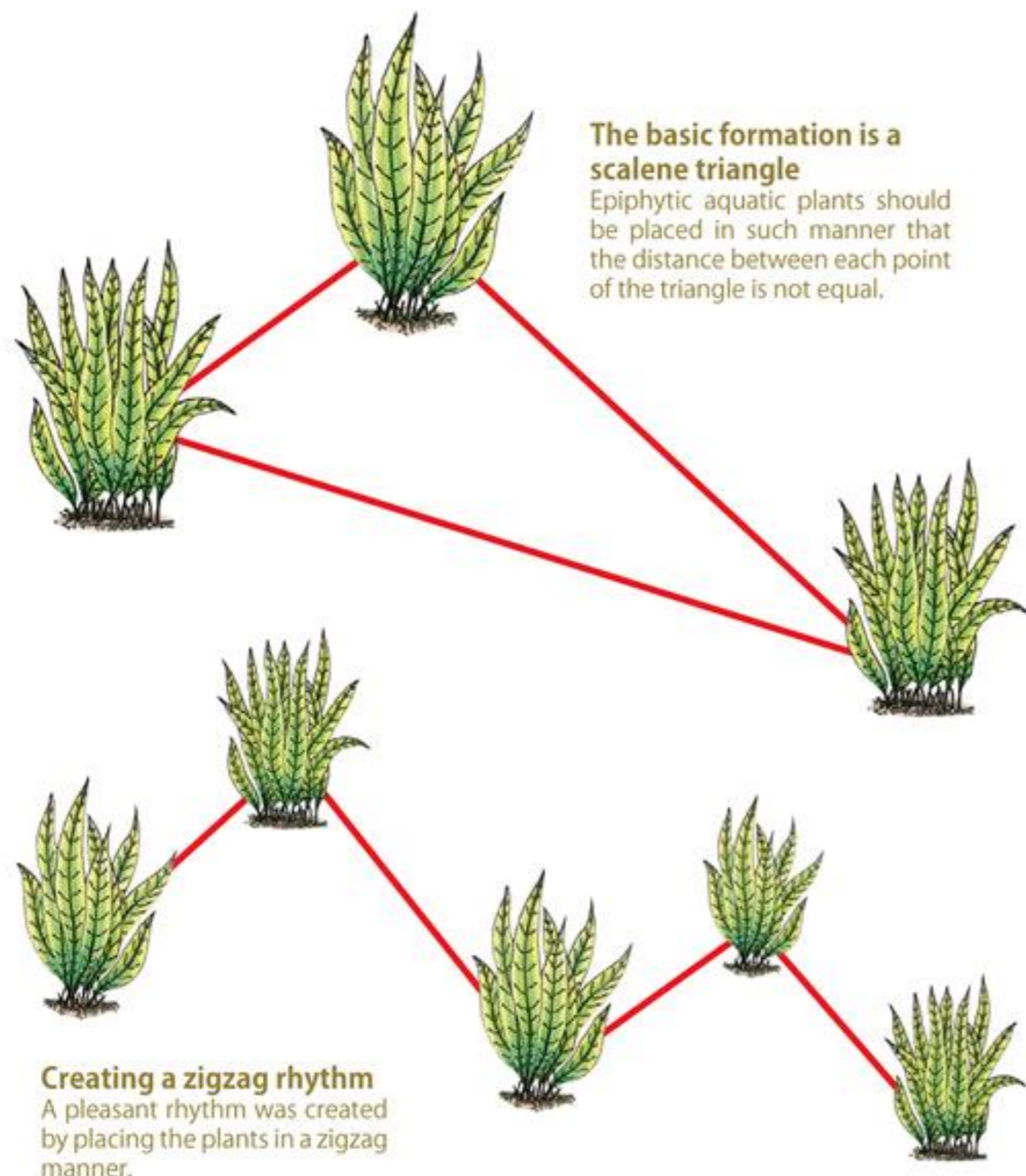
#### Giving rhythm to epiphytic aquatic plants

In Nature Aquarium, the number of stones to be used for Iwagumi and the number of fish to be added to the aquarium are basically an odd number (i.e., 1, 3, 5, 7...). It is because an odd number creates an imbalance in the layout, leading to a dynamic, tense and pleasant view. If the number is an even number, the object can look like a symmetrically split pair. This concept of odd numbers also applies to epiphytic aquatic plants, such as *Microsorium*, *Bolbitis* and *Anubias*, which is to be

arranged on a parts of the driftwood. The method of placing only a single plant, which is not very popular, is used to attract the viewers' attention. In this case, the plant is arranged in a location which serves as a focal point of the layout. The most popular method is attaching three plants to the driftwood to form a scalene triangle. When adding plants to this basic style, the plants should be arranged in a zigzag manner to avoid parallel placement. The method introduced here is merely a basic arrangement. Based on this

basic method, hobbyists can attach more epiphytic plants in locations where the plants can be easily placed such as recesses, branch tips and the base of the branched portion. Other than the locations where you attach the epiphytic aquatic plants, consideration should also be given to the size of the plant. Good balance and enhanced naturalness can be achieved by attaching larger plants to the thick trunk of the driftwood while placing smaller plants on the tips of branches.

#### Arrangement of Epiphytic Aquatic Plants



### Concealing the undesirable portions of driftwood

Driftwood, a composition material, usually has unsightly portions such as artificially cut sections, flat and unappealing areas and overlapping points of the arranged driftwood. However, these undesirable portions can be concealed and they can even look natural if epiphytic aquatic plants are attached to such portions. This is a layout technique that can be achieved only with aquatic plants that have an epiphytic nature. It is a great method to cover up the shortcomings of driftwood by using epiphytic aquatic plants.

The unsightly cut section of a piece of driftwood



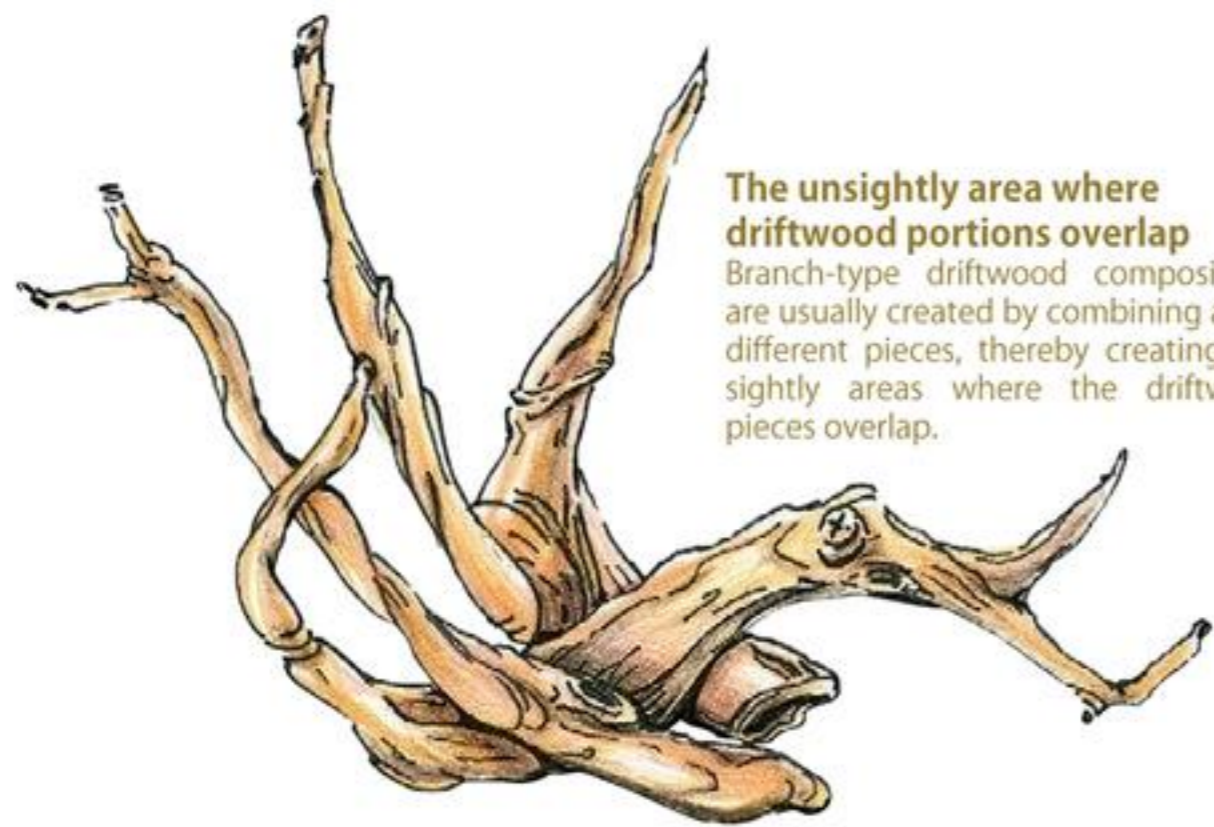
The artificial cut section usually spoils the natural feel of driftwood, even if the wood has good-looking branches.



Place an epiphytic plant that has been tied to a small stone on the cut section.

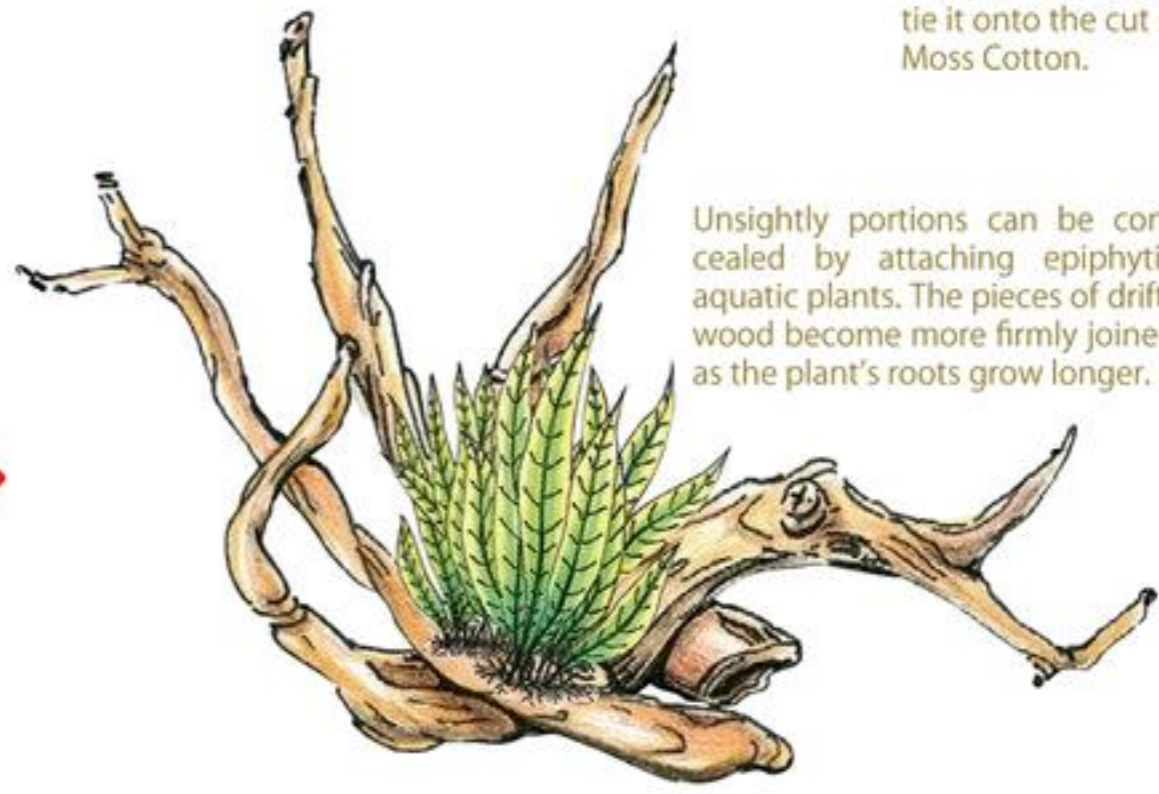


Place a thin layer of Willow moss on the cut section and tie it onto the cut section with Moss Cotton.



The unsightly area where driftwood portions overlap

Branch-type driftwood compositions are usually created by combining a few different pieces, thereby creating unsightly areas where the driftwood pieces overlap.



Unsightly portions can be concealed by attaching epiphytic aquatic plants. The pieces of driftwood become more firmly joined as the plant's roots grow longer.



When attaching epiphytic aquatic plants to the driftwood in several areas, the rhythm of the line connecting one to the other should be taken into consideration.



## Impression of Moss

A stone covered with moss is sitting calmly within a field of Hairgrass. If the stone is not mossy, the layout would appear just as pleasantly fresh as an ordinary Iwagumi layout. The moss grown on the stone expresses the passage of time and adds a profound touch to the impression of the layout. In nature, too, moss requires a long time to grow, even with favorable conditions, such as adequate levels of moisture and ventilation. This is why when moss is used in a layout it gives the impression that a long period of time has passed.

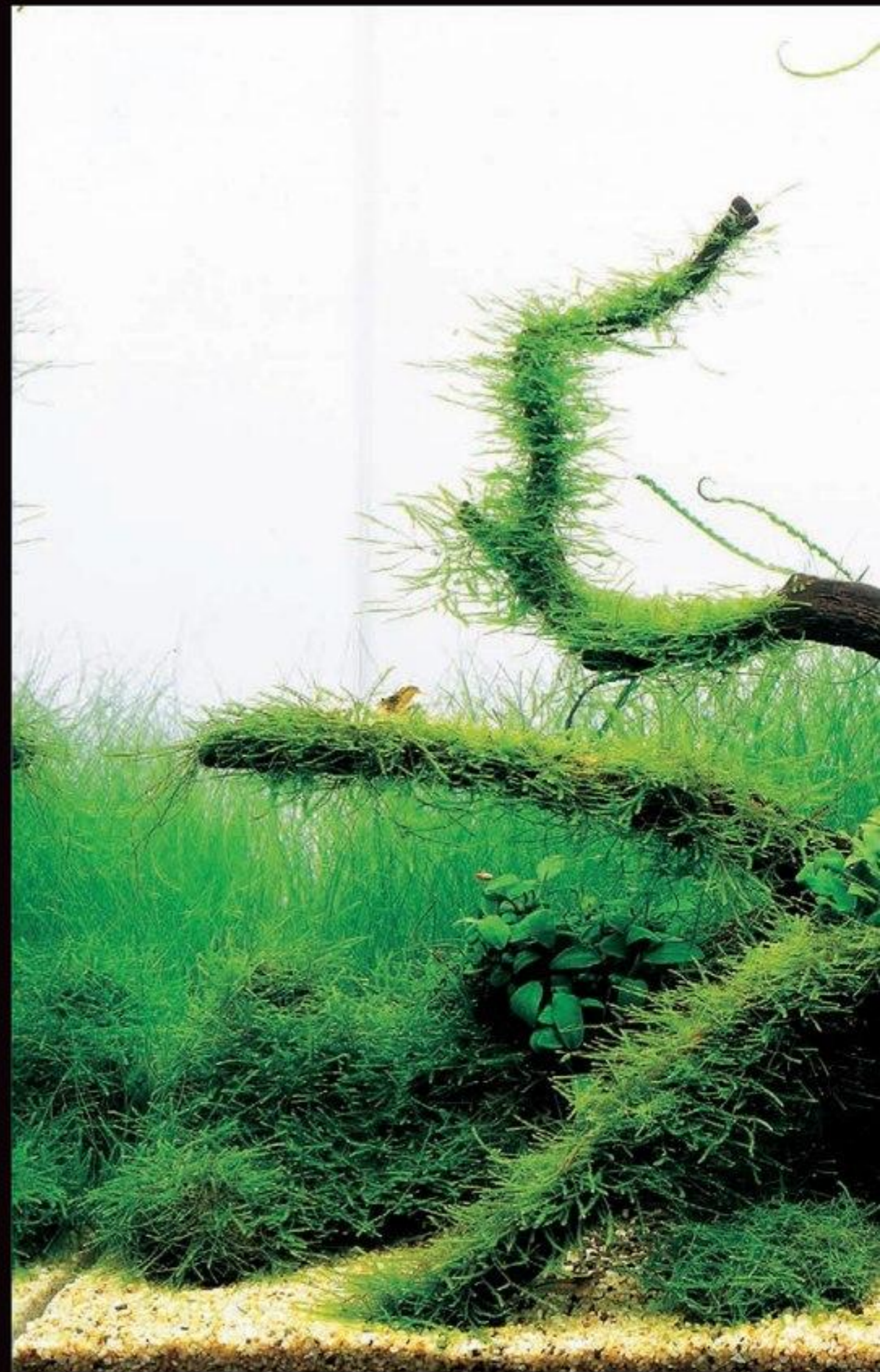


Mossy stones sitting in a river. Other than the beneficial environment where the stones are always kept moist as water rapidly moves by, it also required a long period of time to pass for the stones to become covered by moss.



W90xD45xH45 (cm)

LAYOUT  
WITH  
WILLOW MOSS



## A layout using Willow Moss

In Nature Aquarium, Willow moss is an essential staple plant that is usually attached to compositional materials such as stones and driftwood and becomes an indispensable element of the layout. Attaching Willow moss and a species of aquatic fern with a strong epiphytic nature, together onto compositional materials is an important technique for expressing a natural touch in the layout. The basic method of attaching Willow moss is to place a thin layer of the plant and tie it to the driftwood with Moss Cotton (detailed explanation is provided in another section of this issue). Hobbyists can cover the entire material with Willow moss or attach Willow

moss only to a part of the material depending on the shape of the material and the purpose of the layout. In either case, the willow moss will produce an impression resembling a mossy piece of wood or stone that is seen in nature and expresses the passage of time once it has become completely attached to the compositional material and has developed mature leaves. Moss Cotton, which is made from natural fiber, is an excellent product which biodegrades over time; however, it is advisable to use Riccia Line, instead of Moss Cotton, to attach Willow moss to a composition material that is not very easy for hobbyists to attach plants to, such as Fuji

stone. It takes a much longer time for the moss to attach itself to stone because the stone's hard surface hinders the plant roots from spreading inside. In light of this, Riccia Line, which will not biodegrade, is more suitable than Moss Cotton when attaching moss to stones. Willow moss can be tied to Fuji stones and stacked up or combined with driftwood in the mid-ground location of the layout. Aside from that, Willow moss can be fixed to a small stone and placed between or around the stones in the layout. Willow moss is indeed a useful aquatic plant that can be utilized in a wide array of scenes.



W90×D45×H45 (cm)

# TECHNIQUES

KNOW-HOW 03

## Expressions and Maintenance of Willow Moss

### To enjoy beautiful Willow moss

Willow moss is very strong and easy to grow. However, regular trimming is crucial to make it look attractive on driftwood or other composition materials. Willow moss adds a natural touch to the stones and driftwood when attached to them effectively.

#### Careful trimming with a dedicated trimming tool

Pro-Scissors Spring is a trimming tool that enables you to trim the Willow moss attached to the base of branched portion as if pulling them with your hand. This palm-sized tool is extremely easy to handle and allows the user to prune Willow moss just by pressing the spring-type handles. As we all know, the right

side of the aquarium is the area where right-handed persons find difficulty in doing trimming. With Pro-Scissors Spring, the pruning of Willow moss for this area is made easy even with your non-dominant hand thanks to its design feature which allows you to apply the same level of force to the blades no matter how you hold it. This product is available in two types; Straight and Curve types.



Start the trimming with Pro-Scissors Spring (Straight type).

#### Must-have trimming tools

##### Pro-Scissors Spring (Straight type)

This uniquely-shaped ultra-mini trimming tool allows the user to trim plants just by pressing the spring-like handles. It is truly a must-have item.



##### Pro-Scissors Spring (Curve type)

The Curve type is ideal for pruning of foreground plants and trimming along the curves of the driftwood.



Trim the Willow moss from the branch tip side as if smoothing the plant surface.



Cutting force is smoothly transmitted to the blades just by pressing the handles



Carefully trim the Willow moss at the base of the branched part.



Trim the entire Willow moss to an even thickness.



## ■ Expressions of Willow Moss

### The expression of freshly grown moss

Driftwood looks very natural by attaching Willow moss to some parts of it. The key point is to follow how the moss in nature grows on the wood. When attaching the willow moss to the driftwood in the layout, keep in mind that moss usually starts growing from dents, cracks and in the curved portions of wood.

Even a little bit of Willow moss makes the driftwood look different as shown in this picture.



### Expression of wood covered with moss

There are two ways to express the driftwood entirely covered with moss. One is to wrap the overall surface of straight-or branch-type driftwood with Willow moss from the beginning for the purpose of making its excessively straight line look softer, and the other is the case where the entire driftwood is eventually covered by the moss as it grows in.

When the driftwood is entirely covered by Willow moss it produces a subtle and profound atmosphere.

### Expression of mossy ground

Mossy ground can be expressed by tying Willow moss to Fuji stones using Riccia Line and placing them on the substrate. In a layout using cosmetic sand, Willow moss tied to Fuji stones can be placed along the border between cosmetic sand and Aqua Soil as soil dividers.

An undulating surface is formed by Willow moss, producing an image that resembles a mossy forest floor.



### [ How to Attach Willow Moss ] The following shows the proper attaching method of Willow moss.



Remember to make the layer of Willow moss so thin that the surface of the driftwood is partially seen.



Tie the Willow moss firmly onto the driftwood while tightening and knotting the Moss Cotton.



Cut off the protruding excess willow moss with short-type scissors.



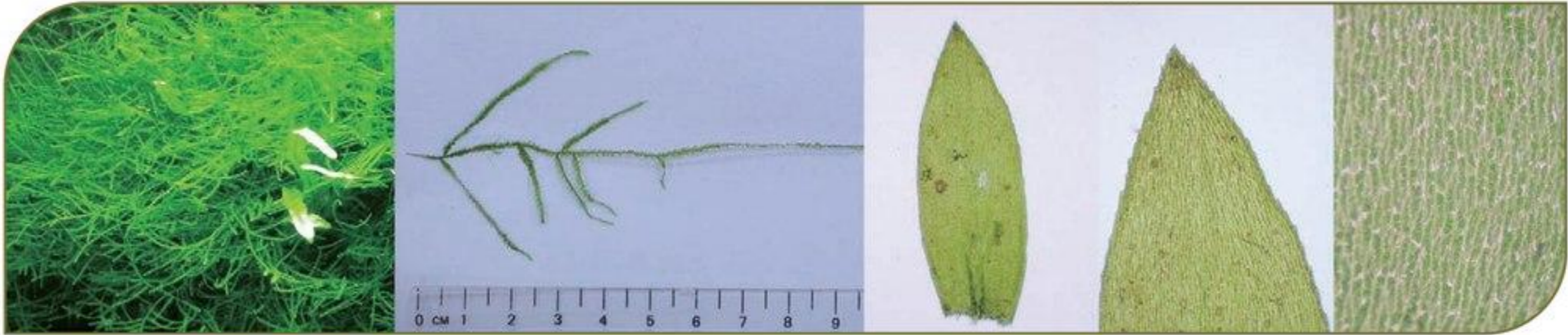
Make sure that the Willow moss is carefully tied onto the driftwood at the branch tips and the base of branched portions. The attaching of Willow moss is now completed.

Aquarium mosses, and for that matter, aquatic plants in general, readily change their form, branching pattern and leaf shape when growing in water. It would seem that for an accurate identification of the species, you will have to depend on the less changeable plant characteristics, such as the leaf cell morphology and the reproductive structures, as in the case of mosses. This section shows six species of moss and discusses the differences among them.

{Source: "Singapore Scientist (102:8-11)" 2004}

Articles by: B.C.Tan\*, Loh Kwek Leong\*\* Photographs by: C. King Hshiau Horng\*, Lim Yao-Hui\*, Chua Keng-Soon\*  
 (\*Department of Biological Sciences, National University of Singapore; \*\* Administrator of "Killies.com")  
 Article provided by: The Aquatic Gardeners Association, Inc.  
 URL: <http://www.aquatic-gardeners.org/>

<*Taxiphyllum barbieri*> **Java Moss**



The small, flattened leaves are arranged on two sides of the stem and branches. When tied to driftwood or rocks, the long branches of the plant become more profusely produced. Observed under the microscope, the leaf shape is oblong to oblong-lanceolate, with a short and wide leaf tip. Its leaf cells are long and narrow, with thin- to moderately thick walls. The leaf margins are toothed throughout. Two short "veins" (or costae) can be clearly seen at the base of the leaf blade. In Japan, this plant is called *Taxiphyllum barbieri*.

<*Vesicularia montagnei* (Bel.) Broth.> **Christmas Moss**



Christmas Moss got its common name because the mature fronds hang down and overlap each other like the branches of a Christmas tree. Grown submersed, the moss can produce long triangular fronds. Its more or less regularly pinnate to subpinnate branches are characteristic to this plant. The leaves are nearly round to broadly oval with an abruptly short and sharp apex. It is a terrestrial moss species.

<*Vesicularia reticulata* (Dozy & Molke.) Broth.> **Erect Moss**



Erect Moss prefers high lighting when grown in water. The common trade name describes the upward orientation of its stems and branches when grown submersed. The leaves are ovate to ovate-lanceolate with consistently long and stout acuminate tip. The leaf cells are oblong to short elongate and broad, longer than those seen in Christmas Moss, but not as long and narrow as the leaf cells of Java Moss. Erect Moss is a widespread, terrestrial moss species in tropical Asia that colonizes wet habitats.

<*Vesicularia dubyana* (C. Muell.) Broth.> Singapore Moss



Singapore Moss has an irregularly pinnate branching pattern. Its leaves are rather variable in shape, ranging from oblong to lanceolate, and with short or long leaf apex. Among aquarium mosses, the Singapore Moss is the most variable in form. The correct identity of Singapore Moss is best done by a microscopic examination of the distinguishing leaf cell characters. The leaf cells of Singapore Moss are somewhat oblong and broad, and with moderately thick walls, like that of Erect Moss.

<*Taxiphyllum alternans* (Card.) Iwats.> Taiwan Moss



The fronds of Taiwan Moss exhibit a triangular shape somewhat similar to the Christmas Moss, but are distinctively more equilateral. The ends of the branches curl up slightly when grown in water. Unlike the Christmas Moss which feels hard when touched, the Taiwan Moss has a soft texture and looks delicate when grown in a bunch. In Taiwan Moss, only the upper leaf apex is irregularly and minutely toothed. In contrast, the leaf margins of Java Moss are toothed throughout. As the common trade name suggests, it is exported from Taiwan but we cannot be sure if the plants truly originated from the island country.

<*Vesicularia ferriei* (Card. & Ther.) Broth.> Weeping Moss



Another recently introduced aquarium moss allegedly from mainland China is the Weeping Moss. The mature fronds of this moss droop like the branches of a weeping willow tree. The overall leaf shape and the oblong and broad leaf cells approach that of Christmas Moss, but the leaf is without an abruptly short and sharp apex. This aquarium moss still needs time to gain popularity among the aquarium plant enthusiasts.

# Growth of Ferns and Moss During the Passing of Time

An Aquascape with an Enhanced Profoundness



First Step

Driftwood that has shapely branch tips should be arranged in such a way that the attractive branches are highlighted. Placing these pieces of driftwood in a layout lets the people who see it imagine the drama the driftwood may have gone through in nature.



Second Step

Small-sized *Microsorium* plants are attached to the branch tips and overlapping portions of the driftwood. The driftwood displays enhanced naturalness just with the ferns and Willow moss attached to it. (Four months have passed.)



One year and nine months have passed since the *Microsorium* and Willow moss were attached to the driftwood. Now the driftwood is totally covered by the plants. These plants have been trimmed repeatedly up until now to achieve an elaborate aquascape.

## A source of Drama in a Natural Environment

“Once, there was a piece of rotten driftwood on the bank of a river. Moss began growing and fern spores, which had flown from somewhere, started to germinate on the wood. It was the birth of new life upon the driftwood which had already once lost its life, leading to the creation of a new landscape” – Epiphytic aquatic plants attached to driftwood are ideal materials which can be the source of such a theatrical drama, just as it’s seen in nature. When attaching epiphytic plants to driftwood

in patches, they should be put at the tips of the branch, curved areas and the base of the branching part. These are the parts of driftwood in which plants in a natural environment usually start growing and following this natural style for the layout will bring an enhanced naturalness to the driftwood placed in the aquarium. Over time, Willow moss gradually grows and it will eventually cover the entire piece of driftwood. For *Microsorium*, which is a fern species, it is advisable to place them in a

zigzag manner so that the plants are not arranged in parallel to each other, as explained in the “TECHNIQUES” section for *Microsorium*. Doing this helps *Microsorium* in the mid-ground give a pleasant rhythm to the aquascape. Moreover, *Microsorium* can be a focal point with its dark-green color. An aquascape with epiphytic plants gets more profound over time as the drama goes by.

# TECHNIQUES

KNOW-HOW 04

## The Care and Maintenance of Epiphytic Aquatic Plants

### Keeping plants attractive

Relatively slow-growing epiphytic aquatic plants are prone to algal attack and therefore, they will not grow into attractive plants unless their damaged or old leaves are cut off to promote the development of new buds. This section discusses the care and maintenance of epiphytic aquatic plants and what measures to take against water temperature increases, which is detrimental to ferns.

#### Algae Control for Anubias



1 First, begin by draining the aquarium water until the infected leaves are above the water line.



2 Dilute Phyton Git with the same amount of water to form 50% solution.



3 Brush the Phyton Git solution onto the leaves of Anubias.



4 Once completed, begin filling the aquarium with water. This method only applies to species of Anubias.

#### Algae control for Anubias

Anubias can easily get damaged by algae due to its characteristically slow growth, additionally, when initially adding new Anubias to the aquarium, algae-eating *Cardina Japonica* (Yamato Numa Ebi) cannot be added to the aquarium due to commonly used pesticide residues on the Anubias. Algae can be controlled by cutting off the effected leaves, but the decrease in the number of leaves is also a problem for Anubias which is slow in developing new buds. An effective solution is the application of diluted Phyton Git to the Anubias leaf surface. This method can also be used as a preventive measure against algae.

#### Phyton Git

Phyton Git effectively suppresses the diseases of aquatic plants and fish, taking advantage of the benefits of phytoncide which is an antimicrobial substance derived from plants.



#### Care of Microsorium



#### Trimming of Microsorium

Microsorium grows into a beautiful plant with neat leaves if it is maintained in an appropriate way. It is advised to cut off the old leaves with spots, excessively large leaves and the leaves with spores immediately. Its leaves should also be adequately thinned out to prevent poor water flow due to excessively crowded leaves.



New plants develop and grow from the leaves with plantlets that have been cut off. It would be a good idea to place this plantlet into a crack in the driftwood and let it grow!



Microsorium spreads brown roots as it grows. Cut off the excessively long roots.

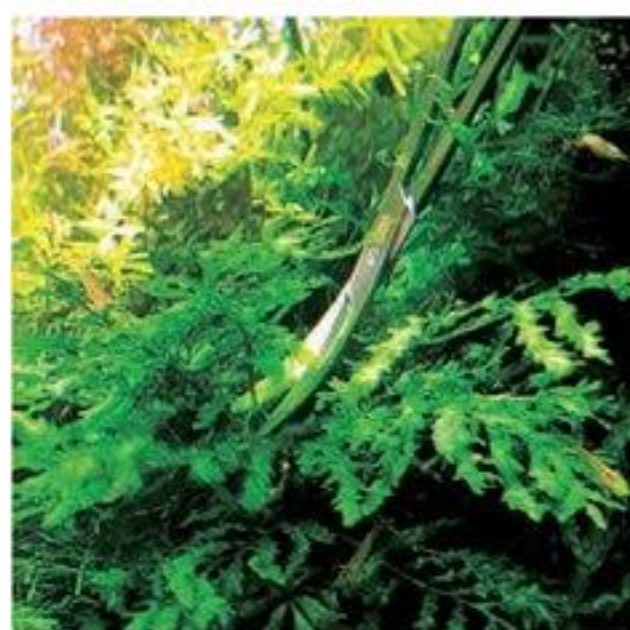
## Care of Bolbitis



**Growing Bolbitis leaves above the water**  
In an open aquarium, emerged leaves of Bolbitis can be enjoyed. For this purpose, make it a point to fix the rhizome of Bolbitis to the driftwood using Wood Tight immediately below the water line. Then, the Bolbitis leaves come above the water as the plant grows.

### Pro-Scissors Force

This is a professional-grade tool which has been designed to have blades resembling a chopping knife to enable the user to cut the leaf stem and the large rhizomes of ferns easily. Uniquely curved blades can easily get to the hard-to-reach leaf stem portion.

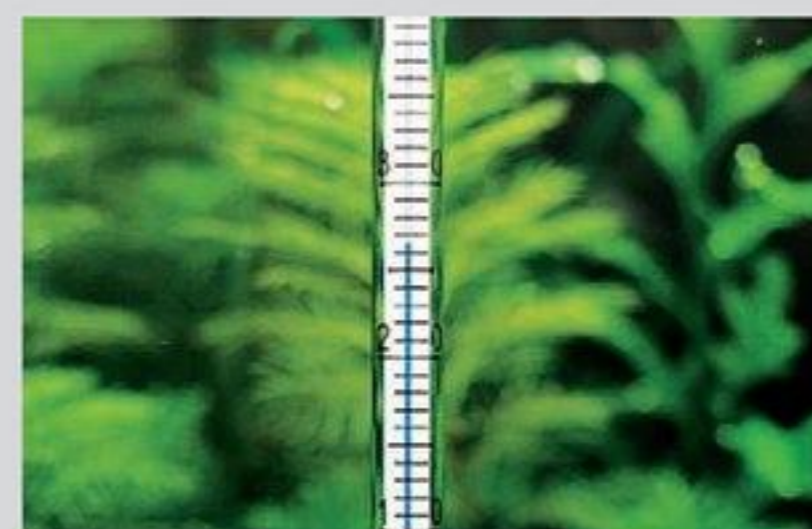


**Trimming of Bolbitis**  
Bolbitis develops beautiful translucent submersed leaves if its old leaves are effectively cut off. Cutting off hard old leaf stems of this plant is made easy with the cutting power Pro-Scissors Force provides.



### [ Measures against Higher Water Temperatures during the Summer ]

It would be best if an indoor air conditioner or aquarium chiller is used during the summer, but not every hobbyist can use this kind of equipment. An easy and effective way to control a rise in water temperature is to install an aquarium fan. Aquatic plants become weak when the temperature of the aquarium water is continuously above 30°C (86°F). Even if the water temperature rises during the daytime, the problem can temporarily be eased by bringing down the water temperature at night to below 30°C (86°F) through performing a water change. This method has another benefit where the fresh water that is added to the aquarium during a water change stimulates the aquatic plants. Ferns may develop fern disease under high water temperature conditions. If black spots, which is a symptom of fern disease, are observed on fern leaves, it is advised to cut off all of them and add one to two drops of Phyton Git per five liters (1.5 gallons) of aquarium water for a few days thereafter.



Be sure to check the water temperature using a thermometer during the summer when the aquarium water temperature rises easily. Change the tank water if the temperature is continuously 30°C (86°F) or above.







## An Aquascape Created using Epiphytic Aquatic Plants

In this huge aquarium tank (W4 X D1.5 X H1.5m) (13' X 5' X 5'), major species of epiphytic plants including *Bolbitis* and *Microsorium* sp. "Narrow Leaf" develop large, mature leaves densely on the gigantic driftwood that stand in 1.5m (5')-deep water right up onto the water line. One of the common features of these epiphytic aquatic plants is that they grow slowly and steadily. Various attachment methods of epiphytic aquatic plants have been introduced in the special feature of this issue, but the ultimate lesson must be to take our time and grow the plants patiently.



Nature Aquarium

# WORLD REPORT

in MALAYSIA



## In Search of Betta Gladiator in Maliau Basin, Borneo

Data provided by: Mr. L.C. Chan,  
CEO, Aquatic Creation Technologies Sdn. Bhd.  
(ADA distributor in Malaysia)  
URL: <http://www.adana.com.my>



A



B



C

### A Mysterious Betta

Betta Gladiator is one of the most mysterious species among wild betta fish. Its brilliant-colored body has never been photographed. Betta Gladiator inhabits the beautiful streams of the Maliau Basin Conservation Area in Sabah, Borneo Island. However, there are few reports about collections of this fish or academic research on its habitat. It is not easy to find this Betta with such a limited amount of information. What makes it more difficult is that the habitats of Betta Gladiator is a national conservation area and no collection activities are allowed without special permission from the governing authority. Fortunately, I was invited by the Department of Fisheries, Malaysia for a trip to Maliau Basin for collecting aquarium fish and aquatic plants. Needless to say, I was very excited about an opportunity where I could find the fascinating Betta Gladiator and collect rare aquatic plants which have not yet been known in the aquatic plant industry.

### A Sanctuary for Fauna and Flora

Not everyone has heard about the Maliau Basin.

It is one of the last remaining natural treasures of Malaysia, and is a saucer-shaped geological structure that spans 25 kilometers (15.5 miles) in diameter with formidable cliffs as high as 1,700 meters (5,500 feet). The forests within these walls are some of the oldest and most untouched in all of Borneo. The highest point is Gunung Lotung (Mount Lotung) which is believed to be over 1,600 meters (5,248 feet) in elevation but has yet to be accurately surveyed. Resembling a volcanic caldera, the 25 km (15.5 mile) diameter Basin is in fact a sedimentary formation comprised mainly of gently inclined beds of sandstone and mudstone. By now, only about 25% of the total area has been mapped, and less than 10% has been studied intensively. Yet, the Basin has already yielded more new species of plants and animals, including Betta Gladiator, than most other places that had many more years of study!

### Catching Betta Gladiator

It was Day four of our trip to Maliau Basin. Throughout the expedition, we were blessed with beautiful weather. On this day, we left the

camp in the early morning and headed for the collection area we had visited the other day. For your information, this conservation area is an undeveloped area and the visitors must have the assistance of a guide who is familiar with the geographical terrain. The first fish caught was a wild betta juvenile, which made us certain that Betta Gladiator was present in this area. Our group was excited and continued to throw nets into the river. Suddenly, a female Betta Gladiator was caught in a clear and gentle stream with plenty of fallen leaves. The muddy bed of acidic river water with rotten leaves created an optimal environment for Betta Gladiator to thrive in. The river water contained rich humic substances and had soon become cloudy after we caught the fish. Therefore, we needed to take many photographs of the area either immediately before or after catching the fish to record the location on the bank of the river.

### Breeding of Betta Gladiator

After three months, we succeeded in breeding the Betta Gladiator we had caught. With this success, it is our hope that in the very near



- A: Betta Gladiator with opercular in metallic blue
- B: Planted aquarium owned by Mr. Chan
- C: Maliau Basin is located in the Malaysian territory of northern Borneo.
- D: A stream where Betta Gladiators live
- E: It is nice to place some leaves from the fish's habitat in the tank.
- F: Driving down a jungle road in a 4WD car.
- G: Unique pattern on lower jaw
- H: A pair of young fish in which breeding is expected
- I: Pristine jungle in Maliau Basin
- J: The Maliau Basin Studies Centre was established within the conservation area.
- K: The first caught Betta Gladiator



future, aquarium fish hobbyists can purchase this betta in retail shops and leave the wild betta in Maliau undisturbed forever. This betta is an aggressive and territorial species that inhabits primarily forested areas with acidic water. Mature Betta Gladiator lives alone at a depth of one meter (3 feet) while the juveniles live in small schools. In captivity, it is necessary to breed mature fishes separately due to their nature as a fighting fish. A pair of Betta Gladiator should be kept in a 75-90cm (30-36in) tank. The betta's tank must be well covered because the fish can jump pretty high. It is desirable to place water enriching items such as live plants or something that can serve as a hideout in the betta's tank. A blackwater environment resembling the natural habitat of Betta Gladiator can be created by placing driftwood and Terminalia Catappa leaves in the tank. Betta Gladiator adapts quickly to a mildly acidic environment. Notes on breeding are the same as the other betta species. The fish is also adaptive to higher pH environment with hard water. Betta Gladiator accepts most frozen, live and fish foods but prefers worms and insects. In general, it is very

easy to keep. Male Betta Gladiator has a broader head than females and its lower jaw extends forward. The brown-color body of a male is more tinged with yellow than its female counterpart. Besides, the male has bluish opercular while that of female is pinkish orange. Caudal fin is plain brown color with a big dark spot on it. Males grow more colorful and larger, up to 6cm (2.32in) in length. Female ovaries might be visible via spotlighting. Gladiator is a paternal mouthbrooder and the male will hold the offspring in its mouth for 12 to 18 days. This period varies depending on the water temperature. The role of the female is for spawning only.

### Spectacular Mouth-Fighting

Dominance between the fish is based on the mouth-size; the fish with the largest mouth will be the dominant male. If this is not apparent, a mouth-fighting confrontation will occur. The fish will swim towards each other with their mouths wide open, just threatening to attack. Usually the intruder will flee, but if it does not, then an actual fight will occur. Both fish will start biting each other's mouth until they have a good grip. Then both fish will swim back and forth while shaking their heads, until it is clear which fish is stronger. The fish that has lost will lose its brilliant body color and make frantic attempts to flee. After a while the dominant male will let go of its grip and chase the intruder away. Occasionally actual harm is done when a lip gets torn off.

### The Gleaming Presence of Betta in Nature to be Preserved

Betta Gladiator appears to be a dweller of the pristine forest in Maliau Basin. Any form of encroachment may seriously threaten the population. A carefully guarded state park could be its last secure haven, provided that ecotourism activities do not go overboard and lead to the degradation of its habitat. Interest expressed by the local stakeholders to monitor, record and safe-guard this species is greatly applauded. Once again, it is hoped that, with the success in breeding of Betta Gladiator, hobbyists who wish to keep and grow this betta can purchase it in retail shops and leave the wild betta in Maliau undisturbed forever.

# Aquatic Plant Encyclopedia *vol.1*

This section introduces aquatic plant species that can be used in Nature Aquarium, along with tips for growing them. Aquatic plants that are very eye-catching are highlighted in this issue. Through providing adequate nutrients, every species listed here will take on beautiful red coloration's like fireworks in the night sky.

## 01 *Pogostemon stellatus*

☀ High 🍃 Narrow 📦 CO<sub>2</sub> Large 📦 PH 6.4 ~ 7.2

*Pogostemon stellatus* can now grow to a large size rather easily with the use of Aqua Soil. However, it poses challenges after trimming, such as the poor development of new buds and shrinking terminal buds.



## 02 *Pogostemon sp. (Australia)*

☀ High 🍃 Narrow 📦 CO<sub>2</sub> Large 📦 PH 6.4 ~ 7.2


*Pogostemon sp. (Australia)* appears delicate with its narrow leaves compared to *Pogostemon stellatus*. This plant is unlikely to grow to a large size with a thick stem, however it does not have the trimming problems that *Pogostemon stellatus* has. This plant is not widely available in the market yet.




## Legend

 High → Low ..... Indicates light intensity levels that influence plant growth and leaf color.

 Small/Narrow → Large ... Indicates width of the leaf, not length.

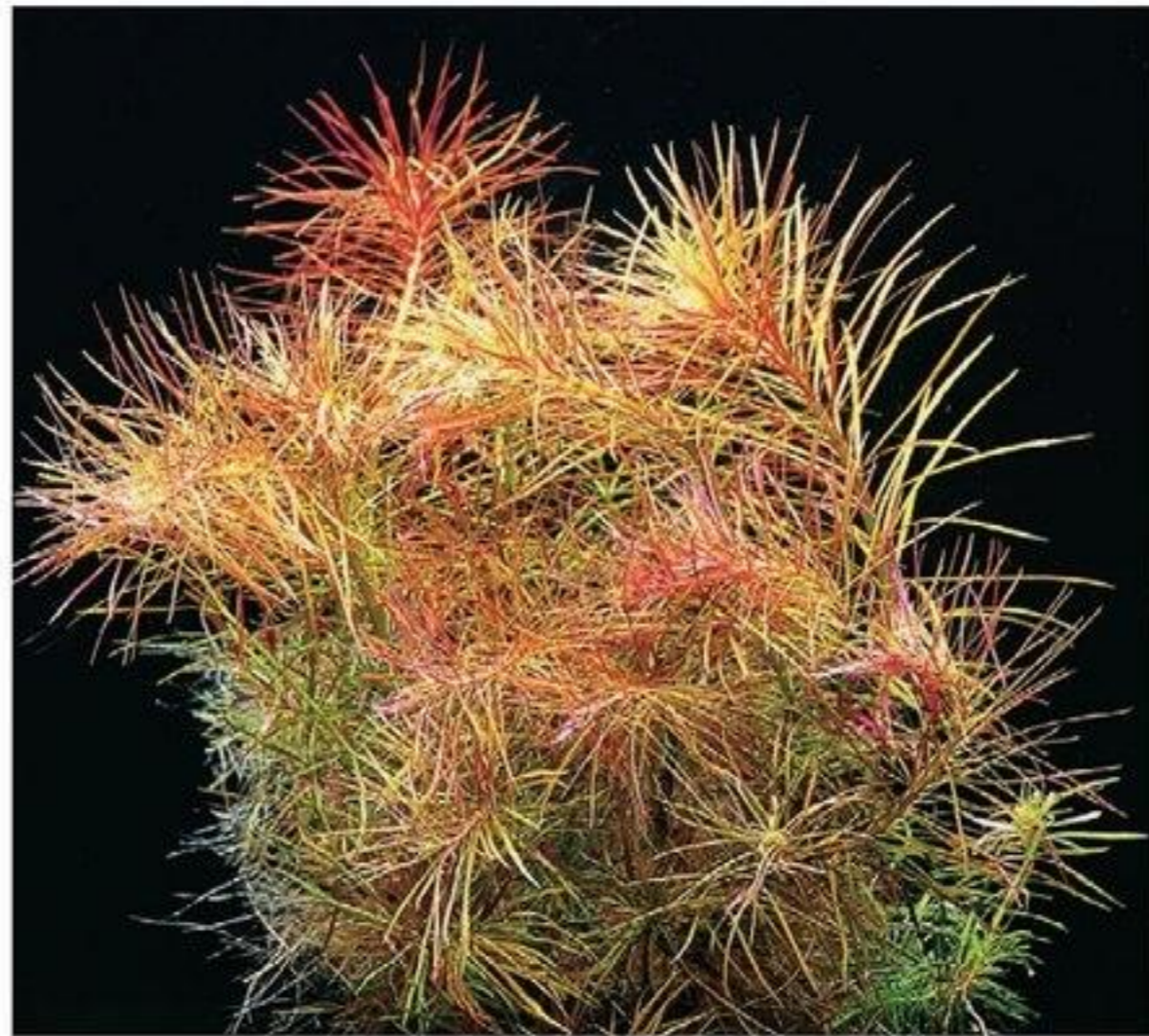
 Small → Large ... Indicates the amount of CO<sub>2</sub> to be injected as a reference. A larger amount of CO<sub>2</sub> generally leads to faster growth of plants.

 6.4  
~  
7.2 ..... Indicates the desirable pH range for plant growth.

## 03 *Pogostemon sp. "Dassen"*

 High  Narrow  Large  6.4  
~  
7.2

*Pogostemon sp. "Dassen"* is readily distinguishable from *Pogostemon stellatus* with its jagged margin leaves. Among the *Pogostemon* group members, this plant is attractive because it is strong and easy to grow. The backside of the leaf takes on a red tinge when dosed with ECA.



## 04 *Ludwigia inclinata "Cuba"*

 High  Narrow  Large  6.4  
~  
7.2

*Ludwigia inclinata "Cuba"* grows in a very appealing orange color with leaves developing in a whorl in high light conditions and iron supplementation through the dosing of ECA. Frequent trimming is required for this fast-growing plant.



## Filter for Large Aquariums

Large-sized aquariums accommodate a large volume of water and an increased number of fish with their large-scale capacity. The water quality is more stable if the water volume is larger, but only if the filters are adequately functioning. The Nature Aquarium Notes of this issue discusses filtration for large aquariums.

### ● Required Filtration Capacity for Large Aquariums

It is generally considered that the water in larger tanks does not get very dirty and the water quality is more stable compared to smaller tanks. However, there is a requirement to achieve this. In Nature Aquarium, the water becomes dirty mainly due to the feces of fish and shrimp as well as the leftover food. It usually takes a longer time until the water in a large tank gets dirty because of the volume of water in the tank, and the lower concentration of contaminants. Regardless, even the large aquarium cannot be maintained properly unless the water is filtered - which is a shared trait with smaller aquariums. For the filters used on large-sized aquariums containing a large volume of water, a higher filtration capacity is required to ensure good water circulation and the proper elimination of the contaminants. This is the requirement mentioned earlier. In this case, then, how will the filtration capacity required for large tanks be determined? One of the deciding factors is the quantity of filter media to be contained in the filter, but this does not mean that the filter has better filtration capabilities just if more filter media is used. In the case of Nature Aquarium and other types of freshwater aquarium, organic matter and contaminants such as ammonium in the water are broken down mainly by the functions of biological filtration, which eventually converts the ammonium into nitrate which is harmless to fish and shrimp (nitrate will be absorbed by aquatic plants or eliminated by the changing of aquarium water). To promote this process, the filter media needs to be colonized with a massive amount of bacteria, fungi and protozoa. What is important for this is the relationship between the surface area of the filter media and its permeability. If more filter media with a finer grain size are used, the surface area will become larger but permeability declines due to in-

creased resistance. Conversely, the surface area will become smaller if larger grain size of filter media are used; but instead permeability is enhanced. The optimal balance between the grain size of filter media and permeability is very important, particularly for large aquariums which require an increased amount of filter media to treat a larger volume of water.

Of the two types of filter media, namely Bio Rio and Bio Cube, are used for biological filtration in Nature Aquarium. Bio Rio is mainly used for larger tanks because it has less chance of clogging. For Super Jet Filter (ES-600EX and above), the M or L size of Bio Rio with larger grain size is used to achieve the optimal relationship between grain size and permeability. Bio Rio is made from natural volcanic stones and has an uneven surface with variable shapes, providing adequate gaps between grains, demonstrating both a larger surface area and good permeability.

### ● Larger Size of an External Filter

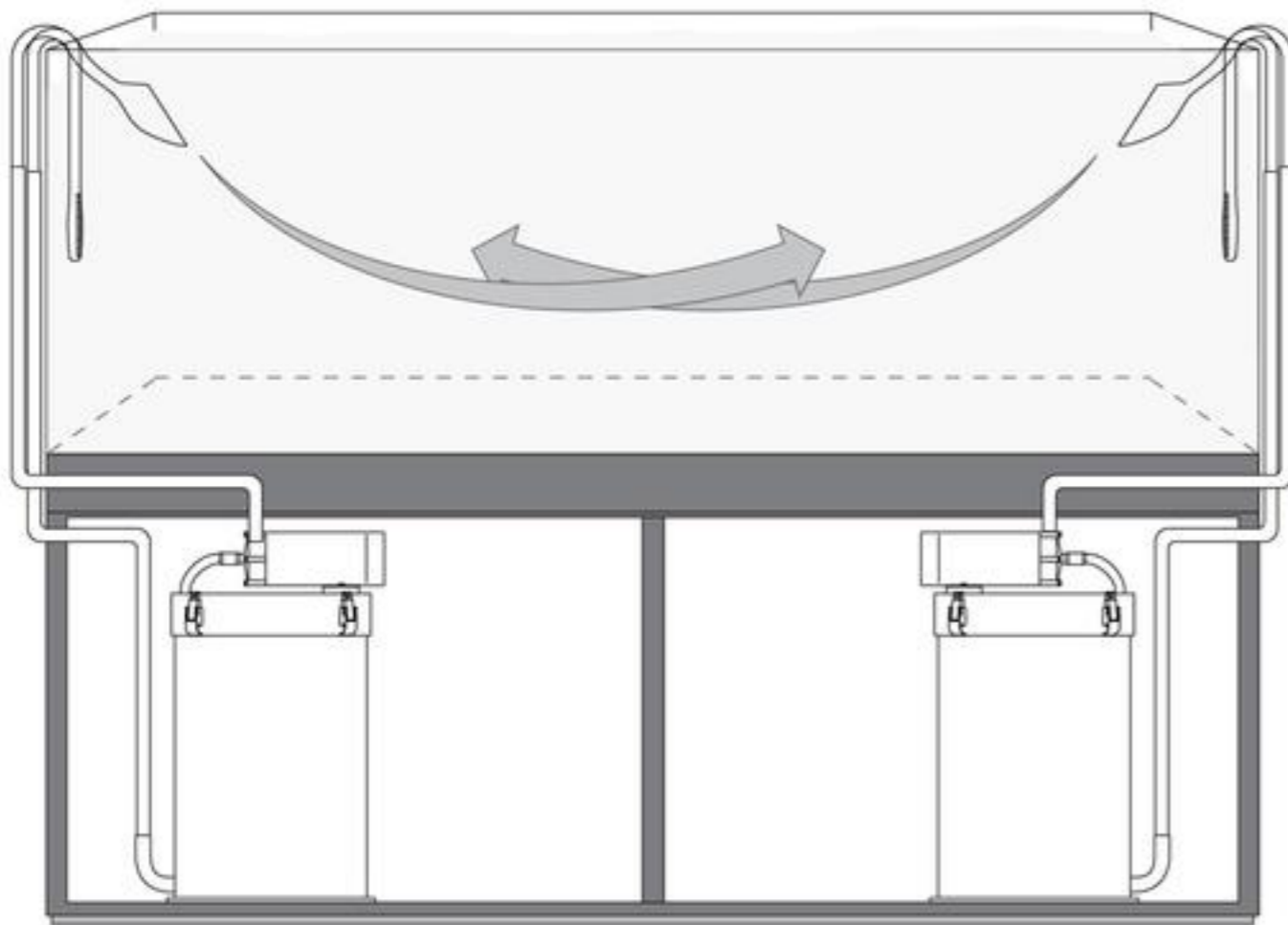
When using a single type of filter media such as Bio Rio, the only way to obtain a larger surface area for bacterial colonization is to increase the quantity of filter media. The external canister filter, which is the main type of filtration system used for Nature Aquarium, consists of a canister filled with filter media (i.e., filter part) and a pump for water circulation. In anticipation for a subsequent increase in the amount of filtration media, it is better to have a large capacity canister from the beginning, and accordingly the flow capacity of the pump also needs to be increased to withstand the load of the filter media. As can be observed from this, the external filter that is to be used for large aquariums needs to be equipped with the larger size of both the canister and pump. However, it is in fact impossible to make the canister as big as desired due to the limited size of the installation site (i.e., cabinet) and also the restriction in

height. For a 180cm (72in) aquarium, for example, Super Jet Filter ES-2400 (Capacity: approx. 24L) is the largest filter which can be installed under or inside the cabinet. In the case where the filter can be installed at the side or back of the cabinet, it is possible to install a larger filter such as ES-2400Es (Capacity: 36L) and ES-2400EX2 (Capacity: 48L) having 1.5 times and 2 times the canister size of ES-2400, respectively. The benefits of using the larger canister size is not merely that it can contain an increased amount of filter media, but also that it provides a longer path through which water flows at an adequate rate. As we all know, the tank water flows through the filter media within the canister. If there is a longer flow path, more contaminants in the water will be broken down by bacteria on the filter media and as a result, more purified water is obtained. What we have to remember in this regard is that there is a limitation on the canister size due to the structure of the external filter which requires a certain difference in height between the water surface and the pump for it to operate.

### ● Installing Multiple External Filters

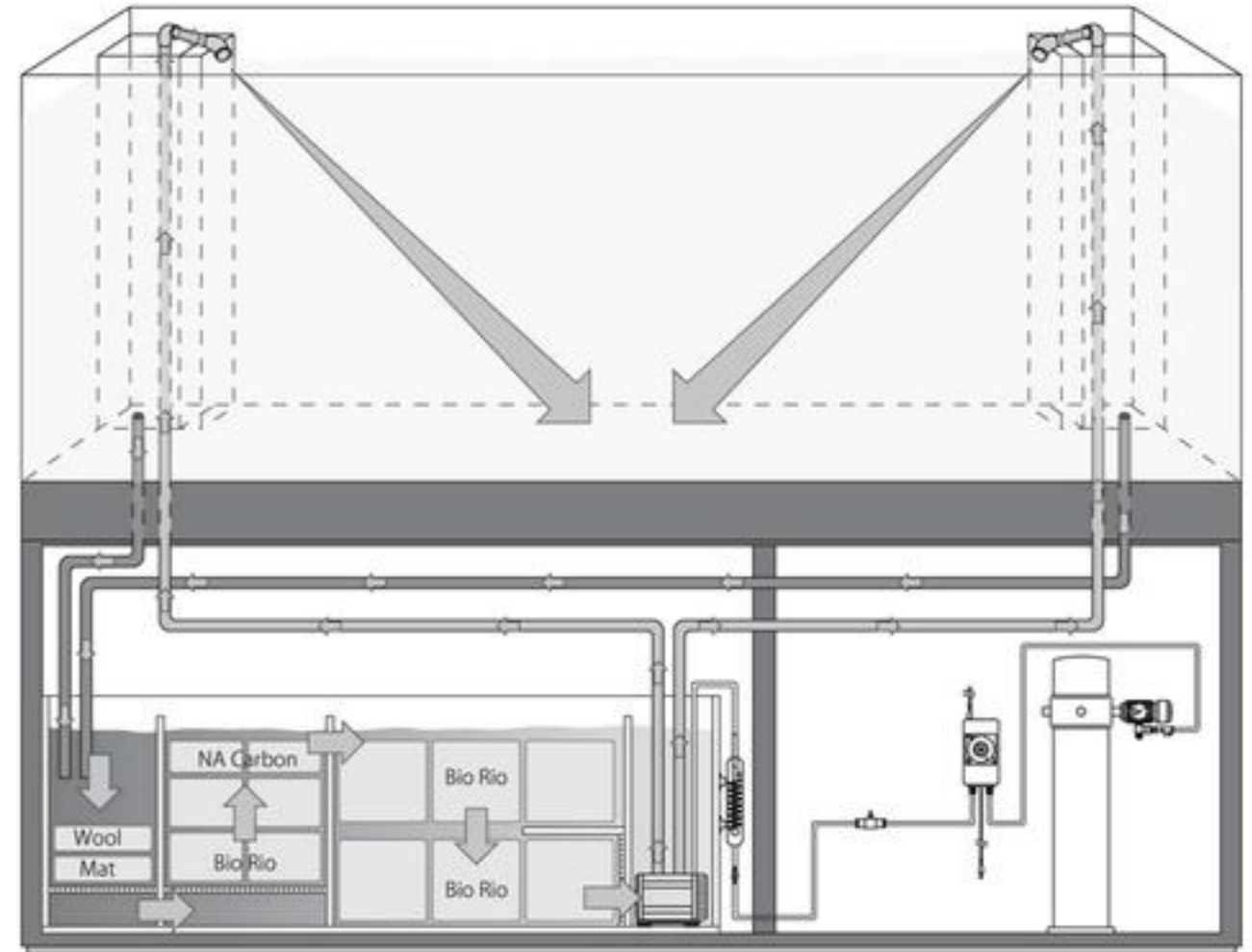
An adequate filter capacity for a 180cm (72in) aquarium is obtained just with a single ES-2400. For a larger aquarium size, however, a few units of the ES-2400 series filters need to be installed. For example, two units of the Super Jet Filter ES2400 are installed for this 240cm (93.6in) tank. And for the 5m (16.4 foot) tank, three units of the largest Super Jet Filter EX-2400EX2 are used. As can be seen in these examples, the filtration requirements for huge aquariums can be met by increasing the number of external filters according to the water volume of the tank. Installing an increased number of external filters has another benefit. First, the number of outflow pipes is increased and an enhanced water flow is provided within the aquarium. This helps keep the tank water at a constant quality and

### Example of installation of multiple units of external filter



Water is discharged from both sides of the tank by the use of two external filters, compensating the water-reachable range of each other. This helps achieve the constant water quality and temperature within the aquarium and minimize the area where water gets stagnant and sludge buildup is caused. This installation method is suitable for large panoramic aquarium tanks.

### Example of overflow filtration system



Carbon dioxide in the water is released into the air and oxygen is dissolved in the water with the aeration effect caused by water falling into the overflow box. The abundant dissolved oxygen helps aerobic filter bacteria to become more active. Carbon dioxide produced through the respiration of the plants will be released into the air directly from the open-type filter.

temperature. Meanwhile, the aquatic plants in a planted aquarium absorb carbon dioxide and nutrients through the leaf surface for photosynthesis and growth. In light of the fact that carbon dioxide and nutrients are carried to the plants by water flow, the growth of aquatic plants may be affected if the tank water becomes stagnant and the concentrations of carbon dioxide and nutrients are uneven within the aquarium. This concern is more likely to arise in large panoramic tanks in which the water from the filter may not reach the entire aquarium if only one filter is installed on one side of the tank. Furthermore, the feces of fish and shrimp as well as the leftover food can easily build up in the locations where the water is stagnant, leading to deteriorated water quality and an algal bloom. To prevent these problems, an adequate water flow must be ensured in each aquarium. In the example of the 240cm (93.6in) tank, the aquarium is maintained in good condition by the adequate water flow created using Violet Glass VP-3 installed on both the sides of the tank. Another advantage of using more than one filtration system is that a temporary backup by the remaining filters can be expected even if one of them has failed. This advantage also applies to the maintenance routines of all the filter media. The decline in filtration capacity caused by the decreased bacteria during the maintenance of a filter can be mini-

mized by staggering the maintenance period of each filter unit. In the event where a problem arises in the condition or the biological filtration system of large-sized aquariums for reasons such as sludge buildup, it may take a long time to restore to the original good condition. Installing multiple external filters is an effective way to maintaining the environment within the large-sized aquarium in a good condition over a long period of time.

#### ● Overflow Filtration System

Most Nature Aquariums, regardless of size, use an external canister filter. This type of filter incorporates a closed filter which does not let carbon dioxide get released into air, and is therefore suitable for Nature Aquarium, which is dependent on aquatic plants growing via photosynthesis. On the other hand, this feature can lead to deteriorated condition for filter bacteria. For the bacteria which colonize the surface of filtration media and break down substances such as organic matter, ammonium and nitrite, many of them are aerobic bacteria which require oxygen for survival. They may be killed in high-CO<sub>2</sub> and low-oxygen environments and cause the problems such as film on the water surface, deteriorated water quality and cloudy water. This occurs particularly when fish are kept that can easily dirty the aquarium water, such as Discus and angelfish. When these fish

species are kept, there is more organic matter in the water and the filtration bacteria significantly increases as a result, which causes a lack of oxygen in the aquarium. Of course, this problem can be prevented by ensuring the balance between the CO<sub>2</sub> injection amount and photosynthesis of aquatic plants and by performing aeration during the night. Yet still, there is always a risk that shortage of oxygen can arise. Unlike an external canister filter, the overflow filtration system incorporates an open filter and is designed to have a structure where carbon dioxide is released into the air and oxygen is supplied into the aquarium before the water enters the filter; thereby preventing a lack of oxygen. For this benefit, the overflow filtration system is adopted for some large-scale Nature Aquariums, including the gigantic W4 X D1.5 X H1.5m (W13 X D5 X H5 ft) Nature Aquarium which appears in the annually-published ADA catalog and W180 X D120 X H60cm (W72 X D48 X H24 in) tank displayed in the Nature Aquarium Gallery, to name a few. Even after taking into consideration that it is a filtration system exclusively for large-sized aquariums due to its bulky structure and large filtration area, the overflow filtration system is still the most suitable for the long-term maintenance of Nature Aquarium.

# Q&A

Summer, the ruthless season for planted aquariums, is now over with and the air is finally getting cooler. How is the condition of your aquarium? Now that autumn has arrived, many readers begin excitedly coming back to their aquariums. If you have any questions, please feel free to contact us. We look forward to hearing from you!

**Q** I'm growing *Echinodorus tenellus* in a 60cm (24") tank. Using 80W lighting, CO<sub>2</sub> injection and daily liquid fertilizer application, the *Echinodorus tenellus* has leaves tinged with red, but it does not grow rapidly by sending out new runners. The leaves are all small. What is the cause of these problems?

**A** The cause of small leaves in *Echinodorus tenellus* is suspected to be old substrate. *Echinodorus tenellus* develops long leaves and grows vigorously when the substrate is still new. However, this plant has a tendency to slow its growing speed and develop smaller leaves over time. These symptoms are hardly improved even if better conditions in terms of light, CO<sub>2</sub> and nutrients are created. Though it cannot be concluded that the root cause of the problem is either hardened substrate or pH level (acidity of the substrate), it is advisable to siphon out the top part of the substrate and replace it with new substrate material to deal with the problem. Aside from that, too many *Cardina japonica* (Yamato Numa Ebi) in the aquarium can also be a cause of poor leaf development. These shrimp always peck the leaves and cause stress to the plants.



*Echinodorus tenellus* is vulnerable to stress.

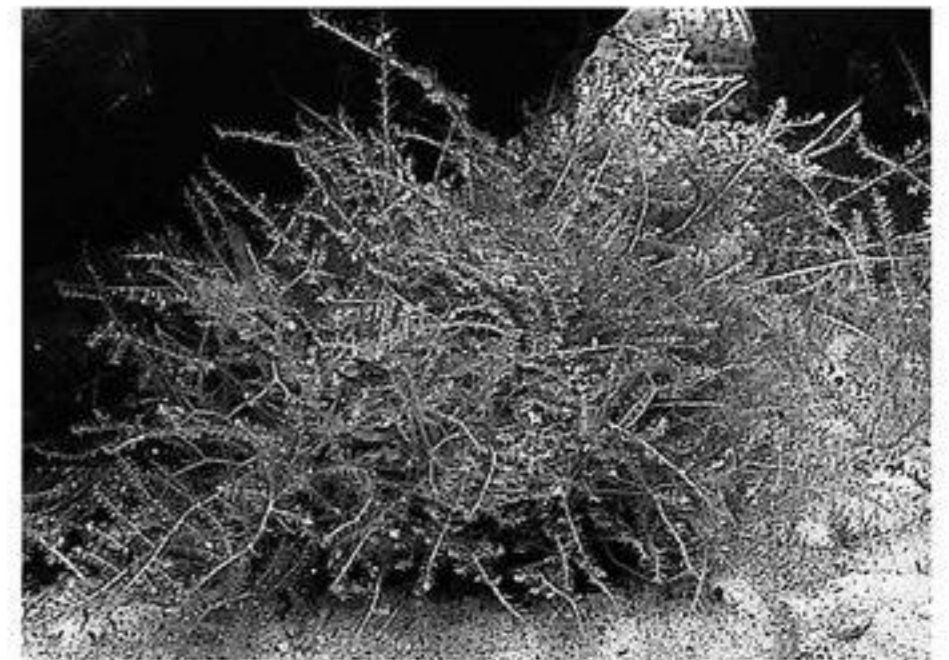
**Q** At which point between the substrate and water line should Pollen Glass Beetle be installed? And on CO<sub>2</sub> Beetle Counter, where should I count the bubbles to see "three bubbles per second"?

**A** The Pollen Glass series has been designed to have an adequate CO<sub>2</sub> diffusion and ensure a balanced appearance in the entire tank when it is installed at the middle point of the water depth in a compatible aquarium tank. As an "ornamental CO<sub>2</sub> diffuser" having a sophisticated design, the Pollen Glass series should be installed in an aesthetically balanced position as an important element of a good-looking aquarium. Technically, higher CO<sub>2</sub> diffusion efficiency can be expected when Pollen Glass is installed in a lower position. However, an adequate amount of dissolved CO<sub>2</sub> can be achieved even when it is installed at the middle position. When higher diffusion efficiency is required for a large-sized tank, it is advisable to adjust the position of the outflow pipe of the filter to expose the CO<sub>2</sub> directly into the water flow. For CO<sub>2</sub> Beetle Counter, you can count bubbles at or above the long spiral portion. Either way, the best position for counting the bubbles is the bottom of the counter where CO<sub>2</sub> bubbles are generated.



**Q** I'm not sure how I can grow *Vesicularia* sp. effectively. It started to float up gradually after about a month since it had been attached and in the end it eventually floated off of its base.

**A** *Vesicularia* sp. is by nature less epiphytic compared to ordinary Willow moss and it does not remain attached for a long period of time in many cases. This moss species grows in the form of overlapped triangles and it can be entirely ripped off easily by hand once it looks like it is rising. The maintenance of this moss is easier if it is fixed to volcanic stones and placed on the substrate (because the moss can be maintained submerged even if a part of it comes off of the stone). In the case where *Vesicularia* sp. is attached to driftwood, it is necessary to tie it onto the wood again sometimes. This plant can stay on the stone or driftwood for a longer time if Riccia Line is used to tie it instead of Moss Cotton, which is biodegradable.



It is recommended to use Riccia Line to fix *Vesicularia* sp. to other objects.

**Q** The water of my planted aquarium has turned green. Can I solve this problem if I install an additional filter?

**A** Green-colored water is caused by a phytoplankton bloom and no immediate effect against this problem can be expected even if an entirely new filtration system is added to the aquarium. It would be more effective if the existing filter is temporarily replaced with a filter used on another tank that contains an adequate amount of filter bacteria. It would be best if a filter containing abundant bacteria colonies is installed in addition to the existing filter for the planted aquarium with a greenwater problem, although it might be difficult for hobbyists to do so in practice. Another remedy is to apply Clear Dash to the aquarium. Please try it.



### Send us your questions!

We welcome your questions and inquiries about Nature Aquarium. Please feel free to send your questions to the ADA Editorial Department by email (aj@adana.co.jp) or to our postal address listed at the end of this magazine.

**Q** I would like to ask about filter media to be installed in the filter. I've heard that the filtration capacity is enhanced if a layer of commercially-available wool mat (filter pad) is placed under the filter media. Is it true? I'm currently using only Bio Rio, with a net on placed on top and bottom, as the filter media for my filter without using any wool mat (filter pad). I'm wondering if my filter has any problems because of this. I personally think the filter media can easily get clogged and require frequent maintenance if a wool layer (filter pad) is placed in the filter.

**A** Wool mats (filter pad) placed at the bottom of a closed filter catches fine dust but easily causes clogging of the filter media as you mentioned. In this case, the clogging problem causes more problems than the benefit of having it. It is sufficient if a net (such as palm net) is placed at the top and bottom gratings. A wool mat (filter pad) can be placed at the top of the filtration system if the aquarium water is slightly cloudy immediately after the set up of the aquarium due to the dust of Aqua Soil. In this case, the wool mat (filter pad) should be removed once the water becomes clear.

**Q** Black, hard algae, about 1cm long, grow everywhere in my aquarium including driftwood, stones, hairgrass and substrate. I'm trying to control them using Phyton Git, but cannot catch up with their growth speed. Could you please tell me how I can get rid of the algae.

**A** In light of the circumstance where black, hard algae grow rapidly, the cause of your problem is suspected to be an excessive amount of fish in the aquarium or an insufficient filtration capacity for the tank water volume. If the number of fish is appropriate and a filter with adequate capacity is installed for the aquarium, then it can be suspected that the filter media of the filter are clogged or the filtration system is not in a good condition after running for a while on the aquarium, when keeping in mind the fact that

black, hard algae does not usually grow during the initial stages of the aquarium. To solve this clogging problem, rinse the filter media lightly in a bucket filled with the tank water to wash off the sludge buildup. The main cause of cloudy water and algae is the poor condition of the filtration system if the appropriate number of fish is kept in the aquarium. It is recommended to clean the filter media on a periodic basis, preferably about once every three months. Adding some Siamese Flying Fox to the aquarium is also an effective way to eliminate black, hard algae. Last but not least, be careful not to apply Phyton Git directly to any aquatic plants other than Anubias as their leaves can dry out with this additive.

### Maintenance of Filter Media



Sludge buildup on filter media can also cause poor water circulation. Make sure to remove the sludge buildup on the net as well.



Sludge can be sufficiently removed just by lightly rinsing the filter media in a bucket pre-filled with tank water.



Place the rinsed filter media back into the filter.



Once the filter is set up again, cleaning is complete.

**Q** My Vallisneria nana is not in a very good condition. The Aqua Soil used for the substrate still looks good, so I'm planning to suction off the sludge buildup on Aqua Soil, cut off all the leaves of Vallisneria nana while its roots remain untouched, and then sprinkle Aqua Soil (Powder type) on the substrate. Can I expect my Vallisneria nana to develop new buds by carrying out this plan?

**A** In the Nature Aquarium Gallery, we do not maintain Vallisneria nana by way of cutting them off except for their roots. The plant will probably develop new buds after the leaves are cut off, but it would take a long time to restore the original state. It would be safer and new buds would develop faster if the Vallisneria nana is carefully pulled out of the substrate and replanted after the damaged leaves are removed.



Densely grown Vallisneria nana

# NEW COMPLETE SYSTEM

ADA NOW REDEFINES STANDARD OF AQUARIUMS

ADA presents an advanced 60cm-wide aquarium system.  
New LED lighting system, AQUASKY 602, has a very simple design,  
but comfortably illuminates the entire planted aquarium layout.  
Super Jet Filter ES-300, with more compact dimensions, is also to be released.



## SUPER JET FILTER ES-300

Coming out in November 2012.

The new model, Super Jet Filter ES-300, is compatible with aquariums 60cm in width and smaller. ADA's signature stainless steel filter is a perfect match for ADA Cube Cabinet - Clear.

<http://www.adana.co.jp/en/>



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