



NISKAI AQUATICS

A Slice of Nature in Your Living Room

Wild Bee Shrimp and how the Niskai Method emulates this in Aquaria

A practical exploration of wild Caridina cantonensis habitats and how to easily replicate these conditions in aquariums for biotopic breeding set-ups

Caridina cantonensis, aka “Bee” or “Crystal” Shrimp are endemic to the mountain streams of Southern China, Taiwan and Northern Vietnam. Fed and fuelled by summer meltwater from high in the mountains, these streams are shallow, fast-flowing and cool water that is noted for having an extremely low mineral content buffered only by trace minerals that seep into the waterways as the stream passes through granite bedrock.

In Chris Lukhaup’s *Breeders and Keepers: Wild Shrimp of China* special, he describes these waterways as having water temperatures that “...vary during the year, from 13°C in January and 28°C in August”, that the “...conductance was 33-45 $\mu\text{S cm}^{-1}$...”, “...pH... between 6.0 and 6.3...”, and “...no carbonate hardness...”.

In layman’s terms, this means a very cool, clean and soft water column.

Of course, water that soft is functionally impossible to safely work with in Aquaria – there is no buffering capacity, and the mineral load of the water is so minimal that heterotrophic microbes will struggle to colonise. This inherently limits hands-off stability to just a few months, and is impractical for any long-term set-up – whether for display or breeding.

In the wild, the system is balanced by a constant level of input – fast flowing water brings constant low-level minerals, leaf litter and other

organic matter to fuel and feed microbes, and constantly flushes out harmful substances that might otherwise create toxic environments for living creatures.

High levels of dissolved oxygen in the meltwater also reduce risk of anoxic conditions, which limit toxin production and reduce the possibility of parasites and diseases that prefer more stagnant conditions.

In aquariums, *Caridina cantonensis* – even wild caught forms – are typically kept in water that has a much higher EC - often 150-200 $\mu\text{S cm}^{-1}$, which is, on average, 3-5x higher than in the wild.

This is done to better stabilise water parameters and ensure that Bee shrimp don't suffer from too little Osmotic pressure which can lead to disease, moulting issues and even death. To better mimic natural environments, high-CEC clay-based "Aqua Soils" are often used to buffer excess minerals, softening the water and stabilising pH around 5.8-6.2 without carbonates. This also provides a slight buffer to protect from pH and Dissolved Organic Carbon (DOC) swings caused by excess organic load in a system that cannot, by design, match the sheer water turnover of a mountain stream.

Pure Reverse Osmosis (RO) water is regularly used as a base, with General Hardness (GH) mineral salts used to slightly harden the water and add essential trace elements that would normally be released by volcanic granite. This typically includes a Calcium to Magnesium ratio of 4:1, and trace elements such as Iron (Fe_2^+ or Fe_3^+), Manganese (Mn), Iodine (I), Silica (SiO_2^+) and Boron (B). These trace elements either form the basis of shell structure or are required for enzymatic or microbial activity that Bee shrimp (and in fact, most *Caridina* or *Neocaridina* species) require for more than just basic survival.

Driftwood and dried leaves are also used to emulate the gentle humic and fulvic acids as well as tannins that are found in the wild that provide DOC for microbial growth, as well as more essential trace elements that are also used for microbial/biofilm growth and for shrimp health. Mosses and small plants can also be used for these purposes but are not often found in most Bee Shrimp habitats – with the exception of deeper catchment pools that stay submerged during the dry season.

These pools are full of decaying leaves, mosses and algae but Chris Lukhaup remarks that: "... in some protected areas, and especially where sources discharge into the streams, bringing somewhat more nutrients into the water, some aquatic mosses or a fine layer of algae cover the rocks. Strikingly enough, there are

practically no or only very few Bee shrimps to be observed in these places. Most shrimps can be found in places where slowly rotting leaves have accumulated in the crevices between the rocks or at the bottom of the pools. The microorganisms feeding off these leaves are the basic food of the dwarf shrimps living there. The bristles on their claw fingers are great tools with which they shave off this biofilm, together with loose cell layers on the leaf surface.”

This suggests that Bee Shrimp prefer the more marginal layers with greater turnover of fresh leaf litter, rather than more permanent places of decomposition – perhaps due to the increased DOC and reduced oxygen levels of said decomposition. In any case, they have clear preference for fresher, cleaner water and higher oxygen levels.

What this means for Aquariums, and why the Niskai method is suited to sustainable and simple breeding of Bee Shrimp:

Simply put, we cannot reasonably provide the same degree of clean water, mineral and organic turnover that makes Bee shrimp habitats unique. It would require a massive undertaking of plumbing, forethought and chemical perfection that even the largest zoos and aquariums just cannot practically (or affordably) replicate – and this represents a conundrum for hobbyists and serious breeders alike. We must find some compromise between parameters practical and realistic, whilst still trying to provide a comfortable, stable and easy to care-for habitat for some of the most sensitive dwarf shrimp in the hobby.

Some breeders settle for the hands-on approach – multiple smaller aquariums that ride the knife’s edge of stability, one missed water change away from disaster and colony loss. This can include large weekly water changes, heavy dosing of bacterial “boosters” and overfeeding. This method of shrimp keeping is not recommended by Niskai Aquatics for several reasons – most prominent being that the founder/COO is incredibly lazy.

To clarify, we embrace the principles of the Japanese term “yōryō ga ii” – or efficiency, practicality and understanding. We leverage this concept by studying and understanding how our chosen species live in nature and explore how best to simulate these conditions in Aquaria. The challenge for us was to decide how best to replicate soft, rapid turnover water systems. And for practicality, we decided that we couldn’t.

So, we turned to other methods and principles to make things work. Instead of trying to emulate precise water conditions, we focused on the

rest of their habitat – primarily the nutrient rich and fragile biofilms that colonise the substrate and provide *Caridina cantonensis* with the vast majority of their food.

The obvious challenge with this concept was the fact that biofilms are shaped as much by the flow of water in Aquaria as they are by the O₂ content, EC/mineral content and substrate. In order to keep the system clean and low in dissolved organic carbon (DOC), bare bottom tanks were the ideal choice. This brought up yet another complexity – how do we buffer the water? The traditional method of buffering pH and KH for Bee shrimp is to use aqua soil as a substrate, which was obviously impossible in a bare-bottom set-up... or is it...?

Originally, we stored soil in fine filter socks or plastic containers next to oversized air driven sponges, but this proved to be messy and frustrating come water changes or filter cleaning time. Eventually, we transitioned to under-gravel Filter (UGF) boxes – self-contained under gravel plates in an easy to remove container.

These were filled halfway with scoria – both to provide varying paths of flow for water and oxygen as well as to leach essential volcanic trace minerals into the column (more on this later) – topped with sponge and then a small amount of Aqua Soil for buffering and it's high Cation Exchange Capacity (CEC, or ability to pull positively charged minerals like pesky pH raising calcium ions from the water). This solved several problems, including water softening/Acidification and chemistry stabilisation, nitrification, redox and anaerobic zones for minor denitrification, water flow, and oxygen saturation.

Under gravel filters (while messy and painful if under substrate), are fantastic systems if managed correctly, and we have adopted UGF boxes for smaller aquariums with extreme enthusiasm due to their capabilities and flexibility.

On to the scoria. This extremely porous rock is formed when volcanic basalt rapidly cools as it is ejected from an active volcano, and this unique formation causes vast amounts of microscopic bubbles to form within the stone, allowing for a single piece to have significantly greater surface area for microbial habitats. As an added benefit, these microbubbles are certainly not uniform and provide varying levels of oxygen and water penetration within each piece. This allows for varying microbial guilds to take root within, unlike more artificial bio-media like ceramic that has

uniform pores and penetration (and thus limits which species and guilds can inhabit their surface).

The additional benefit to scoria is that it often contains essential trace elements like Iron, Manganese, Silica and more that are essential for plants, microbes and most species of fish. This is leached gently into the water (usually not in hobby grade test-detectable amounts) and benefits all life in water of a moderate hardness and mimics the way ground water picks up these minerals as it filters through bedrock.

Those challenges accepted, overcome and promptly forgotten about; we move back to the main water column. We have solved: Filtration, aeration, stabilisation and more, but we still have what's effectively RO water and a bare tank.

So next we fix the water. Products like Salty Shrimp GH+ or Niskai Aquatics' own bio-Boost GH+ (manufactured by AquaPics Australia) are formulated to replicate the mineralised conditions of the Bee Shrimp's ancestral (three, yes ONLY three) hill streams, and can be simply dissolved into new water to the required EC/TDS/dGh (for Bees, this is typically 3-6dGH, 120-150TDS or 150-200 $\mu\text{S cm}^{-1}$ (it's literally all the same) before adding to the system.

This leaves us with 2 final problems (not counting the difficulty encountered finding affordable, quality stock).

One being we still have an empty glass box. There's minimal surface area for grazing and biofilm growth.

We approached this problem obliquely. Understanding that fine, fragile biofilms require constant carbon sources to establish and flourish (constant refreshing of leaf litter does this in nature), we settled for aged hardwood chunks wrapped in whatever simple mosses we had on hand – these were Java moss, Christmas moss, fragments of Taiwan moss and even subwassertang. But any hardy aquatic bryophyte will do the job. This solved the labile carbon and surface area problems. We also threw in some unsealed ceramic pottery shards for varied microbial growth (modified oxygen diffusion and micro-currents permit different styles of biofilm and microbes) and textural enrichment.

The last hitch in the plan was to replicate the constant microbial refreshment from partially decomposed leaf litter being washed into the streams. Fortunately, Niskai Aquatics' resident mad scientist produced

bio-Boost Foundation – a synbiotic (not a typo) powder blend featuring a tailored dose of carbon and trace element rich prebiotic compounds and a curated blend of biofilm forming nutrient cycling bacteria. This blend, when dosed at half the recommended rate (so 500mg scoop per 100L twice a week as opposed to 500mg per 50L once a week) directly into the water column so it settles on every surface, provides critical microbial fuel that drives localised microbial blooms, alongside macro and micro-nutrient rich ingredients that shrimp can graze on (which is a side benefit, not the primary purpose of the product). These ingredients produce minimal ammonia and cause zero detectable nitrate increases when dosed correctly.

The fact that shrimp graze on the powder also reduces the need for Supplemental feeding, reducing costs and water changes. With all these processes in place, the Niskai method is borne. It can take a few months for biofilm growth to reach a self-sustaining level but once this happens, the system requires minimal inputs. Twice weekly scatterings of Foundation, top-ups from evaporation, 20% fortnightly water changes with in-built overflow systems and larger 50% water changes during or just after hot days (where the local temperature exceeds 28 degrees Celsius) are the only inputs required for a low-profile 110L breeder (90cm Long, 45cm wide and 35cm high).

Once shrimp are established and settled and breeding begins, it does not stop. “

Niskai Aquatics' primary (and very prized) S Grade F25 (so 25+ generations) Pure Red Line *Caridina cantonensis* reproduce at a rate that alarms our Keepers at times. It is at the point where there is a shrimp (whether adult, juvie or newly hatched shrimplet) for almost every square centimetre of surface area, with a dozen observed females berried and waiting to lay at any given time. Juvenile survival rates are incredible as well, and videos and photographs of the colony (including multi-generation spanning family portraits) can be obtained from Niskai Aquatics social media pages upon request.

And to further push the concept of yōryō ga ii, the Niskai Method can be rapidly established in new aquariums by transferring small portions of scoria into new filters, moving across some matured and seeded driftwood from existing Niskai systems (and in fact, all Aqua Flora pre-grown driftwood comes seeded with bio-Boost CORE microbial biofilms) which cut Maturation times by up to 75%, meaning that additional Niskai Method systems can be established in 1-2 weeks rather than 1-2 months.

In short (and much belated), the Niskai Method is a systems focused approach, rather than a product recipe. There is no perfect formula for Nature, because nature is chaotic, messy and unpredictable. But we can attempt to compromise and regulate the process – in essence, gaming the system. After all, Why leave Nature to chance when you can Engineer it?

References

Lukhaup, Chris, 'Diamonds of the Stream – The Hongkong Bee Shrimp', in *Breeders 'n' Keepers Wildshrimp: China Special* (2024), pp. 6–19. [Available online](#).