

Frozen Mysis Part 1: The Quest For Quality Food

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A mix of bad and good mysis. Do you know which is which?

Seahorse aquarists face a daunting task finding frozen mysis that is nutritionally intact. Feeding seahorses in aquariums has long been regarded as one of the most important keys to success with these delicate animals.

Widespread availability of captive bred seahorses has made feeding easier in recent years, but it is still fraught with challenges. And finding quality frozen food is often overlooked.

Many aquarists don't realize that frozen shrimp degrade in quality rather quickly. It's not uncommon for new seahorse keepers to overlook this part of seahorse care. Food that is in nutritional decline is easily missed if you don't know what to watch out for. The methods available for storing frozen food at home can create situations that cause a rapid decline in the nutritional quality of their mysis.

About Frozen Mysis

Frozen mysis is the staple diet of most seahorses and many other syngnathids in captivity. As a food source, it is a common part of a wild seahorse's diet, and packs a great nutritional punch. A varied diet is the best diet, but most seahorse keepers fall back on mysis as the main staple because of widespread availability. And seahorses like it, which is a big boon for a fish that is renowned for being exceptionally finicky.

Unfortunately for seahorse keepers, frozen seafood loses quality quickly and in a variety of circumstances. The fats in mysis, vitally important to seahorses, are prone to going rancid in any number of situations that can occur in holding and transporting frozen foods. If handled improperly, protein can be destroyed, losing important nutrients. Vitamins break down.

What's the problem?

Frozen food is something people rarely give much thought. For many people, the assumption is that frozen food equals “safe” or “fresh” food. Unfortunately, there are many ways frozen food can degrade while still in a frozen state, and many more where it degrades due to how it is handled from manufacturer to end consumer.

Frozen mysis should be handled just like frozen seafood for humans – it has a short “shelf life” even when kept at optimal conditions. Why does this matter? The same reason you would worry about the food you consume yourself; it affects the long term health of your seahorses.

This is particularly important if you are looking to breed seahorses, since the mother and father both contribute to the nutrition of the young, their health will directly impact the survivorship of their offspring.

If you're not discriminating with the foods you feed your seahorses, you can unwittingly offer them food that has degraded in quality. While one batch of bad food might not have noticeable effects immediately, if fed long term it can cause serious health issues. And seahorses, with their primitive digestive systems are particularly vulnerable to nutritional deficiencies.

Proper and Improper Handling of Frozen Food

While most manufacturers of frozen foods for fish do an excellent job of freezing and handling, problems frequently start once the food leaves their facility. There is a long chain from manufacturer to our home. Any of those steps in the chain can leave frozen food repeatedly thawed and refrozen, or kept at inadequate temperatures.

As a result, many local fish stores and online vendors end up with food that has degraded to varying degrees. Sometimes it occurs during the distribution chain, from manufacturer to distributor. But it can also be from distributor to retailer or retailer to customer.

Transit Woes

To save money, frozen food is sometimes shipped using 2 day service. And with the proper packing and right weather conditions, 2 day shipping can be done correctly. Which means shipping in an adequate styrofoam box and using dry ice, in weather that is not too warm.

Unfortunately as shipping costs have increased, the ability to ship properly has decreased. Dry ice has become more difficult to ship without special waivers and expenses. Styrofoam boxes are often too thin, and dry ice replace with frozen gel packs which don't always stay frozen throughout the entire shipping process.

Even if the frozen food is received in a still block solid state, employees and warehouse workers might not get it unpacked and into their own freezer in a timely manner. I've been involved in a number of

warehouse operations, and it's easy to see how a box can sit in the loading dock for extended time, especially when that day's orders are particularly high.

Frozen Food Degrades, Thawed Food Degrades Faster

The primary reason improper handling during the shipping process is so detrimental, is that when the shrimp are thawed, inactive bacteria and enzymes immediately starts to attack the food, causing spoilage. Freezing does not kill bacteria, it only inactivates it, waiting for warmer temperatures to prevail.

To further cause complications, freezing causes a breakdown of protein called protein denaturation, due to the enzymes and chemicals naturally found within the living tissue of seafood. Frozen seafood goes through this process once, and refreezing causes it to go through this a second time; further degrading protein.

But, when a commercial operation freezes food, it uses specialty equipment to rapidly freeze foods. This is to reduce the damage to food. At frozen temperatures, the protein denaturation process is accelerated at around -1 to -2 °C (30 to 28F). Commercial freezers rapidly push past this temperature to limit food quality loss.

Without a specialty freezer, refrozen food might languish in this temperature range for an extended time before the internal temperature dives below this.



Refrozen mysis is not fine. Ewww. Photo Courtesy of Louise Hines

For fish stores, this can be particularly problematic: food might be partially thawed before it makes it into their freezer, and many times the food sits in a retailer's freezer for months, well after the nutritional quality would decline. I'm certainly not the only one that has seen frozen food in fish store freezers that is multiple years old.

Storage Times and Temperatures

Frozen food needs to be kept at a minimum of -30°C (-22°F) for the longest storage time. But this does not extend the storage time indefinitely. For shrimp, if handled optimally and kept at this temperature, estimates range from 6 months to 12 months. (More on this in Part 2). These may even be generous though, as important lipids don't freeze until much colder temperatures.

This also means that the food not be stored in a home freezer (smaller fish stores sometimes opt for this), which generally run between -23 °C to -18 °C (-9 °F to 0 °F), but rather a chest freezer or commercial freezer that reaches a minimum of -30 °C (-22 °F).

This leaves many places that frozen food can be damaged in its journey from manufacturer to aquarists. The packaging might be inadequate going from manufacturer to distributor. The distributor might leave cartons on the docks for extended periods of time.



Thawed mysis shrimp.

Transporting from truck to freezer might mean they aren't immediately placed in the freezer. If partially thawed, they'll be frozen again, causing a second and possibly longer protein denaturation period. The freezer might not be cool enough to preserve some of the vital nutrients. And that's just the distributor.

It Happens To Every One

It's not just small shops either; the same thing happens with the big guys – I am unapologetic in my love of Dr. Foster and Smith. Yet, my experience with ordering frozen food has been middling at best.

Frequently I've received food that's partially thawed. I've received food that is well frozen, but clearly thawed and refrozen at some point (which is usually obvious based on the brown hue along with weird air bubbles in the packages.) Other aquarists have noticed the same thing on various forums, but were not aware that this caused a degradation of food quality.

Dr. Foster and Smith has always gone above and beyond to try to resolve the problems; in one case trying to send the frozen food 3 different times at their cost. This isn't meant to be an indictment as them as a company, rather an explanation that even the best guys out there struggle with the handling of frozen food.

Other, less reputable companies have denied that thawed or discolored food is a sign of a problem. One particular UK shop is known for shipping frozen food without any insulation, and refusing refunds, insisting the food is perfectly fine upon refreezing.



Packing frozen food this way is unacceptable in any weather. It lacks any real insulation. Photo Courtesy of Catherine Harris.

Age and Expiration Dates

Seafood is recommended to be no more than 6 months, and as little as 3 months. This is because in a home freezer, the temperatures are not low enough to stop the polyunsaturated fatty acids from breaking down. It's what makes old fish taste "fishy" when cooked.

The rancid fats don't cause imminent danger, but they break down into unhealthy components. Some of these compounds are toxic, especially if consumed over a long enough time. Not only that, they no longer provide the necessary fuel for our seahorses, which need a diet high in polyunsaturated fats. These are the "good fats" people look for in seafood.

Use It Quickly

Unfortunately, sale of older frozen foods for our fish is very common. This can be a problem with the wholesaler or at the fish store level. Hobbyists themselves are sometimes stock up on large quantities, unaware that age is an issue.



This expiration date of 2016/11 is not possible in most real world conditions.

Mysis should be used within 2 months of the date that it is frozen unless one has access to freezers capable of sustained temperatures below -22 °F(-30 °C), largely because of the short timeframe that it takes for polyunsaturated fatty acids to break down in home freezers. (More on the breakdown of polyunsaturated fatty acids in the forthcoming part 2.)

Don't Trust the Dates

The expiration dates on frozen food packaging further confuses the issue of food quality. A few frozen food companies use expiration dates – Hikari™ is one of them. The expiration date on mysis is dated 2 years after production. According to Hikari's customer service, this date is what they have " . . . confirmed the integrity of the animal and the added vitamins are still effective" .

This is misleading to the general public. Two years isn't really the amount of time the food is good for in real world conditions. While it might keep mysis intact in specialty freezers frozen food manufacturers has access to, once it leaves their facility, it's nearly impossible to expect those conditions to be replicated.

The two year expiration date is far too long to still be usable and have maintained nutritional integrity in any freezer either your fish store or your hobbyists have access to. But those expiration dates gives the aquarist a false sense of security about the quality of frozen food.



Old Hikarki™ mysis compared to fresh mysis

Hikari™ is just one example here. I inquired with Ocean Nutrition™, who also uses long expiration dates, for more information. I have not received an answer at the time of publication to clarify their expiration timeframe. I have received packages of their mysis with an expiration date 17 months from the time the food was received.

The Curse of Expiration Dates

Expiration dates on perishable items has been a long-standing problem for the aquarium industry. Aquarists like and expect expiration dates; they give some sense of product freshness and quality. Retailers, on the other hand, loath these dates. Expiration dates mean a shelf life, requiring smaller quantities must be ordered, usually at a higher price. Otherwise product is wasted if not purchased in a set time frame.

The long expiration dates on frozen food do not match with the actual time that the foods remain good in home and store freezers. There are countless studies on how long seafood remains nutritionally complete. The longest dates generally accepted in the food industry is 12 months for shrimp if handled and stored under ideal circumstances. Many industry guides recommend no more than 6 months for frozen whole shrimp.

Finding Good Mysis

Finding quality mysis can be really tricky. Like our seahorse charges, we must be finicky about food. I know plenty of seahorse aquarists that pour over every pack of mysis at their fish store looking for the freshest packs.

I wish I had a simple answer to finding the best mysis, but handling issues are rampant in the industry. I suspect this is because aside from a few of us hardcore seahorse nuts, most aquarists don't realize the importance of high quality frozen food or that there is even a problem. Seahorse aquarists have a

particular need of high quality food because it's usually the main food their seahorses eat, and for many, the only food.

Color

Color has long been used as a way of determining the quality and freshness of fish and seafood for human consumption, and the same works for mysis shrimp for our seahorses. Look for the whitest mysis you can find. The majority of mysis on the market is very white in coloration once frozen. P.E. Mysis™ is the exception, they have orange/yellow/pink fat globules in their stomachs, but the tail section should be white.



White Mysis cube compared to a discolored cube.

My own experience suggests that food that is thawed and refrozen tends to lean towards tan/brown coloration, and old food or food stored in warmer freezers tends to look grey, rather than bright white.

If the mysis you have access to is off white, grey, tan or brown, you should pass. This includes the ice it is packed in.



Compare the discolored mysis on the left to the good mysis on the right, both after rinsing.

Many of the examples included in this article are extreme examples. Color shifts that indicate poor quality are often more subtle.

Package Clues

You can often determine if frozen food has been thawed and refrozen by package shape. Flat packs should be flat and solid, with the plastic touching the frozen food. Mysis is frozen in blocks of ice to help prevent oxidation and that should be touching the plastic. If a has unusual air bubbles, that's a strong suggestion it was thawed and was refrozen.

If the flat pack is anything but flat, that is also a strong suggestion it's been refrozen.

Cube packs can be a little more difficult to discern. However, there are often some telltale signs. Look for air bubbles at the bottom, or gaps. Food frozen at an angle in the cubes suggests refreezing.



Refrozen mysis, notice the bubbles in the cubes in addition to the tan/pink color. Photo courtesy of Louise Hines.

Dimples and crush points suggest thawing as well; the frozen food acts as a reinforcement to the plastic packaging, and when thawed, do not provide much structural support. If the cubes are concave or corners crushed, there is a strong likelihood it was refrozen.

Ordering Online

I'll be completely honest – one of my biggest pet peeves is when a company selling perishable products don't pack correctly for the weather. We've known for years how best to pack perishable items; and yet it's often under-packed. It's my opinion that frozen food should be shipped with dry ice, the exception being the winter in northern climates. But most companies use gel packs as there is additional cost to shipping with dry ice, including training staff for safe handling.



Adequate packing for winter and cooler months, but a thicker wall styrofoam and dry ice would work better, especially in warm weather.

Sometimes frozen gel packs work out, but sometimes the food arrives partially thawed. If the latter happens, demand a refund and trash the food (or return if they'd rather have you do that.) Is it frustrating? Yes. But nothing will change unless the majority of consumers make poor shipping practices unacceptable.

Which, it really makes it important to check with online vendors beforehand not only what their guarantee is for quality of food, but specifically how they ship. As mentioned earlier, one vendor in the UK is notorious for shipping frozen food with no insulation other than packing peanuts, and insisting the customer can just refreeze the thawed food without any loss of quality.

This is simply not true, and a basic understanding of food safety will tell you this is a bad idea. It would be like deciding to cook and eat chicken that's been sitting raw on the counter all night. Sure, you might not get sick, but do you want to take that chance? Neither should you with your seahorse's food.

Other Frozen Foods

The same applies to other frozen food types. However, this article focuses on mysis as it is one of the most important foods for captive syngnathids. It is also frequently easy to identify problems based on the color of frozen mysids. But I've come across brown/black Cyclop-eeze™, freezer burned krill, and a whole host of other bad frozen foods – if anything seems off, don't feed to your seahorses (or any fish, for that matter).

Storing Frozen Food

If possible, store frozen foods in a chest freezer or similar dedicated freezer. Chest freezers and dedicated upright freezers are much preferable to those that are a fridge/freezer as those are usually defrosting freezers; these work by cycling warmer temperatures to melt the frost. These typical home

freezers also don't get as cold, nor stay as cold, causing breakdown of nutrients to occur even in the frozen state.

Unfortunately, no typical home freezer is going to be ideal for long term storage of fish food. If you only have access to a freezer fridge combo, be sure to only buy up to two months worth of food. If you have a standalone or chest freezer that can get down to -30C (-22F), you may be able to safely keep mysis up to 6 months from manufacture.

Conclusion

These problems with frozen fish food occur across the industry and around the globe. While many manufacturers of these foods have put the effort in to get the best quality food on the market, the end of the supply chain is often another story.

And aquarists buy degraded food because most are unaware that this is even an issue. Those that do know better are left with little choice because that's all that is available to them. Some aquarists make their own foods, which can help in some ways. But those of use seahorse and pipefish keepers are limited to specialty foods that are only found through pet supply companies.

Hopefully, with increased awareness, more customers will demand better handled food, and in turn, more stores will opt to ensure they carry the freshest, healthiest foods for our seahorses.

Be sure to check out: [Frozen Mysis Part 2: The Science Behind Frozen Food](#).

Photo Examples

Included are some examples collected of mysis that has been improperly handled and stored. They tend to be extreme examples but are not uncommon.



Bad mysis from Brine Shimp Direct, brown coloration as compared to some okay Hikari Mysis.



Brown Hikari Mysis compare.



Brown Hikari Mysis compared to a better pack.



Mysis totally thawed arriving from a supplier shipping without insulation. Photo courtesy of Louise Hines.



Thawed bad mysis. Photo courtesy of Louise Hines.



Lump of thawed and refrozen bad mysis. Photo courtesy of Louise Hines.



Bubbles in the package show previous thawing, probably partial. Photo courtesy of Louise Hines.



Mysis should not be the color of the box it came in.



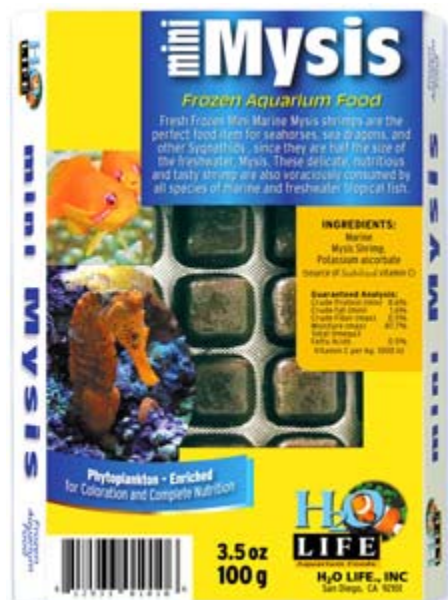
No.



Mysis that foams when rinsing is likely bad. The exception so far being P.E. Mysis, which tends to foam a little even when fresh, probably due to the high lipid content. It should not be excessive.



You would not want to feed this to your seahorses.



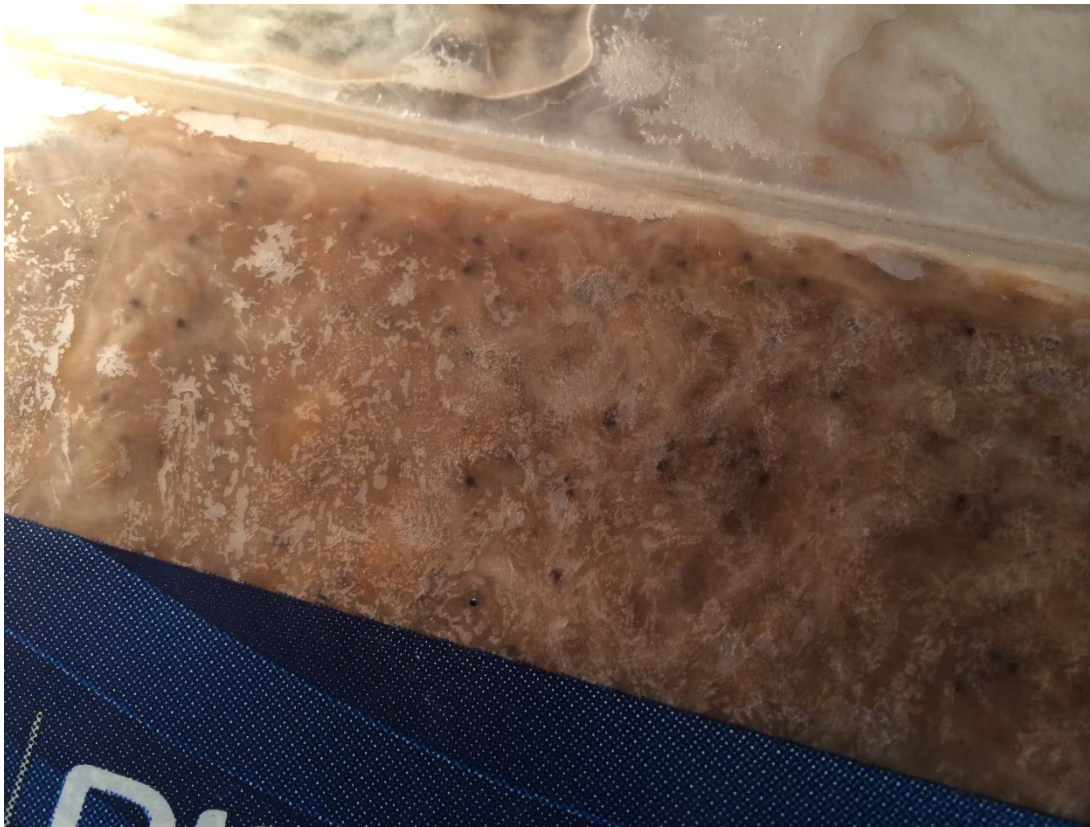
The Manufacturer's home page featured this beauty. Unfortunately, the only mini=mysis I've seen in stores has looked this way too.



Brown, Lumpy package suggests refreezing.



Bend at corner suggests refreezing.



More Brown Mysis

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