

Disease: Part 3

By John Shawn Prescott

Readers will recall that in the last two articles, I attempted to show the important contrasts in stress, and therefore the potential for disease between fish as they are in Nature, & those that are kept in captivity, especially those that are kept in Aquariums.

Today throughout the world, fish are been bred in captivity for food in most cases, but also for our Hobby. It is a fact that today, a very large percentage of the fish we enjoy watching in our home Aquaria, have been bred in captivity. This is a far cry, from the early days of the Hobby, when almost 100% of the fish which were sold, came from wild caught supplies, in many countries.

Although there are similarities, between the environments in which Aquaculture maintains and breeds its fish, to those we create for the home aquarium, there are also important differences. In order to better understand, how fish may be stressed & become ill, it is useful to be able to make such comparisons, which are set forth in Table 1. Below:-

FISH LIVING IN	IN NATURE	IN AQUACULTURE	IN AQUARIA
Many kinds of fish	Yes	No	Varies
One type of fish	Never	Usually	Almost never
High density	No	Yes	Can vary
Ideal water	Yes(for the most part)	Mostly, not always	Variable
Good husbandry	Not applicable	Usually	Variable
Subject to predators	Yes	Only at juvenile stage	Seldom, but can be
Natural food	Yes	No	Rarely
Water changed often	Yes	Depends on method	Variable
Subject to stress	Yes, but only natural	Stress by crowding & more	Depends upon skill of Aquarist

I think it is informative, to look carefully at this short list, as it makes us focus on, what are the similarities, and even more importantly the differences which occur. I maintain that these differences account in quite some measure for the diseases, including the factors that induce our fish to become sick, in too many instances.

Diversity.

We see that in the rivers and oceans, that fish are present, in great numbers as well as in many species. Although predation is natural, the various species have evolved methods to deal with it, such as camouflage, shoaling, natural habitats which give shelter, to name only a few, therefore the fish does not feel stressed, as part of its existence, unless exceptional conditions arise.

In Aquaculture fish are raised in a number of different ways. These include earthen ponds, cages, raceways, (of many types of construction), sea cages in open sea, and protected bays, as well as entrapped bodies of water, Streams, and Lakes, as well as several other variations of these. For the most part in Aquaculture the fish are the same species, though there is a trend in some areas to Polyculture, (the rearing of two or more species, which are compatible, in the same environment). Here at least although stress can and does arise for other reasons, the stress that can be caused by an incorrect choice of species in the Aquarium does not arise.

In Aquariums, it is usual to find a few too many kinds of fish, the discerning Aquarist, will ensure their compatibility, but often by wrong advice or being unaware he will put a fish or two, into the Aquarium, which will become very aggressive to others, such can and will cause stress to other fish, which can quickly result in disease breaking out.

Density.

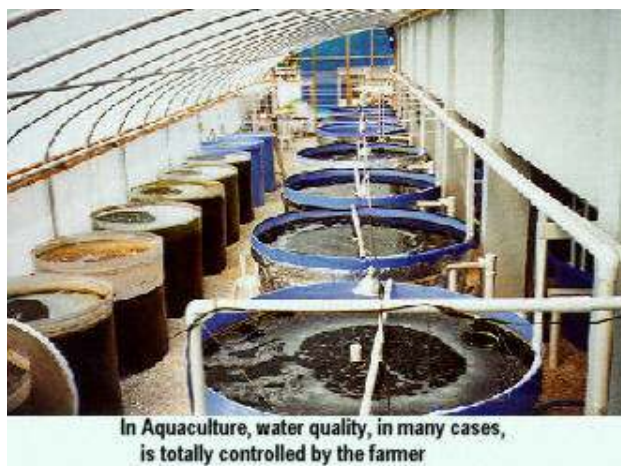
In Nature, the oceans are to a large extent unlimited at least as far as the numbers of fish are concerned. Thus although the numbers in some shoals may be enormous, there is never any problem of overcrowding or the consequential deterioration of the water quality.

In Aquaculture, the name of the game, is to get the absolute maximum numbers of fish, per given size of tank, cage, pond or whatever, as is commensurate with rearing the fish to point of sale, without them getting ill. The expert fish farmers, spends much of their effort, in trying to achieve just this. However from time to time for many different reasons, engineering breakdown, storms, changes in water quality, the fish may be and are sometimes subjected to tremendous stress, so when this happens, the window of time to rectify this is short, and often very limited.

In Aquaria, except with those novice Aquarists, whose enthusiasm exceeds their current knowledge, today most Aquariums, are not overcrowded. When this rule of giving reasonable space to the species we intend to keep, & ensuring that we have made due allowance for the eventual size they will become, the question of density causing stress should not be a factor. Remember though, especially newcomers to the Hobby, it can easily become a factor. Thus choose your fish thoughtfully, & with careful research into the compatibility with the fish you already have.

Water quality.

In Nature the water quality is for the most part a constant, with a few exceptional conditions, which may be caused by run off, or flooding etc. Here the fish has evolved in its ideal habitat, & it is very rare, for any stress to be caused by water chemistry, or temperature changes, other than those which are natural. However increasingly & most regrettably, there is yearly more reported "Red Tides" and similar type occurrences, which are not fully understood at this time by Science. Much informed opinion leans towards the explanation, in at least a large number of cases, that mankind's alteration of the environment by run-off's, by untreated sewerage, by oil spills, by damming of rivers, plus so much more. These "Red Tides", are in many cases, highly lethal, sometimes to the fish themselves, other times to humans who may ingest species exposed to these tides, which often cause toxins of rare potency to be formed.



In Aquaculture, water quality, in many cases, is totally controlled by the farmer

Photo above by courtesy of Mote Marine Laboratories Sarasota Florida

The economic losses, due to the shut downs of collection especially shellfish, during these outbreaks, by Governments, to protect public health, runs into millions of dollars, so assuming that we as humans are in some measure responsible, the consequential losses in economic terms are considerable.

Authors note:- When the advocates of easier (read uncontrolled) development push for less Government regulation, in almost every case to make their development plans proceed without the checks & balances that mankind has attempted to put in place this century, they always understandably look at their own projected bottom line. I believe that as we now have crossed that famous "bridge to the 21st century", that a new form of accounting must urgently be introduced into top decision and Nations law making. We need to look at a much wider picture, to see the broader costs to all of us. Furthermore I feel a property tax on business that would take into account all forms of pollution, discharges of all kinds, as well perhaps of aesthetics, so that the largest polluters paid the highest tax. This would give the correct incentives to the heaviest polluters to take remedial action. Furthermore it would increase the already thriving industry, that produce all forms of pollution control machinery & equipment. At the end of the day, such polluters, would obviously pass on to us the consumers the costs, but all of us would be paying the cost of pollution, and not just an unfortunate few. Competition moreover, would quickly reassert itself, so that those companies that did not "move with the times" would soon find themselves, in an uncompetitive position. Thus we could attack pollution while still retaining the profit motive.



In Aquaculture, the water quality, is in many cases, totally controlled by the farmer, although in sea cages, it can be similar to nature, though even here some problems have arisen. Because this vital parameter is so important, in most fish farms, water changing is a part of the everyday routine. Notwithstanding this, many are the occasions when some vital chemical or other parameter, will change, almost invariably for the worse, and this can threaten the stock of the farm, often within a horrifically short period of time, which can amount to less than an hour in extreme cases.

In Aquariums we today have the technology to control water quality to a high degree. Notwithstanding this, for a large number of good reasons, the water quality from Aquarist to Aquarist, varies in large degree, from superb, to abysmal. Among the myriad of reasons, are, lack of good advice from the dealer, lack of adequate funds to purchase some of the essential equipment, poor water quality at source, & there are several others. The high quality Aquaria, will encounter a much lower level of diseases, whilst one can be sure, that the lower levels of water quality, will have the highest incidence of disease outbreaks. One can also say with certainty that many of the Aquarists who quit the Hobby, do so because they have lost too many fish due to disease. It will help

everyone to be successful, if we can try together to reduce disease, & improve where necessary the water quality.

Good husbandry.

In Nature, this matter is not relevant, as the quality of the fishes life is natural, & it will normally thrive.

In Aquaculture, this is the essence of what fish farming is all about, & woe betide those farmers, that become careless, or do not keep up with the most successful techniques. Any improvements in technology rapidly spread in today's world, and are quickly are reflected in the final price of the fish. For this reason most fish farmers, are constantly tending their stock and pay great attention to their well being.

In Aquariums, this is certainly also true for the elite among our Aquarists. I would say, even the majority among those of you reading this article. Regrettably this is not always the case among too many of the millions of Hobbyists out there. Lack of time, paucity of knowledge, combined with the fact that for too many, Aquarium keeping has and always will be, a passing fancy, to go along with other whims, like roller skating, baseball, the latest movie, etc. It is here that the quality of the water tends to vary downwards, with all the attendant consequences of disease, leading to final abandonment by the enthusiast for the Hobby he ardently espoused for a few weeks or months.

Predation.

In Nature, fish are constantly predating on other fish, or plankton, algae or whatever. This is part of the natural cycle of life. They in turn, with a few exceptions like large whales & sharks, are also subject to predation. Most fish have a built-in awareness of the dangers, & over eons of time, have evolved techniques to lessen the risk. Among these are shoaling (safety in numbers). Background camouflage, habitat security, development of toxins to ward of predators, association with other species, that lessens their risk, & more.

Because all of this has happened naturally, they are seldom in a heightened state of stress, although they have this consciousness that causes them to take cover, when they think danger may approach. We have all seen shoals of fish, move in sudden uniform fashion, to another direction, which is almost always, an instinctive reaction to a perceived danger, which they hope to avoid. By and large then, stress with its consequential increase in disease factor, is not very high in the natural environment.

Aquaculture , for the most part, with good management, is seldom subject to predation, unless in the case of ponds or lakes, etc., there are natural predators that may prey upon the stock. These can & sometimes are a serious nuisance. Among the worst offenders, are Herons, Pelicans, Snakes, Otters, Monitor Lizards, plus others. However any serious fish farmer, is aware of these risks, & technology today, is capable in large part of finding answers to this problem.



There are still some types of predation that we need to find answers to, these are the subject of constant ongoing investigations. One such in Aquaculture especially in Salmon culture is a form of predation that is in reality a parasitic disease. Sea Lice, have emerged as a substantial predator on stocks of salmon, which are now farmed in many countries of the world. These cause enormous economic damage, although some progress has been made to control them, it is not yet adequate.

In Aquariums, predation is often caused by the Aquarist being unaware of the incompatibility of the specimens he has chosen. In Reef tanks many Invertebrates, even though sessile, are capable of causing injury leading to death, of another species, when they are placed to close together so that they touch. Many species of fish will attack another kind, often incessantly, and with some major beautiful species of Angelfish. This is especially so, when the fish are the same kind and of similar size. Other species like Butterfly fishes will live on their natural food, i.e. certain corals, to the horror of the owner, who has spent hard earned money to acquire a prized specimen.

Not only does this cause losses, but the fish which are attacked rapidly develop major stress symptoms, as they (unlike in Nature) cannot escape the problem, being confined in an Aquarium. These symptoms are too often the reason that a disease will break out, which then quickly passes, to others in the tank, who although not being attacked cannot escape the spread of the infective organism(s), that ensue.

It is therefore vital that when we select species of fish or invertebrates for our Aquarium, we should ensure that we carefully taken note of what is compatible, not only with the new species we are about to buy, but also with those we already have in our tank.

Natural food.

In Nature, there is only natural food, so this is hardly ever a cause of disease, as each species seeks out the forms of nourishment most suited to its requirements. There is today an increasing danger however that as mankind has "successfully" over fished almost all of the major commercial species, that the "natural" chain of food, now for the first time, having its knock-on effect, may cause some changes in the ability of many species to have an adequate diet. This over fishing effect has already had undesirable results, with much bird life, when their preferred food species has been tremendously diminished , e.g. sand eels on the Puffin population.

The environmentalists, must also be allowed to make their studies and inputs into the decisions about fishing quotas, so we have a long way to go, before we can safely say we understand it all.

In Canada, the economy of the State of Newfoundland, was seriously impacted when the Government having for years got their statistics wrong, were forced to close down the major fishing grounds on the St. George's bank, with the loss of some 30,000 land based and seafaring jobs. This economic loss is still affecting the local economy.

In Aquaculture, natural food is seldom applied. Almost all diets, although invariably containing some fish meal (a major limitation at the moment on the unbridled expansion of fish farming), are produced in factories that make up a balanced feed, that contains state of the art, know-how about the various requirements of the fishes dietary needs. An interesting but minor exception to this was recently revealed on one of the bulletin boards of the Aquaculture industry. in Ireland, but they found that they were getting a very high conversion ratio, (less than 1:1, this means that they were getting more food in production of the salmon, than they were feeding to them, on the face of it impossible). On investigation they found that the droppings from the fish were causing a "bloom" of phytoplankton, which attracted vast quantities of mysid shrimp. The salmon fed on these shrimps, & grew at a much higher rate than had ever been observed for the applied ration of food. I feel sure that variations of this may become a part of future fish farming.

There also has been in Aquaculture, because of the nature of the food, some important and costly disease/problems, among them it has been found, that some manufacturers, did not have adequate quantities of Zinc, in their diets. This caused blindness with important losses, until rectified. Other diets have been found to lack on or more of the various vitamins, or amino acids, most of which are as vital to the healthy growth of fish, as they are to all other types of living creatures. It is seldom practical to feed natural live foods to the fish in Aquaculture, but it may be pleasing to you as Aquarists to note, that when there are exceptions, it is usually from the ornamental side of the industry, that such are used. Of course in the early larval stages of Aquaculture natural live foods are used all the time, most especially in the form of Brine shrimp(Artemia), without which there would be no Aquaculture for many important species.

Aquarium use of live food is highly variable. Most good shops carry one or more varieties of live foods, a large number of serious Aquarists buy such on a regular basis, others, culture or collect their own. The use of such foods is important, in some cases vital, as there are fish, who will never touch a prepared food, such as leaf fish in Freshwater, Seahorses, Lion fish in Saltwater as well as many others.

Without such additions to their diet, many fish will progressively weaken and become prone to disease. This can be avoided, by choosing a suitable live food, feeding it regularly, though it is sometimes difficult to ensure without a great deal of trouble, that the fish that need the live fish most, get to it. Too often other faster fish, have eaten all or most of it, while slow moving fish like those mentioned, have had almost none of the same.

Another alternative is either to avoid such obligate live feed species altogether, or keep such fish species in a tank to themselves. Sometimes Hobbyists will do this, while ensuring that a number of pregnant female Guppies are always present. Such females will eat almost any food, whilst the continuous supply of their offspring will provide a constant live food diet to those that will eat nothing else. Hobbyists should be aware, that Guppies, can be kept in full saltwater, and will even breed, if the "change over" is done gradually over a few days. Whilst large Lion fish, will also eat the parent stock, Seahorses will not look at an adult female, but will eat newly born fry.

Aquarists, should take careful stock of their fish, along with the eating habits of same, to ensure that the diet, is adequate and balanced, otherwise over a period, stress will develop, along with it diseases that can affect all the fish in the tank.

Water changed often

Finally in Nature the water is constantly changing, and only as said earlier if pollution occurs is their any problem on this account.

In Aquaculture water is often changed on a regular basis, or if in cages in the ocean, is subject to constant change. Notwithstanding this, from time to time even in the sea, the sheer volume of fish in a given area, has caused some massive problems, this in various ways. Good fish farmers, are aware of this problem, so today techniques to measure and control the problem are in place in the more important aquaculture countries.

In Aquariums this is a major variable. Most Aquarists are aware they should change the water on a regular basis. For reasons of time, money, "theories" that contradict the popular wisdom, as well as the insistent adverts, of some producers of additives, many change rarely or insufficiently. Without doubt, this factor is responsible for many unexplained "sudden" outbreaks of disease, in tanks that had apparently had no problems. A good rule of thumb, in Aquariums that are NOT overcrowded, is to change about 7-10% of the water volume weekly. This in both fresh or salt water tanks.

These then are the major differences between the environmental pressures that fish are subjected to, in the 3 different ways of their existence. By looking carefully at these, understanding, what helps, what does not, then by applying these principles to our Aquaria, I believe major benefits can result. john@aquarium-gardening.com