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Bolton Aquarium - its History and Development

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Bolton Museum

The technical aspects of keeping fish are advancing at an alarming rate, so that equipment used today very quickly becomes obsolete. This causes various problems in an established museum aquarium.

Bolton Museum Aquarium was built in the 1930's to a design similar to that at Chester Zoo. On completion there were sixteen display tanks and five quarantine tanks. The fascia was tiled and a brass rail kept people away from the front glass. During the 1970's, when the aquarium was given a facelift, the rail was removed and a new fascia was erected in front of the existing tiled one. Although this allowed people to get 'closer' to the fish, it also allowed diamond rings to scratch the glass, graffiti to appear on the fascia, as well as the inhabitants having to suffer the sudden shock of people thumping the glass. The facelift, therefore, was not necessarily an improvement.

Originally each tank had limestone rockwork cemented in place. This produced two very useful results. As the tanks are made from reinforced concrete the act of cementing in rocks effectively sealed them from leaching carbonates into the water. This extended the life expectancy of the concrete. Also the limestone, being white, reflected the light back into the tanks making them appear very bright. The one drawback was that all the spaces behind the rocks were filled with gravel and this created an area which could not be effectively cleaned.

The filtration system employed at Bolton consisted initially of wooden filter boxes in which there was some medium - gravel/filter floss. The boxes were probably sited under the display tanks and water entered them by gravity feed and was then pumped back into the tanks. This was altered during the late 1960's and the filter box, now of plastic design, was sited above the tank and a submersible pump employed to move water from the tank to the filter box. The filter medium now being used is one of the following: foam, filter floss and gravel or filter floss and bio granules. It is still not fully satisfactory and it is hoped to improve it again in the future.

From the time of opening until the mid 1960's the aquarium tanks were all connected so that water could enter at one end of a run of tanks, percolate through to the other end and then leave and run away to drains. This is known as an 'open' system. By and large it can be a very effective system when operated competently. However, because most museum aquaria are considered low priority, inexperienced staff are often employed and there is an initial period when experience is being acquired when things can go wrong. Unfortunately during the 1960's things did go wrong on a major scale and quite a lot of the

livestock were lost. This resulted in the change of filtration, removal of a lot of rockwork and the isolation of each tank.

The rockwork was replaced with sheets of darvic as a temporary measure; the sheets are still used today - twenty years later!

Sometime during the 1960's one section of the aquarium was used to display native marine life. Unfortunately salt water rots concrete quite quickly. These tanks soon developed leaks and were then used to display reptiles, until the mid '70's when they were repaired and a fibreglass skin installed to prevent leakage. Twenty years on and the rest of the tanks are undergoing the same problem. It is hoped that they can be treated and have a glassfibre skin inserted to increase their life by about 10-15 years.

In the 1970's, when the fascia was altered and the rail removed, the static display in the corridor leading to the aquarium was converted to include aquaria; six tanks, 5ft x 1.5ft x 1.5ft, were installed. This effectively increased the number of tanks from 16 to 22. It also added scope so that more small fish could be displayed - the smaller fish are often lost in a large tank eg. 8ft x 3ft x 3ft. Unfortunately this area was full of compromises and the design leaves a lot to be desired. Because of the relative shallowness of the tanks and the height at which they are installed, small children have difficulty seeing in them and adults have to stoop. There is very little space for access to the tanks and all maintenance work is carried out from the display side. Consequently this is done before 9.30am when the aquarium opens. There is also a problem with the keyholes getting filled with pencils, pens and chewing gum, so getting into the tanks can sometimes take a long time.

The tank lighting has over the past few years gone through quite a lot of changes. Initially there were incandescent bulbs; these were changed to fluorescents, which were then altered to splash-proof fittings - part of the Zoo Licence conditions. It is hoped eventually to change again to spot lamps because these focus the light on the tank whereas fluorescents give a 360 degree spread. Spot lights will create a heat problem but this should be nullified by altering the air circulation through the aquarium.

The aquarium is predominantly fresh water. Approximately ten of the tanks are tropical and consequently require heating. Until very recently this was done using a number of domestic heaters connected to a contactor which was switched on using a domestic thermostat. Because a large number of heaters were used they burned out regularly and it was time-consuming searching out the offending heater. The domestic heaters were therefore replaced with industrial units of 1 or 2kw capacity.

When the conversion was made from domestic heating to industrial heating it soon became apparent that the power supply to the aquarium was insufficient. At present ten tanks require heat; total demand, based on 1kw requiring 4.2 amps, is in excess of 60 amps. As only 25 amps are being delivered, some tanks are not heated all the time. The building is at present being surveyed for rewiring which, hopefully, will take place in 1988.

In 1985 the Bolton Aquarium was inspected for the Zoo Licence. This involved a team of inspectors from the Department of the Environment and from the Environmental Health Department inspecting all aspects of the aquarium. They decided to grant a licence but only conditionally. The two conditions were that

i) electrical fixtures be altered to splash proof fixtures and earth leakage circuit breakers be fitted to all circuits, and
ii) that intensive records be kept of all occurrences so that in the event of staff illness the fish would still be maintained in the correct manner. The inspection proved very useful in that the inspection team made a number of suggestions, observations and recommendations which helped tremendously with the husbandry of the stock.

The main feed for fish is oxheart. This is given three times a week. The oxheart is bought fresh. It has the outer and inner membranes removed and is then cubed and dusted with vionate vitamin powder. Some of the cubes are then minced and it is then fed to the fish.

The inspectors were concerned that the vitamins would wash off and would not get into the fish. They suggested liquidising the heart and setting it in agar with the added vitamins. Unfortunately agar is quite expensive so gelatine was preferred. This was used for twelve months during which time it became obvious that the fish were losing weight and condition. As the larger fish chewed the cubes of gelatine/heart/vitamins, a large proportion of the feed was squirted out through the gills into the tank, creating a soup with which the filters could not cope. So the gelatine was dropped and for the time being feeding has reverted to the original method. However, more of the commercial feed has been introduced into the diet in the hope that the fish will ingest more vitamins.

Concern was expressed by the inspection team about the condition of the concrete tanks. They are showing signs of 'concrete cancer' and are spalling badly. Because of this concern an inspection was carried out by a concrete specialist. The report stated that although there was no danger of tank collapse, repair work should be carried out soon.

The acquisition of new fish poses the problem of stress. In imported fish the long journey and the changes of water chemistry (exporter to importer/wholesaler to final home) can be extremely stressful. The large dealers' tanks often leave a lot to be desired and some colleagues prefer to either import their own

fish, which is fairly risky or to take them from the wholesaler as soon as possible to reduce the chance of new arrivals being diseased.

Wild caught fish have the additional problem of getting used to alien conditions. For native fish, stress can easily be reduced by careful handling and by using oxygen and a mild tranquillizer eg MS-222.

At Bolton MS-222 is used to quieten wild caught native fish. This, coupled with careful handling, has reduced deaths in transport to virtually nil. A stock solution is made up so that 100ml of solution holds 450mg of tranquillizer; 10ml of stock solution added to 1 gallon of water will give approximately 45mg/gallon. According to D J Solomon and A D Hawkins[1] a concentration of 10-30 mg/l is sufficient to tranquillize fish.

As there are 4.5 litres per gallon then 10ml of stock solution added to 1 gallon gives the lowest concentration. Note this is only used in transport; prolonged exposure to MS-222 can lead to respiratory problems.

During the next few years it is hoped that Bolton can join the Lake Victoria cichlid scheme to preserve fish stock native to the Lake. It is also hoped that the two pairs of freshwater stringray, at present housed in the aquarium, will attain sexual maturity and start breeding.

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Introduction

Liverpool Museum has a long tradition of living displays. For example, the 5th Annual Report for 1857 states that:

"During the year several aquaria, both salt and freshwater, have been established in the Museum and have proved objects of very great interest to visitors; indeed, there is good reason to suppose that it is mainly owing to the new additions to the Museum that the number of visitors has been so much in advance of previous years."

The 'advance' referred to was an increase of no less than 16,145 visitors over the previous year's total of 106,914.

We are particularly fortunate that this tradition continues to receive the backing of the museum's management team who are prepared to underwrite the considerable effort and resources necessary for the upkeep of the displays. The result is that some 130 years on, live displays remain at the forefront in the popularity stakes, and continue to play an important role in the Museum's educational programme.

Display techniques

Management of large-scale marine displays requires, above all else, an ability to keep a host of disparate elements in relative equilibrium at all times. Whilst attempting such a biological balancing act, usually within the confines of a multitude of aquaria, one must also be constantly mindful of the needs not just of the inmates, but of the observers as well. After all there is little point in providing optimum conditions for your favourite species of burrowing goby if all the visitor has to look at is an occasional cloud of mud and a hundred-word label! The most successful living displays should have immediate aesthetic appeal and educational impact. This can only be achieved through excellent presentation supported by dedicated staff with access to comprehensive maintenance facilities.

The present aquarium and vivarium replaced the original one which was destroyed in the last war, and was first opened to the public in March 1966. Unfortunately, from the outset it suffered from the effects of poor design in several important areas. The 26 rectangular display aquaria were of mild steel construction and their internal resin coating soon chipped off, causing corrosion problems. The light level achievable over displays was inadequate and the safety of the installation questionable.

Large but inefficient sand filters, located below floor level, required the laborious removal of floor boards in order to inspect or service. Only twelve small aquaria were provided for quarantine purposes. They were located in a 10ft x 10ft room which also doubled as an office, enquiry point and store. An ambient temperature in excess of 30°C (86°F), caused by uninsulated sub-floor steam pipes, frequently resulted in 'cold water' displays operating at temperatures higher than those found in the tropics.

Fortunately, most of these problems are now things of the past. We have full quarantine and breeding facilities of over sixty tanks contained in two rooms. On the west display gallery the ambient temperature is maintained at 20°C (68°) by four individual air-conditioners and the water temperature of the thirteen local marine and freshwater displays is further reduced to 10°C (50°F) by a titanium cooling plant of advanced design.

The east gallery is fitted out with thirteen marine and freshwater display tanks which contain a wide range of tropical species. High-tech backup includes automatic photoperiod control, emergency power supplies to essential equipment, dual circuit air turbines, UV water irradiation equipment and